Teaching in a Digital Age - Second Edition

Teaching in a Digital Age - Second Edition

Guidelines for designing teaching and learning

A.W. (Tony) Bates

TONY BATES ASSOCIATES LTD.
VANCOUVER, B.C.

Sample APA-style citation:

This textbook can be referenced. In APA citation style, it would appear as follows:

This book was produced using Pressbooks.com, and PDF rendering was done by PrinceXML.

Bates, A.W. (2019). *Teaching in a Digital Age – Second Edition*. Vancouver, B.C.: Tony Bates Associates Ltd. Retrieved from https://pressbooks.bccampus.ca/teachinginadigitalagev2/

Contents

Scenario A: A university professor addresses change

Overheard in a coffee shop near campus:

Hey, Frank, you don't look too happy.

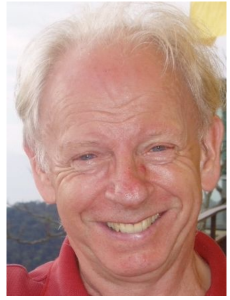
Yeah, I'm mad as hell. Our Dean called a meeting yesterday of all faculty to discuss the university's new academic plan, and what it means for all the academic departments in the Faculty. I knew there had been meetings earlier in the year, a few of which I'd attended, but it seemed to be the same old waffle about building a university fit for a new age, and revolutionizing the way we teach. But those discussions didn't seem to affect the courses I'm teaching – it was clear early on that there was no threat to the department being closed down. If anything, it looked like my classes would be getting even bigger, with the usual statements about having to do more with less. My research is going well, and there was no talk this time round about having to take on an increased teaching load. At that point, I'd switched off: I'd been through all this many times before.

But as soon as the dean started yesterday, I sensed trouble. He started talking about the need for the department to be more 'flexible' in its teaching. What the hell does that mean – yoga exercises at the beginning of each lecture? Then he went on to talk about 'defining clear learning outcomes' and 'personalizing learning.' Well, that's stupid. Anyone knows that you have to internalize what you learn or it doesn't happen. And my courses are changing all the time – if I set outcomes even at the beginning of a course, they'll probably be different by the time we get to the end.

But then the real kicker, when I knew things were going to be difficult. 'We want to have at least 50 per cent of all classes taught in a blended or hybrid manner within the next five years.' OK, I guess I could handle that – I've been using the LMS to back up my lectures already, but when he said that means offering the same content across different courses, and getting rid of most lectures, I really started to worry. He started rambling on about needing to serve all kinds of learners from high school entrants to lifelong learners, and for us all to teach in teams, with the senior faculty member as a teaching consultant. Now if he thinks I'm going to let some of the other idiots in this department decide what I'm going to teach, he's out of his mind. The scary part is that I think the Dean really believes all this claptrap.

But when I really started to panic is when he said we would all have to start taking courses on how to teach. Now I get pretty good student ratings for my lectures – they just love my jokes – and I'm NOT having anyone telling me how to teach my subject. I'm one of the top people in my area of research in this country, and what the hell does the administration know about how to teach it? And when am I going to find the time, anyway, to take courses? I'm already working flat out. Why don't they just leave us alone, and trust us to get on with the job we're paid to do?'

If any of that rings a bell, this is the book for you.



For my comments on the scenario, click on the podcast below

About the book – and how to use it

This is the second edition of *Teaching in a Digital Age*. The first edition was published in April 2015. All changes to the first edition are in this green colour text.

i. Why this book?

Teachers, instructors and faculty are facing unprecedented change, with often larger classes, more diverse students, demands from government and employers who want more accountability and the development of graduates who are workforce ready, and above all, we are all having to cope with ever changing technology. To handle change of this nature, teachers and instructors need a base of theory and knowledge that will provide a solid foundation for their teaching, no matter what changes or pressures they face.

Although the book contains many practical examples, it is more than a cookbook on how to teach. It addresses the following questions:

- is the nature of knowledge changing, and how do different views on the nature of knowledge result in different approaches to teaching?
- How do I balance the demands of my discipline with developing the skills that students will need in a digital age?
- what is the science and research that can best help me in my teaching?
- how do I decide whether my courses should be face-to-face, blended or fully online?
- what strategies work best when teaching in a technology-rich environment?
- what methods of teaching are most effective for blended and online classes?
- how do I make choices among all the available media, whether text, audio, video, computer, or social media, in order to benefit my students and my subject?
- how do I maintain high quality in my teaching while managing my workload?
- what are the real possibilities for teaching and learning using MOOCs, OERS, open textbooks?

In summary, the book examines the underlying principles that guide effective teaching in an age when everyone, and in particular the students we are teaching, are using technology. A framework and a set of guidelines are suggested for making decisions about your teaching, while understanding that every subject is different, and every teacher and instructor has something unique and special to bring to their teaching.

In the end, though, the book isn't really about teachers and instructors, although you are the target group. It's about helping your students to develop the knowledge and skills they will need: not so much digital skills, but the thinking and knowledge that will bring them success in a digital age. For that to happen, though, your students need you to be on top of your game. This book is your coach.

ii. The audience for the book

The audience I am reaching out for are primarily college and university instructors anxious to improve their teaching or facing major challenges in the classroom, such as very large numbers of students or rapidly changing curricula, and also to many school teachers, particularly in secondary or high schools anxious to ensure their students are ready for either post-secondary education or a rapidly changing and highly uncertain job market. In particular the book is aimed at teachers and instructors anxious to make the best use of technology for teaching.

I draw many of my examples from post-secondary education, but many of the principles will also apply to teachers in the school or k-12 sector. However, as a former elementary/primary school teacher, I am well aware that schools have far fewer resources and less technology support than colleges or universities.

Throughout this book, I have struggled with the term 'instructor', because I argue that we need to move from a transmission model of education ('instruction') to the facilitation of learning ('teaching'), even or especially in post-secondary education. However, the term 'instructor' is often used to distinguish between post-secondary and school or k-12 systems, with 'teachers' being used for the latter, so throughout the book, I've tended to use both terms almost inter-changeably. However, my hope is that we will all eventually become teachers rather than instructors.

Lastly, although technology is a core focus of this book, I am not advocating ripping up the current human-based educational system and replacing it with a highly computerised model of teaching. I believe that although there is a great need for substantial reform, there are many enduring qualities of a well funded and publicly supported education system based on well trained and highly qualified teachers that will be hard if not impossible to replace by technology. The focus here is in making technology work for both learners and teachers.

iii. Why an 'open' textbook?

Although I retain the copyright through a Creative Commons CC BY-NC license, this book is 'open' in all five ways described in Chapter 11, Section 2:

- re-usable: you are allowed to use all or part of the work for your own purposes (for example, you can download any part or the whole of the book, and use it in your own teaching or studies, without needing to ask for permission or to pay anything);
- re-distributable: you can share the work with others (for example, you can e-mail a section of the book to a colleague or fellow student);
- revisable: you can take any part of the book, and change it for your own purposes, or translate bits of it or all of it into another language, again without needing to ask for permission;
- re-mixable: you can take parts of this book and combine them with other 'open source' material or resources to create a new resource (for example, take some of the podcasts from this book and combine them with text from another open textbook to create a new work);
- retainable, which means there are no digital rights management restrictions (DRM), the content is yours to keep, whether you're a teacher or student.

There is only one restriction on all five activities, and that is that you acknowledge me as the source (unless I am quoting someone else, or using someone else's material, of course). Full attribution is particularly important as an example for your students, who need to acknowledge their sources! Also, if you do find the material in this book useful, I would appreciate your sending an e-mail to tony.bates@ubc.ca with any feedback about how you are using the content, and how the book could be improved, but this is just a request, so I can improve the book and track how it is being used.

The first edition was published as I wrote it, a chapter at a time. I published the first draft of most sections in my blog, Online Learning and Distance Education Resources, to get feedback. I did the same for the new sections of this edition. This book is published as an open textbook for many reasons, but the main one being that I see open publishing as the future for education. In a way, this book is a proof of the concept of open publishing. I could not have done this without excellent support from BCcampus, which at the time of writing is leading a major open education initiative for the provincial government of British Columbia in Canada, and without additional support from Contact North, Ontario.

iv. Independent reviews of the book

Shortly after publication of the first full draft of the book, I requested three independent experts in the field to review the book. The process that was followed, and the full, unedited reviews, can be seen in Appendix 3. This book was also independently selected and reviewed by MERLOT.

v. Different ways to use the book

If you have found your way to this book website, you can read it off the screen at any time and anywhere. Just bookmark the home page (https://pressbooks.bccampus.ca/teachinginadigitalagev2/) then click on any chapter heading or any section in the content list.

The book will download in pdf and ebook versions, so you can print out or download the whole book if you wish, for straightforward reading. In general, it is best to read the book online direct from this website, if you can, as when it exports to different versions, sometimes the illustrations get moved around to fit the page or screen layout. Also reading on the small screen of a mobile phone may be somewhat frustrating as the graphics will be very small. Reading on tablets should not be a problem, except the graphics may not always fit as intended.

You can also buy a print copy – just click on the relevant button. However, if your institution has print-on-demand facilities, it will be cheaper to download the pdf version and print locally.

The book can also be cloned, so you can edit or adapt the book or parts of the book for your own use.

You will see from the book website that the book is now available in at least seven languages. More are being added. All these translations have been done by volunteers in their own language, again demonstrating the power of open publishing. If you wish to do a translation, please let me know but otherwise you are free to do so. Just remember though that the book cannot be sold commercially under the terms of the license, even in translation.

The book is written on the assumption (based on research) that most reading will be done in chunks of one hour or less, so each section of a chapter can be completed in one hour at the maximum (some sections will be much shorter).

Many of the sections will have suggested activities, which mainly require you to reflect on how what you have read relates to your own work or context. These activities will usually take no more than 30 minutes each.

Each chapter begins with a set of learning goals for the chapter, the topics covered, a list of activities for the chapter, and the key takeaways or main points made. To access this, just click the chapter heading (e.g. Chapter 1: Structural Changes in the Economy). [Note that text in red indicates a live link/url – just click on it to activate it. This doesn't always show clearly on screens under certain conditions so run your cursor – or finger on mobile devices – over the text to see where the links are.] The arrows in the red section at the bottom of the page will take you either to the previous page or the next page.

There are many different ways this book could be used. Here are some suggestions:

- straight read through (over several days) for personal use: this is probably the least likely, but there is a logical sequence and a continuous, coherent argument that builds up through the book;
- read a specific chapter or section that is useful for you, and come back later to other sections or chapters as you need them (use this preface and/or the list of contents on the home page as a guide);
- do the activities that follow most sections;
- use the book as the core reading for a course (or part of a course) on how to teach in a digital age. You can use the activities I have suggested, or, if you clone the book, you can edit it and replace the activities with your own.
- at the time of writing it is NOT possible to clone just sections of the book, but you can use the Pressbooks XML file to import specific chapters.

There are also:

- podcasts and occasionally a video giving my personal spin on each chapter,
- a search facility at the top right corner of each page – just type in the word or phrase you are looking for,
- a full bibliography containing all the references in the book
- there is no index: use the search engine [Search in book (Q)] located at the top right of each section. Type in the term or name you are looking for. It will provide a list of the sections where this term or name is used..

This book – as indeed are open textbooks in general – is a work in progress, so keep checking back to see what new features are being added over time. As new developments occur, I will try to ensure that they are incorporated so that the book stays up to date (also you can follow my blog). I will also make changes based on feedback from readers.

vi. An overview of the content

Chapter 1 Fundamental change in Education

This sets the stage for the rest of the book. Chapter 1 looks at the key changes that are forcing teachers and instructors to reconsider their goals and methods of teaching, In particular it identifies the key knowledge and skills that students need in a digital age, and how technology is changing everything, including the context in which we teach.

Chapters 2-4: Epistemology and teaching methods

These chapters address the more theoretical and methodological aspects of teaching and learning in a digital age.

Chapter 2 covers different views on the nature of knowledge and how these understandings of knowledge influence theories of learning and methods of teaching.

Chapter 3 analyses the strengths and weaknesses of different campus-based methods of teaching and

Chapter 4 does the same for blended and fully online methods. These chapters form a theoretical foundation for what follows.

Chapters 5-9: Media and technology

The focus in these five chapters is on how to choose and use different media and technologies in teaching, with a particular focus on the unique pedagogical characteristics of different media.

Chapter 5 looks at the strengths and weaknesses of MOOCs.

Chapter 6 looks at the main components of an effective learning environment (this was Appendix 1 in the first edition).

Chapter 7 examines the difference between 'media' and 'technology' in educational contexts and provides an analytical framework for understanding the differences between media.

Chapter 8 then applies the analytical framework to identify the educational 'affordances', the strengths and weaknesses, of different media, then examines three emerging technologies (artificial intelligence, virtual/augmented reality, and serious/educational games).

Chapter 9 offers a set of criteria and a model (SECTIONS) for making decisions about different media and technologies for teaching.

Chapters 10-11: Modes of delivery and open education

These two chapters look at the impact of recent digital learning developments for the design of teaching and learning in a digital age.

Chapter 10 addresses the question of how to determine what mode of delivery should be used: campus-based, blended or fully online.

Chapter 11 examines the potentially disruptive implications of recent developments in open content, open publishing, open data and open research. This chapter above all is a messenger of the radical changes to come to education.

Chapters 12-13: Ensuring quality in teaching in a digital age

These take two different but complementary approaches to the issue of ensuring high quality teaching in a digital age.

Chapter 12 suggests nine pragmatic steps for designing and delivering quality teaching in a highly digital teaching context.

Chapter 13 very briefly examines the policy and operational support needed from schools, colleges and universities to ensure relevant and high quality teaching in a digital age.

Appendices

Appendix 1 is a set of questions, to be used in conjunction with the SAMR and SECTIONS models, to help you make decisions about the choice and use of media within your own teaching context.

Appendix 2 is a list of different online learning quality standards, organisations and research

Appendix 3 includes three independent peer reviews commissioned at the completion of the first edition of this book, as well as an unsolicited review for MERLOT by its Teacher Education Editorial Board.

Finally, there is a section that provides feedback on activities set at the end of several sections of the book.

Scenarios

There are nine 'what if' scenarios scattered throughout the book. These are semi-fictional, 'semi-', because in almost every case, the scenario is based on an actual example. However, I have sometimes combined one or more cases, or extended or broadened the original case. The purpose of the scenarios is to stimulate imagination and thinking about both our current 'blocks' or barriers to change, and the real and exciting possibilities of teaching in the future.

Other features

Each chapter ends with a set of key 'takeaways' from the chapter, and a complete set of references. Most chapter sections end with an activity. For many of these I have provided a podcast to give my views on the topics of the activities.

vii. Acknowledgments and thanks

This book could not have been done without tremendous support from a number of people and institutions. First of all, I am truly indebted to BC campus. BCcampus hosts the site and has allowed me to use their own version of Pressbooks. In particular Clint Lalonde, assisted by Brad Payne, and with the support of Mary Burgess, has provided wonderful help and support. I was completely new to the technology of open publishing, and Clint and Brad held my hand through all my struggles. I could not have done this without them. BCcampus's help desk also provided essential support in setting up this second edition.

Open textbooks may be free to end users but they do not become a reality without professional technical support. As part of its mandate to support innovation in education and learning, Contact North | Contact Nord, Ontario's Distance Education & Training Network, provided essential support and help with instructional design/editing, graphics, copyright clearance and is assisting with marketing and promotion. Contact North | Contact Nord has also made it possible to make the first edition of the textbook available in French.

I also received unexpected but very welcome assistance from Leonora Zefi and her instructional design team at the Digital Education Strategies, The G. Raymond Chang School of Continuing Education, Ryerson University, Toronto, who volunteered to read the drafts of each chapter and provided incredibly valuable feedback. Katherine McManus provided instructional design and copy editing advice, and Elise Gowen did all the dirty work in checking copyright and getting permissions. For the

second edition I drew heavily on the work of Naza Djafarova and her colleagues on serious games at the Chang School at Ryerson University.

I also want to acknowledge the huge influence of my colleagues from the Open University UK, the Open Learning Agency, and the University of British Columbia, who did much of the research and innovation from which I have drawn. Throughout my career, I have been immensely supported by two overlapping communities of practice: distance educators; and educational technologists/instructional designers. This is really their book; I'm merely a spokesperson for all their ideas and work. I just hope I have represented their knowledge accurately and clearly.

Lastly, there was all the valuable feedback I received from my blog readers. I published the first draft of most sections of the book in my blog as I wrote them. Instead of a peer review team of two or three, I had a review team of many hundreds – indeed thousands – of readers of my blog. The advice I received from everyone was really helpful and much appreciated. However, I didn't always follow all the advice I got, and I take full responsibility for any errors or misjudgements you may come across.

viii. Over to you

The great thing about an open textbook is that is is a dynamic, living project. Changes can be made immediately. I would really like to hear from you, by e-mail to tony.bates@ubc.ca. Constructive criticisms and feedback will be very welcome.

Above all, I hope you find this book interesting and helpful and that it inspires you and/or your colleagues to develop the knowledge and skills our students need in this challenging age.

About the author

I graduated from the University of Sheffield, U.K, with a B.A. (Hons.) in psychology in 1962, obtained a post-graduate certificate in education from Goldsmiths College, the University of London, and a Ph.D. in educational administration from the Institute of Education, the University of London (now part of University College, London).

On leaving university, I taught a class of 42 children aged between 8 and 11 in a small rural school, then went on to teach students with special needs in a large urban secondary (high) school in England. I was then recruited to work on a government research project looking at the administration of very large high schools.

When this contract ended in 1969, I was appointed the 20th member of staff at the newly created Open University in the United Kingdom, where I spent 20 years, ending as a Professor of Educational Media Research, primarily evaluating first the learning effectiveness of the television and radio programs made for the OU by the BBC, then other new media as they became adopted by the Open University. During that period, I was also a course author/instructor on several courses on social science and technology

At the end of 1989, I emigrated to Canada, where I worked for five years as Executive Director of Strategic Planning at the Open Learning Agency in British Columbia. I left to become Director of Distance Education and Technology at the University of British Columbia, where I designed, developed and taught their first online courses and then helped initiate the first fully online degree programs at UBC. In 2003, I took mandatory retirement from UBC and set up my own consultancy company specialising in advising universities, colleges and government agencies on strategies for online and blended learning. I have worked with more than 50 universities and colleges, and several governmental agencies, in Canada, the USA, and Europe, and undertaken other contracts worldwide with the World Bank, UNESCO and the OECD.

I decided to retire from paid work in 2014 in order to write this book. (That retirement didn't last for long.) I am also the author of 11 other books on educational technology, online and distance learning, some of which have been translated into French, Spanish, Chinese, Korean, Arabic and Serbo-Croat.

I have also been awarded honorary degrees by the Open University of Portugal, the Open University of Catalonia, the Open University of Hong Kong, Athabasca University, and Laurentian University.

I have a private pilot's licence, and have flown across Canada and back in a Cessna 172, and I play golf badly but regularly. I am married, with two sons and four grandchildren, all living in England.

Other books by the author

Bates, T. and Robinson, J. (eds.) (1977) *Evaluating Educational Television and Radio* Milton Keynes UK: The Open University Press

Bates, A.W. (ed.) (1984) *The Role of Technology in Distance Education* London: Croom Helm (reprinted in 2015 by Routledge)

Bates, A. (1984) *Broadcasting in Education: An Evaluation* London: Constable

Bates, A.W. (ed.) (1990) *Media and Technology in European Distance Education* Heerlen, Netherlands: The European Association of Distance Teaching Universities

Bates, A.W. (1995) *Technology, Open Learning and Distance Education* London: Routledge

Bates, A.W. (2000) *Managing Technological Change: Strategies for College and University* Teachers San Francisco: Jossey Bass

Epper, R. and Bates, A.W. (2001) *Teaching Faculty How to Use Technology: Best Practices from Leading Institutions* Westport CT: American Council on Education

Bates, A.W. (2002) *National Strategies for E-Learning* Paris: International Institute for Educational Planning

Bates, A.W. and Poole, G. (2003) *Effective Teaching with Technology in Higher Education* San Francisco: Jossey Bass

Bates, A.W. (2005) *Technology, e-Learning and Distance Education* New York: Routledge

Bates, A.W. and Sangrà, A. (2011) *Managing Technology in Higher Education: Strategies for Transforming Teaching and Learning* San Francisco: Jossey-Bass

Updates and revisions

An open textbook is a dynamic project. New developments, such as relevant new publications, can be added, urls go dead and new ones have to be found, and reader feedback in the form of comments to sections of the book get added almost on a daily basis. This second edition includes the changes made to the first edition.

Here I will keep track of changes, using 10 October 2019, when this second edition was first made available in its ‘final’ form, as the baseline.

Chapter 1: Fundamental Change in Education

The purpose of this chapter

When you have read this chapter you should be able to:

- describe and discuss some of the structural social and economic changes that are affecting education in a digital age
- describe and discuss some of the key skills that are needed in a digital age
- identify and discuss some of the ways technology is leading to changes in teaching and learning
- discuss the extent to which contemporary developments require changes in how we teach and how students learn

What is covered in this chapter

In this chapter, I will be discussing the pressures that are mounting on post-secondary institutions to change, particularly with regard to the way they deliver one of their core activities, teaching. I will be arguing that although our institutions will need to change if they are to survive, it is important to maintain and strengthen their core values. Thus it's not a question of throwing out everything and starting afresh, but managing that change in such a way that the core values are protected.

In particular, this chapter covers the following topics:

Also in this chapter you will find the following activities:

- Activity 1.3 What skills are you developing in your students? Part 2
- Activity 1.4 Change and continuity
- Activity 1.5 How much wriggle room do you have?
- Activity 1.6 Dealing with diversity
- Activity 1.7 The consequences of change
- Activity 1.8 Your main conclusions from Chapter 1.

Key Takeaways from the Chapter

- Teaching methods need to be used that help to develop and transfer specific skills that serve both the purposes of knowledge development and dissemination, while at the same time preparing graduates for work in a knowledge-based society
- As student numbers have increased, teaching has regressed for a variety of reasons to a greater focus on information transmission and less focus on questioning, exploration of ideas, presentation of alternative viewpoints, and the development of critical or original thinking. Yet these are the very skills needed by students in a knowledge-based society.
- The wide diversity of the student body is a major challenge for institutions. This requires more focus on teaching methods that provide support for learners, more individualization of learning, and more flexible delivery.
- Online learning is a continuum; every instructor and every institution now needs to decide: where on this continuum of teaching should a particular course or program be?
- As more academic content becomes openly and freely available, students will look increasingly to their local institutions for support with their learning, rather than for the delivery of content. This puts a greater focus on teaching skills and less on subject expertise.
- Faculty and instructors need a strong framework for assessing the value of different technologies, new or existing, and for deciding how or when these technologies make sense for them (and/or their students) to use.

1.1 Structural changes in the economy: the growth of a knowledge society

Figure 1.1.1 Learning in a digital age
Image: © CC Duncan Campbell, 2012

1.1.1 The digital age

In a digital age, we are surrounded, indeed, immersed, in technology. Furthermore, the rate of technological change shows no sign of slowing down. Technology is leading to massive changes in the economy, in the way we communicate and relate to each other, and increasingly in the way we learn. Yet our educational institutions were built largely for another age, based around an industrial rather than a digital era.

Thus teachers and instructors are faced with a massive challenge of change. How can we ensure that we are developing the kinds of graduates from our courses and programs that are fit for an increasingly volatile, uncertain, complex and ambiguous future? What should we continue to protect in our teaching methods (and institutions), and what needs to change?

To answer these questions, this book:

- discusses the main changes that are leading to a re-examination of teaching and learning;
- identifies different understandings of knowledge and the different teaching methods associated with these understandings;
- analyses the key characteristics of technologies with regard to teaching and learning;
- recommends strategies for choosing between media and technologies;
- recommends strategies for high quality teaching in a digital age.

In this chapter I set out some of the main developments that are forcing a reconsideration of how we should be teaching.

1.1.2 The changing nature of work

Of the many challenges that institutions face, one is in essence a good one, and that is increased demand, particularly for post-secondary education. Figure 1.1.2 below represents the extent to which knowledge has become an increasingly important element of economic development, and above all in job creation.

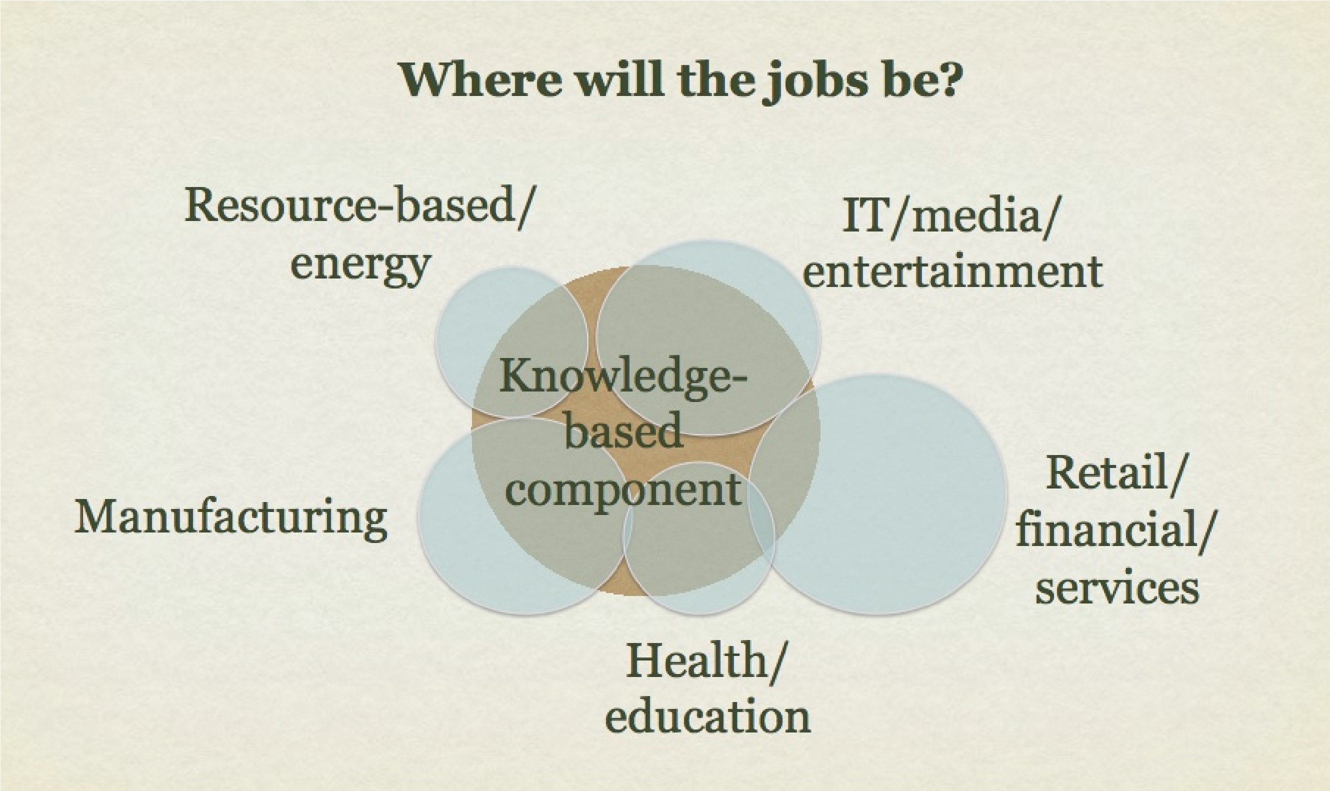


Figure 1.1.2: The knowledge component in the workforce

The figure is symbolic rather than literal. The pale blue circles representing the whole work force in each employment sector may be larger or smaller, depending on the country, as too will be the proportion of knowledge workers in that industry, but at least in developed countries and also increasingly in economically emerging countries, the knowledge component is growing rapidly: more brains and less brawn are required (see OECD, 2013a). Economically, competitive advantage goes increasingly to those companies and industries that can leverage gains in knowledge (OECD, 2013b). Indeed, knowledge workers often create their own jobs, starting up companies to provide new services or products that did not exist before they graduated.

From a teaching perspective the biggest impact is likely to be on technical and vocational instructors and students, where the knowledge component of formerly mainly manual skills is expanding rapidly. Particularly in the trades areas, plumbers, welders, electricians, car mechanics and other trade-related workers are needing to be problem-solvers, IT specialists and increasingly self-employed business people, as well as having the manual skills associated with their profession.

Artificial intelligence (AI) is another development that is already affecting the workforce. Routine work, whether clerical or manual, is being increasingly replaced by automation. Although all kinds of jobs are likely to be affected by increased automation and applications of AI, those in the workforce with lower levels of education are likely to be the most impacted. Those with higher levels of education are likely to have a better chance of finding work that machines cannot do as well – or even creating new work for themselves.

1.1.3 Knowledge-based workers

There are certain common features of knowledge-based workers in a digital age:

- they usually work in small companies (less than 10 people);
- they sometimes own their own business, or are their own boss; sometimes they have created their own job, which didn't exist until they worked out there was a need and they could meet that need;
- they often work on contract or are self-employed, so they move around from one job to another fairly frequently (the gig economy);
- the nature of their work tends to change over time, in response to market and technological developments and thus the knowledge base of their work tends to change rapidly;
- they are digitally smart or at least competent digitally; digital technology is often a key component of their work;
- because they often work for themselves or in small companies, they play many roles: marketer, designer, salesperson, accountant/business manager, technical support, for example;
- they depend heavily on informal social networks to bring in business and to keep up to date with current trends in their area of work;
- they need to keep on learning to stay on top in their work, and they need to manage that learning for themselves;
- above all, they need to be flexible, to adapt to rapidly changing conditions around them.

It can be seen then that it is difficult to predict with any accuracy what many graduates will actually be doing ten or so years after graduation, except in very broad terms. Even in areas where there are clear professional tracks, such as medicine, nursing or engineering, the knowledge base and even the working conditions are likely to undergo rapid change and transformation over that period of time. However, we shall see in Chapter 1 Section 2 that it is possible to predict many of the *skills* they will need to survive and prosper in such an environment.

This is good news for the higher or post-secondary education sector overall (universities and colleges) as the knowledge and skill levels needed in the workforce increases. It has resulted in a major expansion of post-secondary education to meet the demand for knowledge-based work and higher levels of skill. The post-secondary enrolment rate of 19-year-olds across all Canadian provinces increased steadily from 53% in 2001 to 64% in 2014, equivalent to a 21% rise over the 13-year period (Frenette, 2017). This means more students for universities and colleges, even where population trends are flat or even declining.

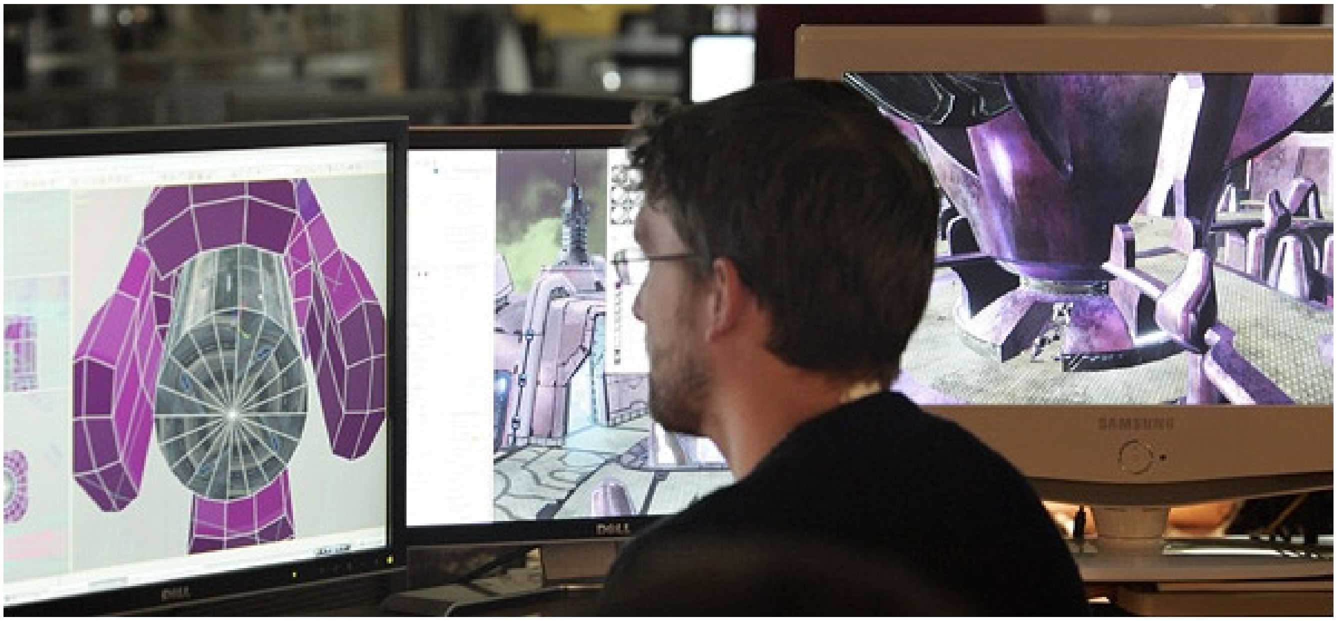


Figure 1.1.3 A video animator: a typical knowledge worker. Photograph: Elaine Thompson/Associated Press, 2007.

References

OECD (2013a) *OECD Skills Outlook: First Results from the Survey of Adult Skills* Paris: OECD

OECD (2013b) *Competition Policy and Knowledge-Based Capital* Paris: OECD

Frenette, M. (2017) *Postsecondary Enrolment by Parental Income: Recent National and Provincial Trends* Ottawa: Statistics Canada

Activity 1.1 Thinking about skills

1. What kind of jobs are graduates in your subject discipline likely to get? Can you describe the kinds of skills they are likely to need in such a job? To what extent has the knowledge and skills component of such work changed over the last 20 years?

2. Look at the family members and friends outside your academic or educational field. What kind of knowledge and skills do they need now that they didn't need when they left school or college? (You may need to ask them this!)

3. Exactly how are you assisting your students develop such skills through your teaching? Is this centre or peripheral to your work? Is this part of your job – or someone else's?

There is no feedback on this activity.

1.2 The skills needed in a digital age

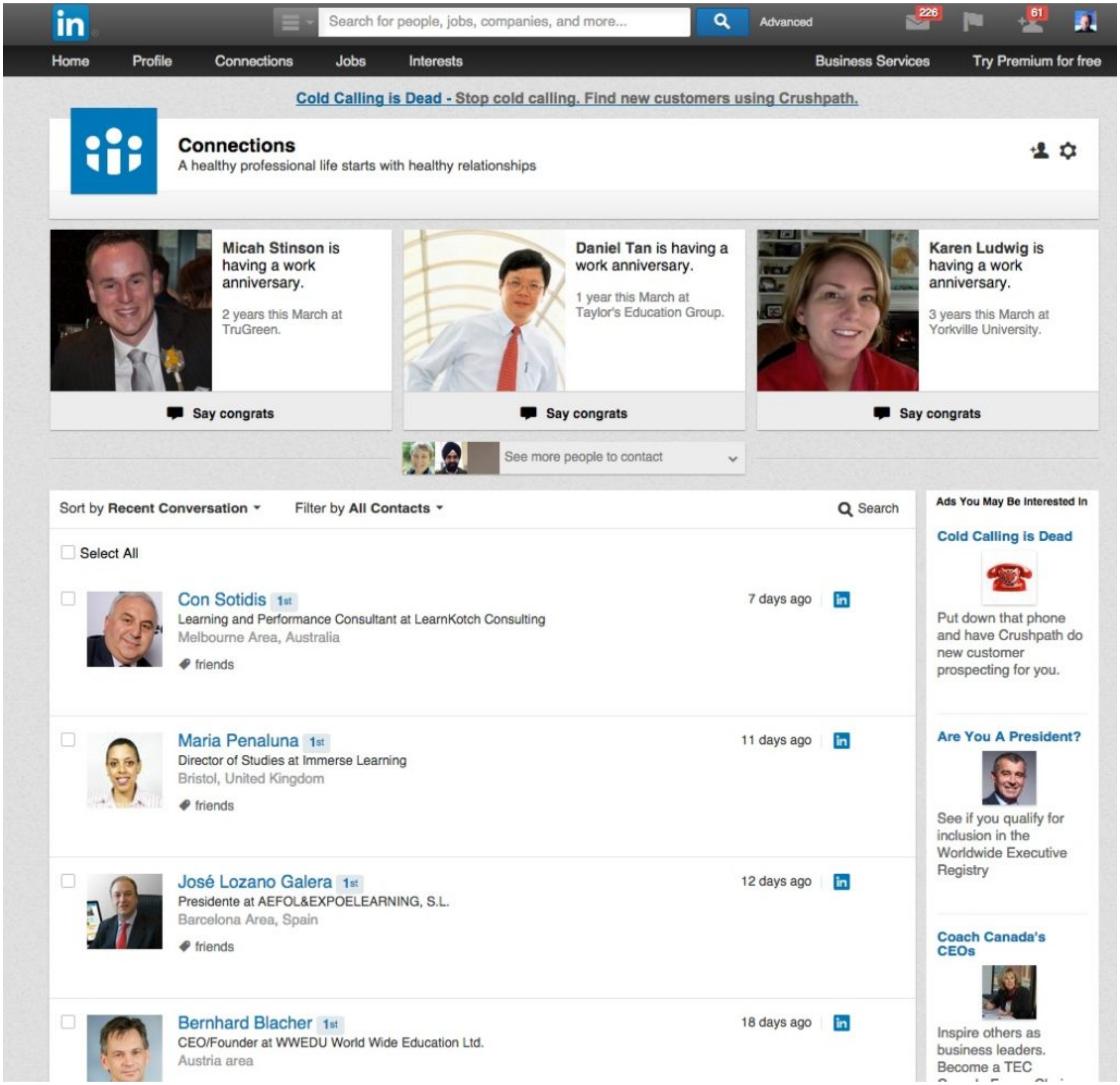


Figure 1.2.1 Using social media for communication is an essential skill for a digital age

1.2.1 The growing importance of skills development

Knowledge involves two strongly inter-linked but different components: content and skills. Content includes facts, ideas, principles, evidence, and descriptions of processes or procedures. Most instructors, at least in universities, are well trained in content and have a deep understanding of the subject areas in which they are teaching. Expertise in skills development though is another matter. The issue here is not so much that instructors do not help students develop skills – they do – but whether these intellectual skills match the needs of knowledge-based workers, and whether enough emphasis is given to skills development within the curriculum.

1.2.2 The needs of a digital society

Prediction is always risky, but usually the big trends in the future can already be seen in the present. The future will merely magnify these current conditions, or current conditions will result in a transformation that we can see coming but is not here yet. Examples are many:

- the Internet of Things where almost everything is digitally connected
- autonomous vehicles and transportation
- massive amounts of data about our personal lives being collected and analysed to anticipate/predict/influence our future behaviour
- automation replacing and/or transforming human work and leisure
- state agencies and/or commercial oligopolies controlling access to and use of data
- lack of transparency, corruption of messaging, and magnification of these distortions, in digital communications.

One thing is clear. We can either as individuals throw up our hands and leave all these developments to either state or commercial entities to manage in their own interests, or we can try to prepare ourselves so that we can influence or even control how these developments are managed, for the greater good.

This is what I mean when I talk about developing 21st century skills, or preparing for a digital society. We have a responsibility for ensuring our students are educated sufficiently so that they understand these issues and have the means by which to address them. This is a responsibility of every educator, because it affects all areas of knowledge.

For instance the science professor needs to instill in her students an ability to identify reliable and unreliable sources of scientific data, and an ability to apply that knowledge in ethical ways that benefit mankind. This is a particularly important responsibility for those teaching computer sciences. We need to teach about the dangers of unintended or unknown consequences of artificial intelligence applications and of automated analyses of mass data, potential biases in algorithms, and the need to audit and adjust automated procedures to avoid unforeseen but harmful consequences before they do damage.

Digital (rather than purely online) learning has a critical role to play, because in order to develop these skills our students' learning itself needs to be digitally embedded. Only by mastering technology can we control it.

1.2.3 What skills?

The skills required in a knowledge society include the following (adapted from Conference Board of Canada, 2014):

- *communications skills*: as well as the traditional communication skills of reading, speaking and writing coherently and clearly, we need to add social media communication skills. These might include the ability to create a short YouTube video to capture the demonstration of a process or to make a sales pitch, the ability to reach out through the Internet to a wide community of people with one's ideas, to receive and incorporate feedback, to share information appropriately, to identify trends and ideas from elsewhere;

- *the ability to learn independently*: this means taking responsibility for working out what you need to know, and where to find that knowledge. This is an ongoing process in knowledge-based work, because the knowledge base is constantly changing. Incidentally I am not talking here necessarily of academic knowledge, although that too is changing; it could be learning about new equipment, new ways of doing things, or learning who are the people you need to know to get the job done;

- *ethics and responsibility*: this is required to build trust (particularly important in informal social networks), but also because generally ethical and responsible behaviour is in the long run more effective in a world where there are many different players, and a greater degree of reliance on others to accomplish one's own goals;

- *teamwork and flexibility*: although many knowledge workers work independently or in very small companies, they depend heavily on collaboration and the sharing of knowledge with others in related but independent organizations. In small companies, it is essential that all employees work closely together, share the same vision for a company and help each other out. In particular, knowledge workers need to know how to work collaboratively, virtually and at a distance, with colleagues, clients and partners. The 'pooling' of collective knowledge, problem-solving and implementation requires good teamwork and flexibility in taking on tasks or solving problems that may be outside a narrow job definition but necessary for success;

- *thinking skills* (critical thinking, problem-solving, creativity, originality, strategizing, for example): of all the skills needed in a knowledge-based society, these are the most important. Businesses increasingly depend on the creation of new products, new services and new processes to keep down costs and increase competitiveness. Also, it is not just in the higher management positions that these skills are required. Trades people in particular are increasingly having to be problem-solvers rather than following standard processes, which tend to become automated. Anyone dealing with the public in a service function must identify needs and find appropriate solutions. Universities in particular have always prided themselves on teaching such intellectual skills, but the move to larger classes and more information transmission, especially at the undergraduate level, undermines this assumption;

- *digital skills:* most knowledge-based activities depend heavily on the use of technology. However the key issue is that these skills need to be embedded within the knowledge domain in which the activity takes place. This means for instance real estate agents knowing how to use geographical information systems to identify sales trends and prices in different geographical locations, welders knowing how to use computers to control robots examining and repairing pipes, radiologists knowing how to use new technologies that 'read' and analyze MRI scans. Thus the use of digital technology needs to be integrated with and evaluated through the knowledge-base of the subject area;

- *knowledge management*: this is perhaps the most over-arching of all the skills. Knowledge is not only rapidly changing with new research, new developments, and rapid dissemination of ideas and practices over the Internet, but the sources of information are increasing, with a great deal of variability in the reliability or validity of the information. Thus the knowledge that an engineer learns at university can quickly become obsolete. There is so much information now in the health area that it is impossible for a medical student to master all drug treatments, medical procedures and emerging science such as genetic engineering, even within an eight year program. Thus knowledge management is the key skill in a knowledge-based society: how to find, evaluate, analyze, apply and disseminate information, within a particular context. Above all students need to know how to validate or challenge sources of information. Effective knowledge management is a skill that all graduates will need to employ long after graduation.

In 2018, the Royal Bank of Canada issued a report, called 'Humans Wanted.' This was based on an analysis of big data derived from job postings over a 12 month period on LinkedIn, in which the actual skills being requested by employers were identified and analysed, and from which an analysis of the demand for different types of labour was conducted.

The main conclusion of the report was that there will be plenty of jobs in the future, but they will require different skills from those generally required at the present. In particular, many of the new skills needed will be what are perhaps confusingly called soft skills, such as attentive listening, critical thinking, digital fluency, active learning, etc. (confusing, because these 'soft skills' are often as difficult to cultivate as 'hard skills'.) These are skills that automation and AI cannot easily replicate or replace but which will be needed in the new digital economy. The Royal Bank identified the following as key skills that will be in high demand between 2018 and 2023 (dark blue = very important; lighter blue = important):

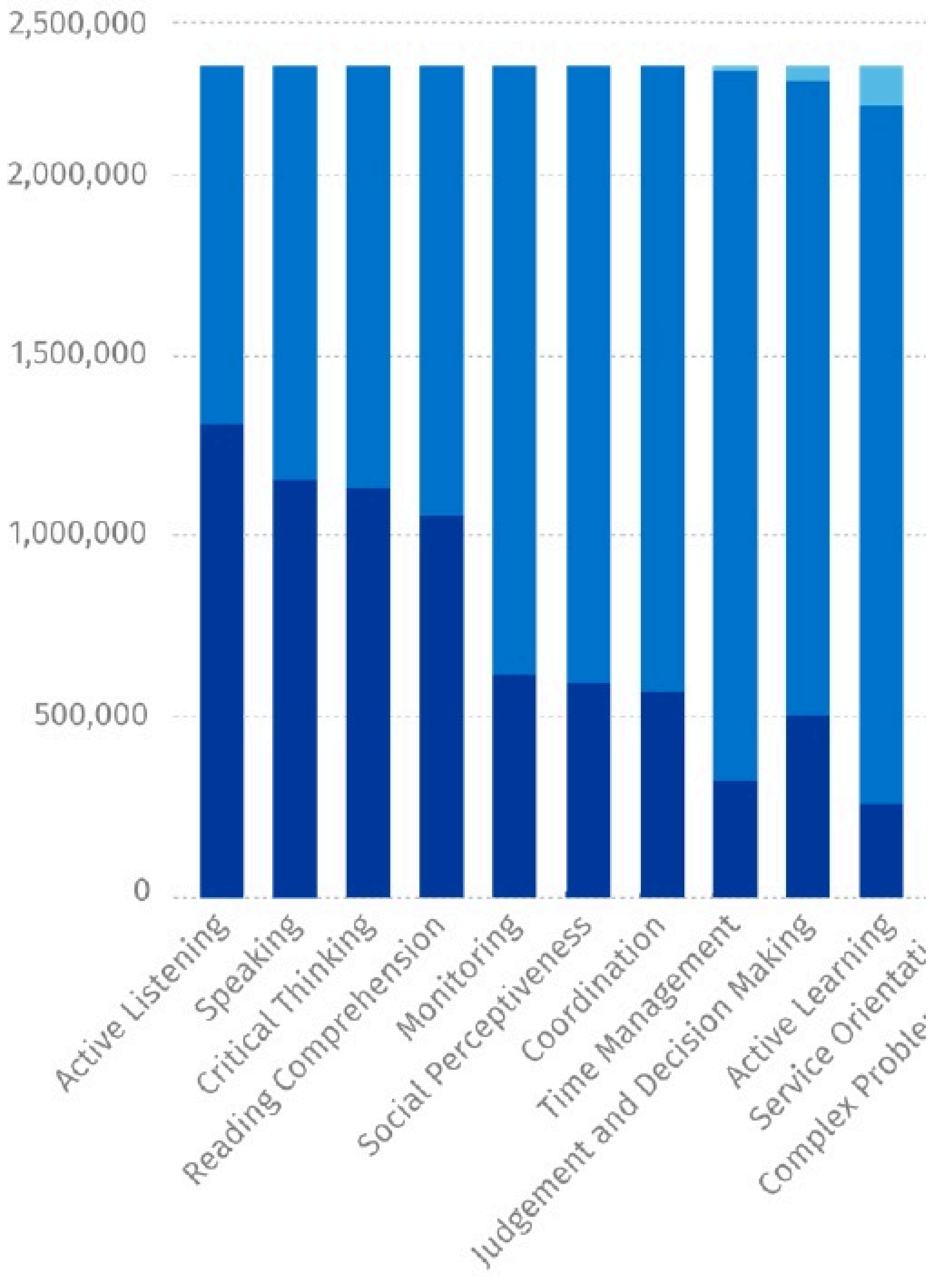


Figure 1.2.2 From 'Humans Wanted', Royal Bank of Canada, 2018

Two of the main conclusions from the Royal Bank report were as follows:

- Canada's education system, training programs and labour market initiatives are inadequately designed to help Canadian youth navigate this new skills economy.

- Canadian employers are generally not prepared, through hiring, training or retraining, to recruit and develop the skills needed to make their organizations more competitive in a digital economy.

1.2.4 Developing skills

What methods of teaching are most likely to develop soft skills? In fact, we can learn a lot from research about skills and skill development (see, for instance, Fischer, 1980, Fallow and Steven, 2000):

- skills development is relatively context-specific. In other words, skills need to be embedded within a knowledge domain. For example, problem solving in medicine is different from problem-solving in business. First of all, of course, the content base used to solve problems is different. Less well understood though is that somewhat different processes and approaches are used to solve problems in these domains (for instance, decision-making in medicine tends to be more deductive, business more intuitive; medicine is more risk averse, business is more likely to accept a solution that will contain a higher element of risk or uncertainty). Embedding skills within a particular context such as a subject discipline is perhaps the biggest challenge for educational institutions in a digital age. How well does an ability to think critically about English literature transfer to other areas of critical thinking, such as political analysis or assessing the behaviour of a workplace colleague? In many cases, some elements of these soft skills do transfer well but other parts are more context specific. More attention needs to be paid to what is known about the transfer of skills, based on research, and to ensuring this evidence affects the way we teach.

- learners need practice – often a good deal of practice – to reach mastery and consistency in a particular skill;

- skills are often best learned in relatively small steps, with 'jumps' increasing as mastery is approached;

- learners need feedback on a regular basis to learn skills quickly and effectively; immediate feedback is usually better than late feedback;

- although skills can be learned by trial and error without the intervention of a teacher, coach, or technology, skills development can be greatly enhanced or speeded up with appropriate interventions, which means adopting appropriate teaching methods and technologies for skills development;

- we shall see later that although *content* can be transmitted equally effectively through a wide range of media, *skills development* is much more tied to specific teaching approaches and technologies.

What are the implications of this for not only teaching methods, but also curriculum design? It is worth remembering that unlike competencies, many 'high-level' soft skills such as critical thinking are cumulative and do not have a clear end-point. Serena Williams keeps winning not because she continues to get faster and stronger than younger players, but because she continues to hone her skills (including strategy) to a level that compensates for her diminishing strength and speed.

Soft skills need to be developed over a program (indeed a lifetime) rather than in a single course. How do we identify then how to build critical thinking skills for example from first year through to graduation in a particular discipline? How does the development of skills in later stages build on work done earlier in a program?

1.2.5 Measuring skills

Another challenge is measuring skills. I was once questioned by a colleague when I said my students were learning to think critically.

'How do you know?' he said.

My answer was: 'I know it when I see it in their assessments.'

'But how will your students know what you are looking for if you can't describe it in advance?'

The Higher Education Quality Council of Ontario (HEQCO) published a report in 2018 that claimed to be 'one of the first major attempts to measure employment-related skills in university and college students on a large scale.' The second study used a test designed to evaluate students' ability to analyse evidence, understand implications and consequences, and develop valid arguments.

The HEQCO study concluded that final-year students had somewhat higher scores in literacy and numeracy than their first-year counterparts, although there was considerable variation among programs, but little difference between the test scores of incoming and graduating students in critical-thinking abilities, although critical thinking ability too showed considerable variation among programs.

There are a number of possible criticisms of this study. One of the challenges that the HEQCO study faced was finding valid and reliable ways to assess soft skills. The first study measured literacy, numeracy and problem-solving abilities of adults using everyday scenarios.Why assess these skills outside the knowledge domains in which they were taught, given the importance of context? Were the measurements sensitive enough to really discriminate differences in skill development over time?

Nevertheless, it is worrying that HEQCO found that after four years of post-secondary study there was no noticeable difference in critical thinking skills. Is this because this is not being well taught, or because the tests used were not valid? Any attempt to identify learning outcomes involving skills requires consideration from the beginning of how these skills can validly be assessed. Instructors should not complain about HEQCO's assessment methods if they cannot justify their own methods of identifying and assessing skills.

1.2.6 Skills and learning outcomes

The Royal Bank of Canada and the HEQCO studies both highlight that it is becoming increasingly important to define learning outcomes in terms of skills acquisition. Both these are valuable studies that identify some of the issues around developing the knowledge and skills that students will need to succeed, not just in the workforce, but in life generally in the last three quarters of this century. However, the two reports have barely touched the tip of this particular iceberg. Neither for instance attempted to suggest *how* students can develop these skills or what instructors need to do to help students develop such skills.

When developing curricular, in terms of deciding not only what but also how to teach, we need to ask the following questions:

(a) are programs identifying clearly the learning outcomes expected from a program of study?
(b) do these learning outcomes sufficiently take into account skills as well as content/topics?
(c) are these learning outcomes relevant for a digital society?

In other words, we have a major pedagogical challenge in several parts:

- identifying the most important soft skills that students will need (although the RBC report goes a little way in that direction)
- identifying the best way to teach such soft skills
- assessing students' ability in soft skills (although the HEQCO report similarly goes a little way in that direction)
- identifying the extent to which soft skills are generalisable.

The key point here is that content and skills are tightly related and as much attention needs to be given to skills development as to content acquisition to ensure that learners graduate with the necessary knowledge and skills for a digital age.

1.2.7 Rethinking teaching and learning

These are essentially curriculum and pedagogical issues. It means rethinking not only the curriculum and how we teach it, but also the role that technology can play in developing such skills. How can technology increase empathy and understanding (for example, through creating virtual environments or simulations where students play the role of others)? How can technology be used to provide scenarios that enable skills development and testing in a safe environment? How can technology be used to enable students to solve real world problems?

There are a million possible answers to such questions and they need to be answered by instructors and teachers – and by learners – with deep understanding of their subject matter. But subject knowledge alone is not enough if we are to make the last three quarters of the 21st century a time when all people can thrive and feel free.

Chapters 2 and 3 explore different methods of teaching and will look at how well these methods accommodate skills development. But in the next section I discuss the dangers of tying skills development too closely to the immediate needs of the labour market.

References

The Conference Board of Canada (2014) *Employability Skills 2000+* Ottawa ON: Conference Board of Canada

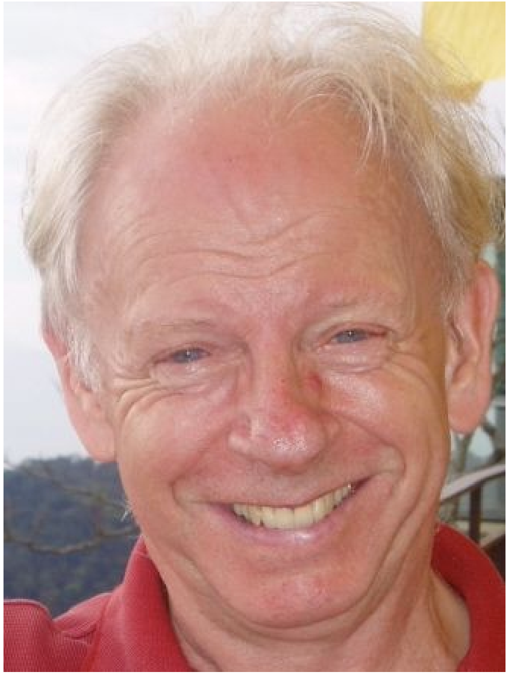
Fallow, S. and Stevens, C. (2000) *Integrating Key Skills in Higher Education: Employability, Transferable Skills and Learning for Life* London UK/Sterling VA: Kogan Page/Stylus

Finnie, R. et al. (2018) *Measuring Critical-thinking Skills of Postsecondary Students* Toronto ON: HEQCO

Fischer, K.W. (1980) A Theory of Cognitive Development: The Control and Construction of Hierarchies of Skills *Psychological Review*, Vol. 84, No. 6

Royal Bank of Canada (2018) *Humans Wanted* Toronto ON: Royal Bank of Canada

Weingarten, H. et al. (2018) *Measuring Essential Skills of Postsecondary Students: Final Report of the Essential Adult Skills Initiative* Toronto ON: HEQCO



For my comments on why skills development is so important in a digital age, click on the podcast below

An audio element has been excluded from this version of the text. You can listen to it online here: *https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=34*

Activity 1.2 What skills are you developing in your students? Part 1

1. Write down a list of skills you would expect students to develop as a result of studying your courses.
2. Compare these skills to the ones listed above. How well do they match?
3. What do you do as an instructor that enables students to practice or develop the skills you have identified?

There is no feedback provided for this activity, but see podcast above..

1.3 Should education be tied directly to the labour market?

Figure 1.3.1 Knowledge workers
Image: Phil Whitehouse, 2009. Retrieved from https://www.flickr.com/photos/philliecasablanca/3344142642/.

However, there is a real danger in tying university, college and schools programs too closely to immediate labour market needs. Labour market demand can shift very rapidly, and in particular, in a knowledge-based society, it is impossible to judge what kinds of work, business or trades will emerge in the future. For instance, who would have predicted 20 years ago that one of the largest companies in the world in terms of stock market valuation would emerge from finding ways to rank the hottest girls on campus (which is how Facebook started)?

The focus on the skills needed in a digital age raises questions about the purpose of universities in particular, but also schools and two year community colleges to some extent. Is their purpose to provide ready-skilled employees for the work-force? Is it really the job of historians or physicists to teach skills such as attentive listening, time management or social perceptiveness?

Certainly the rapid expansion in higher education is largely driven by government, employers and parents wanting a workforce that is employable, competitive and if possible affluent. Indeed, preparing professional workers has always been one role for universities, which have a long tradition of training for the church, law and much later, government administration. The goal here is to ensure that as well as a deep understanding of the content and core values of a subject discipline, students can also develop skills that enable them to apply such knowledge in appropriate contexts.

Secondly, focusing on the skills required for a knowledge-based society (often referred to as 21st century skills) merely reinforces the kind of learning, especially the development of intellectual skills, for which universities have taken great pride in the past. Indeed in this kind of labour market, it is critical to serve the learning needs of the individual rather than specific companies or employment sectors. To survive in the current labour market, learners need to be flexible and adaptable, and should be able to work just as much for themselves as for corporations that increasingly have a very short operational life. The challenge then is not re-purposing education, but making sure it meets that purpose more effectively.

Thirdly, enabling students to live well and to feel some measure of control in a technology-rich society is surely the responsibility of every educator. For instance, all students, whatever their discipline, need to know how to find, evaluate, analyse and apply information within their specific subject discipline. With so much content of varying quality now available at one's fingertips, such skills are essential for a healthy society.

Thus in some cases it is a language issue: instructors may be achieving some of these '21st century skills' such as critical thinking within the requirements of a specific discipline without using this terminology (for example, 'compare and contrast…' is a critical thinking activity). However, the HEQCO study (Weingarten et al., 2018) indicates that high-level soft skills are hard to measure and probably need to be defined and communicated more clearly and purposefully by instructors. In particular, development of such skills need to be considered at a program level so instructors can define what level of skill they expect of students when they arrive, and to what level that skill has been increased or improved by the end of a course or program.

A good example of this is from the Faculty of Computer Science at Dalhousie University. The department developed a map showing the inter-relatedness between specific learning outcomes, course content, and course and learning outcome sequencing, so that each instructor understood what level of skills and outcomes students would have from previous courses, and could identify what levels of skills they were passing on when students left their course. One result of this was to move the theory courses from the fourth year to the first year, as this helped students in the later stages of the program.

These activities do not challenge in any way core disciplinary values, or make universities or colleges merely preparatory schools for business, but they do ensure that students leave with skills that prepare them well for living in a very challenging age.

Reference

Weingarten, H. et al. (2018) *Measuring Essential Skills of Postsecondary Students: Final Report of the Essential Adult Skills Initiative* Toronto ON: HEQCO

Activity 1.3: What are the skills you are developing? Part 2

The new Ontario provincial government in 2019 announced that it would link funding of its post-secondary institutions to ‘performance outcomes’. Institutions would be encouraged to suggest their own performance measures.

Your institution has decided to focus on the development of ’21st century skills’ as a ‘key performance indicator’, and is asking all its academic departments to list the ‘core’ skills that their programs are developing.

If you were asked this, what would you suggest from looking not just at your teaching but the teaching of the department or program as a whole? And what evidence would need to be provided to show such skills are being achieved by your students?

Would having to do this be an infringement of your academic freedom?

No feedback is provided on this activity.

1.4 Change and continuity

Figure 1.4.1 Harvard University

> *In the age of constant connectedness and social media, it's time for the monolithic, millennium-old, ivy-covered walls to undergo a phase change into something much lighter, more permeable, and fluid.*

Anya Kamenetz, 2010

Although this book is aimed at teachers and instructors in schools and colleges as well as universities, I want to look particularly at how the digital age is impacting on universities. There is a widely held belief

– even among those who have benefited from fine degrees at prestigious universities – that universities are out of touch, that academic freedom is really about protecting professors in a comfortable career that doesn't require them to change, and that the entire organization of the academy is better left to its medieval past: in other words, universities are an artifact of the past and something new needs to replace them.

Nevertheless, there are very good reasons why universities have been around for more than 800 years, and are likely to remain relevant well into the future. Universities are deliberately designed to resist external pressure. They have seen kings and popes, governments and business corporations, come and go, without any of these external forces fundamentally changing the nature of the institution. Universities pride themselves on their independence, their freedom, and their contribution to society. So let's start by looking, very briefly, at these core values, because any change that really threatens these core values is likely to be strongly resisted from professors and instructors within the institution.

Universities are fundamentally about the creation, evaluation, maintenance and dissemination of knowledge. This role in society is even more important today than in the past. For universities to perform that role adequately, though, certain conditions are necessary. First they need a good deal of autonomy. The potential value of new knowledge in particular is difficult to predict in advance. Universities provide society with a safe way of gambling on the future, by encouraging innovative research and development that may have no immediate apparent short-term benefits, or may lead to nowhere, without incurring major commercial or social loss. Another critical role is the ability to challenge the assumptions or positions of powerful agencies outside the university, such as government or industry, when these seem to be in conflict with evidence or ethical principles or the general good of society.

Perhaps even more importantly, there are certain principles that distinguish academic knowledge from everyday knowledge, such as rules of logic and reasoning, the ability to move between the abstract and the concrete, ideas supported by empirical evidence or external validation (see for instance, Laurillard, 2001). We expect our universities to operate at a higher level of thinking than we as individuals or corporations can do in our everyday lives.

One of the core values that has helped to sustain universities is academic freedom. Academics who ask awkward questions, who challenge the status quo, who provide evidence that contradicts statements made by government or corporations, are protected from dismissal or punishment within the institution for expressing such views. Academic freedom is an essential condition within a free society. However, it also means that academics are free to choose what they study, and more importantly for this book, how best to communicate that knowledge. University teaching then is bound up with this notion of academic freedom and autonomy, even though some of the conditions that protect that autonomy, such as tenure or a job for life, are increasingly under pressure.

I make this point for one reason and one reason alone. If universities are to change to meet changing external pressures, this change must come from *within* the organization, and in particular from the professors and instructors themselves. It is the faculty that must see the need for change, and be willing to make those changes themselves. If government or society as a whole tries to enforce changes from outside, especially in a way that challenges the core values of a university such as academic freedom, there is a grave risk that the very thing that makes universities a unique and valuable component of society will be destroyed, thus making them less rather than more valuable to society as a whole. However, this book will provide many reasons why it is also in the best interests of not only learners but instructors themselves to make changes, in terms of managing workload and attracting extra resources to support teaching.

Schools and two-year colleges are in a somewhat different position. It is easier (although not that easy) to impose change from above or through forces from outside the institution, such as government.

However, as the literature on change management clearly indicates (see, for instance, Weiner, 2009), change occurs more consistently and more deeply when those undergoing change understand the need for it and have a desire to change. Thus in many ways, schools, two year colleges and universities face the same challenge: how to change while preserving the integrity of the institution and what it stands for.

Activity 1.4 Change and continuity

1. Do you think that universities are irrelevant today? If not, what alternatives are there for developing learners with the knowledge and skills needed in a digital age?

2. What are your views on the core values of a university? How do they differ from the ones outlined here?

3. Do you think schools, colleges and/or universities need to change they way they teach? If so, why, and in what way? How could this best be done without interfering with academic freedom or other core values of educational institutions?

There are no right or wrong answers to these questions but you may want to return to your answers after reading the whole chapter.

References

Kamenetz, A. (2010) *DIY U: Edupunks, Edupreneurs, and the Coming Transformation of Higher Education* White River Junction VT: Chelsea Green

Laurillard, D. (2001) *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies* New York/London: Routledge

Weiner, B. (2009) A theory of organizational readiness for change *Implementation Science*, Vol. 4, No. 67

1.5 The impact of expansion on teaching methods

Figure 1.5.1 More students means bigger lecture classes

Governments in different provinces, states and countries have varied in their response to the need for more highly educated people. Some (as in Canada) have increased state funding to post-secondary education institutions to an extent that matches or even exceeds the increase in student numbers. Others (particularly in the USA, Australia, and England and Wales) have relied mainly on steep cuts in direct state funding for operating budgets, combined with massive increases in tuition fees.

Whatever the government strategy, in every university and college I visit, I am told instructors have more students to teach, class sizes are getting larger, and as a result, more and more classes are just lectures with little interaction. Indeed, statistics support this argument. According to Usher (2013), the overall full-time faculty:full time student ratio in Canadian universities increased from 1:18 in 1995 to 1:22 by 2011, *despite* a 40 per cent increase in per student funding (after inflation). In fact, a 1:22 ratio means much larger class sizes, because in universities full-time faculty spend only a notional 40 per cent of their time on teaching, and students may take up to 10 different courses a year. The fact is that especially in first and second year classes, class sizes are extremely high. For instance, one Introductory Psychology class in a mid-sized Canadian university has one full-time professor responsible for over 3,000 students.

Tuition fees though are very visible, so many institutions or government jurisdictions have tried to control increases in tuition fees, despite cuts in operating grants, resulting in increased full time instructor:student ratios. Also, as a result of higher tuition fees and increased student debt to finance university and college education, students and parents are becoming more demanding, more like customers than scholars in an academic community. Poor teaching in particular is both visible and less and less acceptable to students paying high tuition fees.

The general complaint from faculty is that government or the institutional administration has not increased funding for faculty in proportion to the increase in student numbers. In fact, the situation is much more complicated than that. Most institutions that have expanded in terms of student numbers have handled the expansion through a number of strategies:

- hiring more contract/sessional lecturers at lower salaries than tenured faculty
- greater use of teaching assistants who themselves are students
- increasing class sizes
- increasing faculty workload.

All of these strategies tend to have a negative impact on quality, if the methods of teaching otherwise remain unchanged.

Contract instructors are cheaper to employ than full time professors but they do not usually have the same roles such as choice of curriculum and reading materials as tenured faculty, and although often well qualified academically, the relatively temporary nature of their employment means that their teaching experience and their knowledge of students are lost when their contracts end. However, of all the strategies, this is likely to have the least negative impact on quality. Unfortunately though it is also the most expensive for institutions.

Teaching assistants may be no more than a couple of years ahead in their studies than the students they are teaching, they are often poorly trained or supervised with regard to teaching, and sometimes, if they are foreign students (as is often the case), their English language skills are poor, making them sometimes difficult to understand. They tend to be used to instruct parallel sections of the same course, so that students studying the same course may have widely different levels of instruction. Employing and paying teaching assistants can be directly linked to the way that post-graduate research is being funded by government agencies.

The increase in class size has tended to result in much more time being devoted to lectures and less time to small group work. Lectures are in fact a very economical way of increasing class size (provided that the lecture halls are large enough to accommodate the extra students). The marginal cost of adding an extra student to a lecture is small, since all students are receiving the same instruction. However, as numbers increase, faculty resort to more quantitative and less flexible forms of assessment, such as multiple-choice questions and automated assessment. Perhaps more importantly, student interaction with faculty decreases rapidly as numbers increase, and the nature of the interaction tends to flow between the instructor and an individual student rather than between students interacting as a group. Research (Bligh, 2000) has shown that in lectures with 100 or more students, less than ten students will ask questions or provide comments over the course of a semester. The result is that lectures tend to focus more heavily on the transmission of information as class size increases, rather than on exploration, clarification or discussion (see Chapter 3, Section 3 for a more detailed analysis of the effectiveness of lectures).

Increasing faculty teaching load (more courses to be taught) is the least common of the four strategies, partly because of faculty resistance, sometimes manifesting itself in collective agreement negotiations. Where increased faculty teaching load does occur, quality again is likely to suffer, as faculty put in less preparation time per class and less time for office hours, and resort to quicker and easier methods of assessment. This inevitably results in larger classes if full-time faculty are teaching less but doing more research. However, increased research funding results in more post-graduate students, who can supplement their income as teaching assistants. As a result there has been a major expansion in the use of teaching assistants for delivering lectures. However, in many Canadian universities, full-time faculty teaching load has been going *down* (Usher, 2013), leading to even larger class sizes for those that do teach.

In other employment sectors, increased demand does not necessarily result in increased cost if that sector can be more productive. Thus government is increasingly looking for ways to make higher education institutions more productive: more and better students for the same cost or less (see for instance Kao, 2019). Up to now, this pressure has been met by institutions over a fairly long period of time by gradually increasing class size, and using lower cost labour, such as teaching assistants, but there becomes a point fairly quickly where quality suffers unless changes are made to the underlying processes, by which I mean the way that teaching is designed and delivered.

Another side effect of this gradual increase in class size without changes in teaching methods is that faculty and instructors end up having to work harder. In essence they are processing more students, and without changing the ways they do things, this inevitably results in more work. Faculty usually react negatively to the concept of productivity, seeing it as industrializing the educational process, but before rejecting the concept it is worth considering the idea of getting better results without working as hard but more smartly. Could we change teaching to make it more productive so that both students and instructors benefit?

References

Bligh, D. (2000) *What's the Use of Lectures?* San Francisco: Jossey-Bass

Kao, J. (2019) Ontario's 2019 budget reveals plan to significantly tie university funding to performance outcomes *The Varsity*, University of Toronto

Usher, A. (2013) Financing Canadian Universities: A Self-Inflicted Wound (Part 5) *Higher Education Strategy Associates*, September 13

Activity 1.5 How much wriggle room do you have?

1. Are you in general satisfied with your working conditions regarding teaching? If not, what are your main frustrations?
2. What practical solutions (taking into account the financial situation of your institution, student needs, and the time you have available for teaching) could perhaps alleviate some of the frustration?

3. If you could change the way you teach, what would be the main benefits to both yourself and your students? What would need to change for this to happen?

There is no feedback on this activity

1.6 Changing students, changing markets for higher education

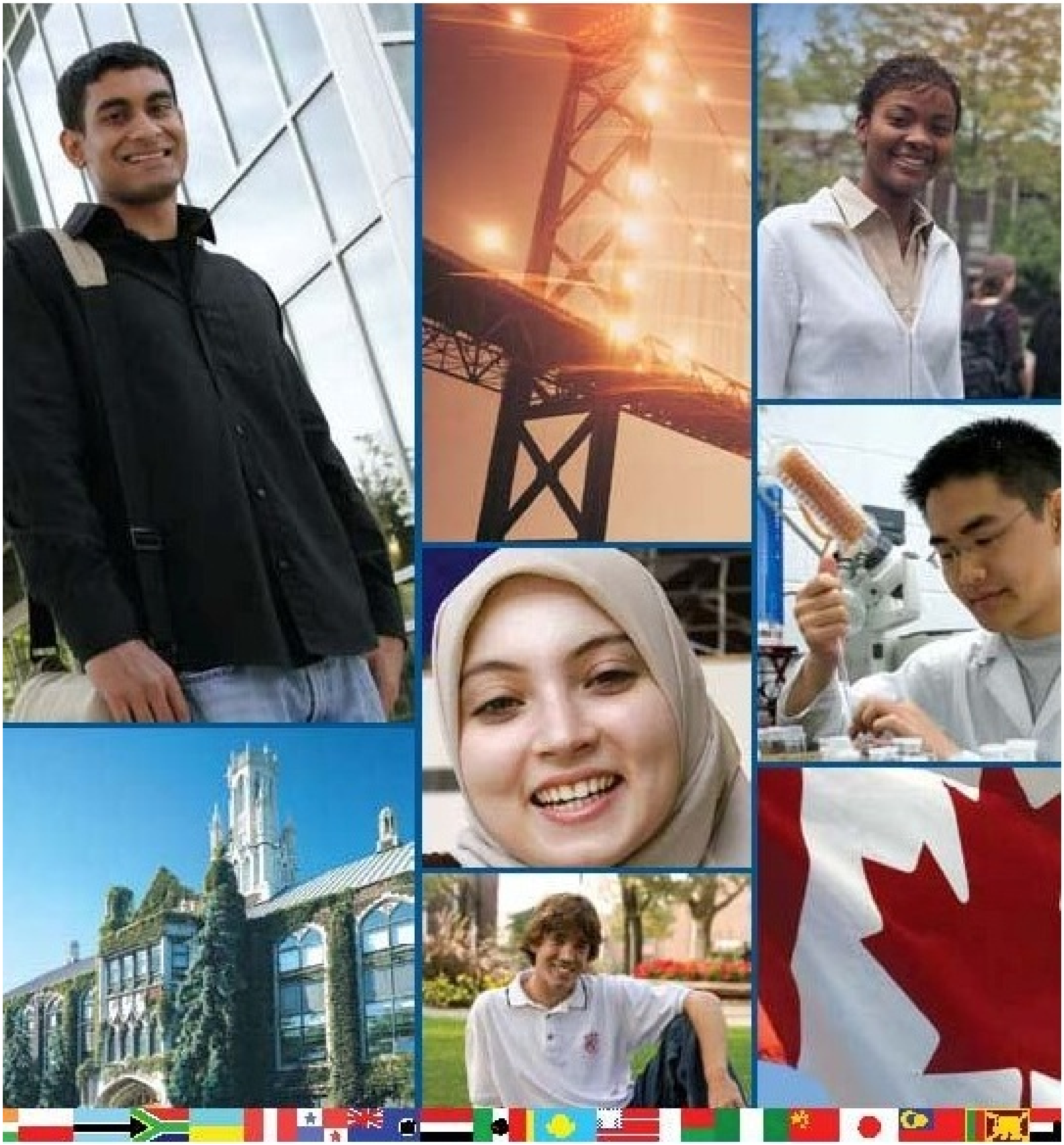


Figure 1.6.1 More diverse students
Image: © greatinternational students.blogspot.com, 2013

1.6.1 Greater diversity of students

Probably nothing has changed more in higher education over the last 50 years than the students themselves. In 'the good old days', when less than a third of students from high schools went on to higher education, most came from families who themselves had been to university or college. They usually came from wealthy or at least financially secure backgrounds. Universities in particular could be highly selective, taking students with the best academic records, and thus those most likely to succeed. Class sizes were smaller and faculty had more time to teach and less pressure to do research. Expertise in teaching, while important, was not as essential then as now; good students were in an environment where they were likely to succeed, even if the prof was not the best lecturer in the world. This ‘traditional’ model still holds true for most elite private universities such as Harvard, MIT, Stanford, Oxford and Cambridge, and for a number of smaller liberal arts colleges. But for the majority of publicly funded universities and two year community colleges in most developed countries, this is no longer the case (if it ever was).

The student base has become much more diverse. For instance, in British Columbia, roughly two-thirds of the full Grade 8 school cohort of 2007/2008 (67%) entered B.C. public post-secondary education by Fall 2014 (Heslop, 2016). As state jurisdictions push institutions to participation rates of around 70 per cent going on to some form of post-secondary education (Ontario, 2011), institutions must reach out to previously underserved groups, such as ethnic minorities (particularly Afro-American and Latinos in the USA), new immigrants (in most developed countries), aboriginal students in Canada, and students with English as a second language. Governments are also pushing universities to take more international students, who can be charged full tuition fees or more, which in turn adds to the cultural and language mix. In other words, post-secondary institutions are expected to represent the same kind of socio-economic and cultural diversity as in society at large, rather than being institutions reserved for an elite minority.

We shall also see that in many developed countries, university and college students are older than they used to be and are no longer full-time students dedicated only to lots of study and some fun (or vice versa). The increasing cost of tuition fees and living expenses forces many students now to take part-time work, which inevitably conflicts with regular classroom schedules, even if the students are formally classified as full-time students. As a result students are taking longer to graduate. In the USA, the average completion time for a four year bachelor degree is now 5.1 years (Shapiro, et al., 2016).

1.6.2 The lifelong learning market

The Council of Ontario Universities (2012) noted that students NOT coming direct from high school now constitute 24% of all new admissions, and enrolments from this sector are increasing faster than those from students coming direct from high schools. Perhaps more significantly, many graduates are returning later in their careers to take further courses or programs, in order to keep up in their ever-changing knowledge domain. Many of these students are working full-time, have families and are fitting their studies around their other commitments.

Figure 1.6.2 Lifelong learners are an increasingly important market for higher education
Image: © Evolllution.com, 2013

Yet it is economically critical to encourage and support such students, who need to remain competitive in a knowledge-based society. especially as with falling birthrates and longer lives, in some jurisdictions lifelong learners, students who have already graduated but are coming back for more study, will soon exceed the number of students coming directly from high school. Thus at the University of British Columbia in Canada, the mean age of all its graduates students is now 31, and more than one third of all students are over 24 years old. There is also an increase in students transferring from two year colleges to universities – and vice versa. For instance, in Canada, at the British Columbia Institute of Technology more than 20 per cent of its new enrolments each year already have a university degree.

1.6.3 Digital natives

Another factor that makes students somewhat different today is their immersion in and facility with digital technology, and in particular social media: instant messaging, Twitter, video games, Facebook, and a whole host of applications (apps) that run on a variety of mobile devices such as iPads and mobile phones. Such students are constantly 'on'. Most students come to university or college immersed in social media, and much of their life evolves around such media. Some commentators such as Mark Prensky (2001) argue that digital natives think and learn fundamentally differently as a result of their immersion in digital media.

Many instructors too often see such technology as a distraction. Attentive listening is impossible if students are scrolling through videos or Facebook pages. Many instructors would like to ban all mobile phones and tablets from their classes. However, a ban on mobile phones is an attempt to deny the reality of living in a digital age. We should be educating our students in the appropriate use of everyday technology for learning and social purposes, not trying to deny the existence of the technology.

Instead we should be encouraging students to use their technological devices to find, analyse, evaluate and apply their knowledge. This means giving them engaging tasks in class time that require the use of their phones. Yes, they will probably use their device to text other students but then that can be also used for group work and social learning. In particular, mobile phones can be used to support the learning of higher level skills, such as problem solving and critical thinking.

But this means providing criteria and procedures for students that enable their learning – and also learning when they need to put their phones down and switch off. These are skills and knowledge that are essential for life in today's society and it is irresponsible for the education system to ignore such needs. Students expect to use social media in all other aspects of their life. Why should their learning experience be different? We shall explore this further in Chapter 8, Section 6.

1.6.4 From elitism to success

Many older faculty still pine for the good old days when they were students. Even in the 1960s, when the Robbins' Commission recommended an expansion of universities in Britain, the Vice-Chancellors of the existing universities moaned 'More means worse.' However, for public universities, the Socratic ideal of a professor sharing their knowledge with a small group of devoted students under the linden tree no longer exists, except perhaps at graduate level, and is unlikely ever to return to public post-secondary institutions (except perhaps in Britain, where the Conservative government seems to be dialling back the clock to the 1950s). The massification of higher education has, to the alarm of traditionalists, opened up the academy to the great unwashed. However, the massification of higher education is needed as much for economic reasons as for social mobility.

The implications of these changes in the student body for university and college teaching are profound. At one time, German math professors used to pride themselves that only five to ten per cent of their students would succeed in their exams. The difficulty level was so high that only the very best passed. A tiny completion rate showed how rigorous their teaching was. It was the students' responsibility, not the professors', to reach the level required. That may still be the goal for top level research students, but we have seen that today universities and colleges have a somewhat different purpose, and that is to ensure, as far as possible, that as many students as possible leave university appropriately qualified for life in a knowledge-based society. We can't afford to throw away the lives of 95 per cent of students, either ethically or economically. In any case, governments are increasingly using completion rates and degrees awarded as key performance indicators that influence funding.

It is a major challenge for institutions and teachers to enable as many students as possible to succeed, given the wide diversity of the student body. More focus on teaching methods that lead to student success, more individualization of learning, and more flexible delivery are all needed to meet the challenge of an increasingly diverse student body. These developments put much more responsibility on the shoulders of teachers and instructors (as well as students), and require a much higher level of skill in teaching.

Fortunately, over the last 100 years there has been a great deal of research into how people learn, and a lot of research into teaching methods that lead to student success. Unfortunately, that research is not known or applied by the vast majority of university and college instructors, who still rely mainly on teaching methods that were perhaps appropriate when there were small classes and elite students, but are no longer appropriate today (see, for instance, Christensen Hughes and Mighty, 2010). Thus a different approach to teaching, and a better use of technology to help instructors increase their effectiveness across a diverse student body, are now needed.

References

Christensen Hughes, J. and Mighty, J. (2010) *Taking Stock: Research on Teaching and Learning in Higher Education* Montreal and Kingston: McGill-Queen's University Press

Council of Ontario Universities (2012) *Increased numbers of students heading to Ontario universities* Toronto ON: COU

Heslop, J. (2016) *Education Pathways for High School Graduates and Non-Graduates* Victoria BC: Student Transitions Project, Government of British Columbia

Prensky, M. (2001) '*Digital natives, Digital Immigrants*' On the Horizon Vol. 9, No. 5

Robbins, L. (1963) *Higher Education Report* London: Committee on Higher Education, HMSO

Shapiro, D., et al. (2016) *Time to Degree: A National View of the Time Enrolled and Elapsed for Associate and Bachelor's Degree Earners (Signature Report No. 11)*. Herndon, VA: National Student Clearinghouse Research Center.

Activity 1.6 Dealing with diversity

1. What changes if any have you noticed in the students you are teaching? How does this differ from my analysis?

2. Whose responsibility is it to ensure students succeed? To what extent does the diversity of students place more responsibility on teachers and instructors?

3. Do you agree that 'More means worse'? If you do, what alternatives would you suggest for higher education? How would this be paid for?

4. Does your country/state have the balance right between academic and vocational education? Do we put too much emphasis on universities and not enough on technical or vocational colleges?

No feedback is provided for this activity.

1.7 From the periphery to the center: how technology is changing the way we teach

Figure 1.7.1 Technology is changing the way we teach – and the way students learn Image: Vidyo.com

We shall see in Chapter 7, Section 2 that technology has played an important role in teaching from time immemorial, but until recently, it has remained more on the periphery of education. Technology has been used mainly to support regular classroom teaching, or operated in the form of distance education, for a minority of students or in specialized departments (often in continuing education or extension).

However, in the last ten to fifteen years, technology has been increasingly influencing the core teaching activities of universities and colleges. Some of the ways technology is moving from the periphery to the centre can be seen from the following trends.

1.7.1. Fully online learning

Credit-based online learning in recent years has become a major and central activity of most academic departments in universities, colleges and to some extent even in school/k-12 education.

Online learning enrolments increased by between 10-20 per cent per annum between 2002 and 2012 in North American higher education institutions, compared with an increase in campus-based enrolments of around 2-3 per cent per annum (Allen and Seaman, 2014).

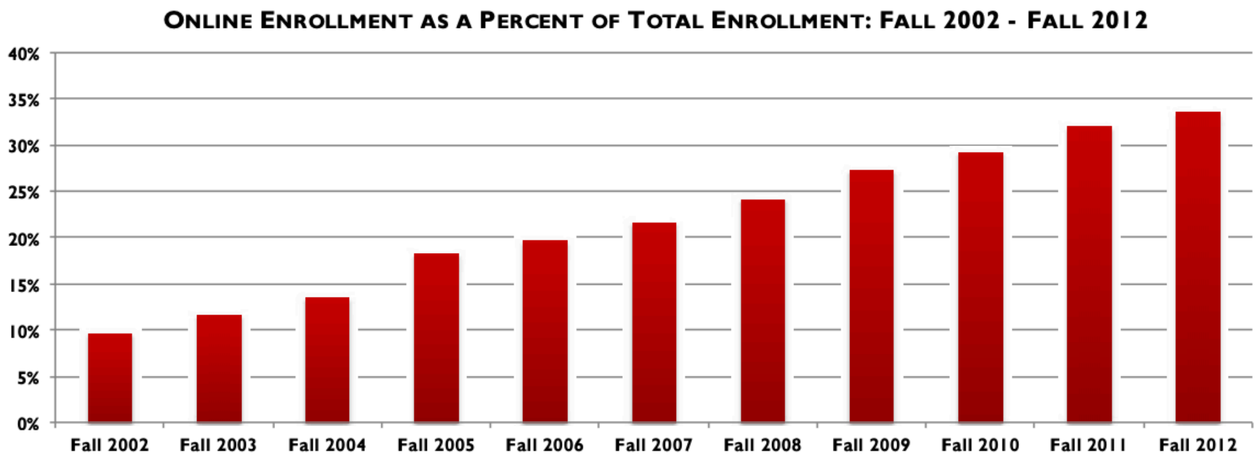


Figure 1.7.2 From Allen and Seaman, 2014

In just the California Community College System alone, there are almost one million online course enrolments (Johnson and Mejia, 2014). There are now at least seven million students in the USA taking at least one fully online course, almost 30 per cent of all post-secondary students in the USA; and 14 per cent of all students are taking *only* distance education courses. The majority of these fully online enrolments (just over two-thirds) are in public institutions in the USA (online enrolments in for-profit institutions plunged after 2012 due to Obama-era regulation). At the same time, the number of students studying on a campus in the USA dropped by almost one million (931,317) between 2012 and 2015 (Digital Learning Compass, 2017).

The situation in Canada is somewhat similar. Most Canadian post-secondary institutions (83 per cent) offered fully online courses for credit in 2017. Roughly 17 per cent of all students were taking at least one online course; online course registrations totalled 1.3 million, accounting for eight per cent of all credit course enrolments. This is equivalent in a system with roughly 70 universities and 150 public colleges to four additional universities of 27,000 students, and five additional colleges of 10,000 students. Online learning was considered by institutional leaders to be very or extremely important for the institution's future in over two-thirds of all institutions (Bates et al, 2018)

Thus fully online learning is now a key component of many school and post-secondary education systems.

1.7.2. Blended and hybrid learning

As more instructors have become involved in online learning, they have realised that much that has traditionally been done in class can be done equally well or better online (a theme that will be explored more in Chapter 10, Section 2). As a result, instructors have been gradually introducing more online study elements into their classroom teaching. So learning management systems may be used to store lecture notes in the form of slides or PDFs, links to online readings may be provided, or online forums for discussion may be established. Thus online learning is gradually being blended with face-to-face teaching, but without changing the basic classroom teaching model. Here online learning is being used as a supplement to traditional teaching. Although there is no standard or commonly agreed definitions in this area, I will use the term 'blended learning' for this use of technology.

More recently, though, lecture capture has resulted in instructors realising that if the lecture is recorded, students could view this in their own time, and then the classroom time could be used for more interactive sessions. This model has become known as the 'flipped classroom'.

An even more significant move, but still in a minority of classes, is the move to hybrid learning, where some, but not all, of regular classroom time is replaced by online activities. This sometimes leads to a complete re-design of the teaching experience for students.

Some institutions are now developing plans to move a substantial part of their teaching into more blended or flexible modes. Almost two-thirds of the institutions in the 2017 Canadian survey either had a plan for online learning or were developing one, and another 30 per cent reported that they did not have a plan but needed one. For instance in 2013 the University of Ottawa developed a plan to have at least 20 per cent of its courses blended or hybrid within five years (University of Ottawa, 2013). The University of British Columbia has a plan to redesign most of its first and second year large lecture classes into hybrid classes. Furthermore, some instructors are incorporating emerging technologies such as simulations and educational or serious games, augmented and virtual reality, in ways that fundamentally change the experience of learning. These are all indications of the growing importance of digital learning.

1.7.3. Open learning

Another increasingly important development linked to online learning is the move to 'open' education that over the last 10 years has begun to impact directly on conventional institutions. The most immediate is open textbooks – such as what you are reading now. Open textbooks are digital textbooks that can be downloaded in a digital format by students (or instructors) for free, thus saving students considerable money on textbooks. For instance, in Canada, the three provinces of British Columbia, Alberta, and Saskatchewan are collaborating on the production and distribution of peer-reviewed open textbooks for the 40 high-enrolment subject areas in their university and community college programs. By 2018 nearly all post-secondary institutions in British Columbia (90 per cent) had adopted at least one open textbook (Bates et al, 2018).

Open educational resources (OER) are another recent development in open education. These are digital educational materials freely available over the Internet that can be downloaded by instructors (or students) without charge, and if necessary adapted or amended, under a Creative Commons license that provides protections for the creators of the material. Probably the best known source of OER is the Massachusetts Institute of Technology OpenCourseWare project. With individual professors' permission, MIT has made available for free downloading over the Internet video lectures recorded with lecture capture as well as supporting materials such as slides.

The implications of developments in open learning will be discussed further in Chapter 11.

1.7.4. MOOCs

One of the main developments in online learning has been the rapid growth of Massive Open Online Courses (MOOCs). In 2008, the University of Manitoba in Canada offered the first MOOC with just over 2,000 enrolments, which linked webinar presentations and/or blog posts by experts to participants' blogs and tweets. The courses were open to anyone and had no formal assessment. In 2012, two Stanford

University professors launched a lecture-capture based MOOC on artificial intelligence, attracting more than 100,000 students, and since then MOOCs have expanded rapidly around the world.

Although the format of MOOCs can vary, in general they have the following characteristics:

- open to anyone to enroll and simple enrollment (just an e-mail address)
- very large numbers (from 1,000 to 100,000)
- free access to video-recorded lectures, often from the most elite universities in the USA (Harvard, MIT, Stanford in particular).
- computer-based assessment, usually using multiple-choice questions and immediate feedback, combined sometimes with peer assessment
- a wide range of commitment from learners: up to 50 per cent never do more than register, 25 per cent never take more than the first assignment, less than 10 per cent complete the final assessment.

However, MOOCs are merely the latest example of the rapid evolution of technology, the over-enthusiasm of early adopters, and the need for careful analysis of the strengths and weaknesses of new technologies for teaching. They are evolving over time, and are beginning to find a more limited but still important niche in the higher education market. MOOCs will be discussed more fully in Chapter 5.

1.7.5 Managing the changing landscape of education

These rapid developments in educational technologies mean that faculty and instructors need a strong framework for assessing the value of different technologies, new or existing, and for deciding how or when these technologies make sense for them and their students to use. Blended and online learning, social media and open learning are all developments that are critical for effective teaching in a digital age.

However, these emerging technological developments need to be harnessed to the changing needs of learners in a digital society, which means also looking at different ways of teaching and ensuring these teaching methods and choices of technology are fully aligned with the needs of learners in a digital age.

References

Allen, I. and Seaman, J. (2014) *Grade Change: Tracking Online Learning in the United States* Wellesley MA: Babson College/Sloan Foundation

Bates, T. et al. (2018) *Tracking Online and Distance Education in Canadian Universities and Colleges 2018* Halifax: Canadian Digital Learning Research Association

Digital Learning Compass (2017) Distance Education Enrolment Report 2017 Wellesley MA

Johnson, H. and Mejia, M. (2014) *Online learning and student outcomes in California's community colleges* San Francisco CA: Public Policy Institute of California

University of Ottawa (2013) *Report of the e-Learning Working Group* Ottawa ON: University of Ottawa: see also *Report on the Blended Learning Initiative (2016)*, which reports on progress in implementing the plan

Activity 1.7 The consequences of change

1. Have you in recent years moved to blended or online learning or used new technology in your teaching? If so, what was your reason?
2. If not, what has stopped you trying a new approach with technology?
3. If you have started to use technology in your teaching, what were the main difficulties you encountered? Did you get sufficient help from colleagues or the institution?
4. Did you change your academic goals or did you try to achieve the same learning outcomes as in fully face-to-face teaching?
5. Were there any unintended or unexpected consequences of moving towards the use of more technology in your teaching?

There is no feedback provided for this activity.

1.8 Navigating new developments in technology and online learning

Instructors in both universities and colleges now face the following challenges:

- to teach in ways that help develop the knowledge and skills needed in today's society;
- to handle increasingly large classes;
- to develop teaching methods that are appropriate for an increasingly diverse student body;
- to deal with a variety of different modes of delivery.

However, in general, teachers and instructors in post-secondary education have little or no training in teaching, pedagogy or the research on learning. Even many school teachers lack adequate training to deal with rapidly changing technologies. We wouldn't expect pilots to fly a modern jet without any training, yet that is exactly what we are expecting of our teachers and instructors.

This book then aims to provide a framework for making decisions about how to teach, and how best to use technology, in ways that are true to the core values of universities, colleges, and schools, while building on the large amount of research into learning and teaching, and into the use of technology for teaching, that has been done over the last 50 years or so.

The next chapter deals with the most important question of all: how do you want to teach in a digital age?

Activity 1.8 Your main conclusions from Chapter 1

Write down at least five conclusions you would draw from this chapter, in addition to the key takeaways below.

Click here to compare your answers with mine.

Key Takeaways

1. Teaching methods need to be used that help to develop and transfer specific skills that serve both the purposes of knowledge development and dissemination, while at the same time preparing graduates for work in a knowledge-based society.
2. As student numbers have increased, teaching has regressed for a variety of reasons to a greater focus on information transmission and less focus on questioning, exploration of ideas, presentation of alternative viewpoints, and the development of critical or original thinking. Yet these are the very skills needed by students in a knowledge-based society.
3. The wide diversity of the student body is a major challenge for institutions. This requires more focus on teaching methods that provide support for learners, more individualization of learning, and more flexible delivery.

4. Online learning is a continuum; every instructor and every institution now needs to decide: where on this continuum of teaching should a particular course or program be?
5. As more academic content becomes openly and freely available, students will look increasingly to their local institutions for support with their learning, rather than for the delivery of content. This puts a greater focus on teaching skills and less on subject expertise.
6. Faculty and instructors need a strong framework for assessing the value of different technologies, new or existing, and for deciding how or when these technologies make sense for them (and/or their students) to use.

Chapter 2: The nature of knowledge and the implications for teaching

Purpose of the chapter

This chapter discusses the relationship between our views on the nature of knowledge and the way we decide to teach.

After reading this chapter you should be able to:

- recognize your own epistemological/philosophical position that determines the way you are currently teaching;
- reflect on the similarities or differences between academic and everyday knowledge;
- decide whether technology changes the nature of knowledge, and consider the implications for teaching;
- describe in broad terms the main theories of learning and discuss their implications for teaching;
- identify different levels and types of learning and decide which is most appropriate for your subject area/students;
- integrate these ideas into a personal strategy or philosophy for the teaching of your subject;
- decide on whether or not to change your overall approach to teaching in the light of the issues raised in this chapter.

What is covered in this chapter

In this chapter, I will be discussing different beliefs about the nature of knowledge, and how that influences teaching and learning. In particular, this chapter covers the following topics:

Also in this chapter you will find the following activities:

Key Takeaways

1. Teaching is a highly complex occupation, which needs to adapt to a great deal of variety in context, subject matter and learners. It does not lend itself to broad generalizations. Nevertheless it is possible to provide guidelines or principles based on best practices, theory and research, that must then be adapted or modified to local conditions.

2. Our underlying beliefs and values, usually shared by other experts in a subject domain, shape our approach to teaching. These underlying beliefs and values are often implicit and are often not directly shared with our students, even though they are seen as essential components of becoming an ‘expert’ in a particular subject domain.

3. Different theories of learning reflect different views on the nature of knowledge.

4. Every teacher starts from some epistemological or theoretical position, even if it is not explicit, or even if the teacher is not fully aware of their beliefs.

5. With the possible exception of connectivism, there is some form of empirical evidence to support each of the theories of learning outlined here. The difference then is as much about values and beliefs about knowledge as it is about the effectiveness of each theory.

6. It is argued that academic knowledge is different from other forms of knowledge, and is even more relevant today in a digital age.

7. However, academic knowledge is not the only kind of knowledge that is important in today’s society, and as teachers we have to be aware of other forms of knowledge and their potential importance to our students, and make sure that we are providing the full range of contents and skills needed for students in a digital age.

Scenario B: A pre-dinner party discussion

Figure 2.B The Dinner Party, from NBC's The Office

List of characters.

- Peter and Ruth (hosts)
- Stephen (a mechanical engineer and Peter's brother)
- Caroline (a writer and Ruth's friend)

Peter to Stephen. I think Caroline's arrived. Now I know you've not met Caroline before, but for goodness sake, do try to be polite and sociable this time. The last time you were here, you hardly said a word.

Stephen. Well, nobody said anything that interested me. It was all about books and art. You know I'm not interested in that sort of thing.

Peter: Well, just try. Here she is. Caroline – lovely to see you again. Come and sit down. This is Stephen, my brother. I don't think you've met, although I've told you about him – he's a professor of mechanical engineering at the local university. But first, what would you like to drink?

Caroline. Hi, Stephen. No, I don't think we have met. Nice to meet you. Peter, I'll have a glass of white wine, please.

Peter. While you're introducing yourselves, I'll go and get the drinks and give Ruth a hand in the kitchen.

Stephen. Peter says you're a writer. What do you write about?

Caroline (laughing). Well, you do like to get straight to the point, don't you? It's a bit difficult to answer your question. It depends on what I'm interested in at the time.

Stephen. And what are you interested in at the moment?

Caroline. I'm thinking about how someone would react to the loss of someone they love due to the action of someone else they also love deeply. It was prompted by an item on the news of how a father accidentally killed his two year old daughter by running her over when he was backing the car out of the garage. His wife had just let the girl out to play in the front garden and didn't know her husband was getting the car out.

Stephen. God, that's awful. I wonder why the hell he didn't have a rear view video camera installed.

Caroline. Well, the horrible thing about it is that it could happen to anyone. That's why I want to write something around such everyday tragedies.

Stephen. But how can you possibly write about something like that if you haven't experienced that kind of thing yourself? Or have you?

Caroline. No, thank goodness. Well, I guess that's the art of a writer – the ability to embed yourself in other people's worlds, and to anticipate their feelings, emotions and consequent actions.

Stephen. But wouldn't you need a degree in psychology or experience as a grief counsellor to do that in that situation?

Caroline. Well, I might talk to people who've undergone similar kinds of family tragedies, to see what kind of people they are afterwards, but basically it's about understanding how *I* might react in such a situation and projecting that and modifying that according to the kind of characters I'm interested in.

Stephen. But how do you know it would be true, that people really would react the way you think they would?

Caroline. Well, what is 'truth' in a situation like that? Different people are likely to act differently. That's what I want to explore in the novel. The husband reacts one way, the wife another, and then there's the interaction between the two, and all those round them. I'm particularly interested in whether they could actually grow and become better people, or whether they disintegrate and destroy each other.

Stephen. But how can you not know that before you start?

Caroline. Well, that's the point, really. I don't. I want the characters to grow in my imagination, and the outcome will inevitably be determined by that.

Stephen. But if you don't know the truth, how those two people actually responded to that tragedy, how can you help them or others like them?

Caroline. But I'm a novelist, not a therapist. I'm not attempting to help anyone in such an awful situation. I'm trying to understand the *general* human condition, and to do that, I have to start with myself, what I know and feel, and project that into another context.

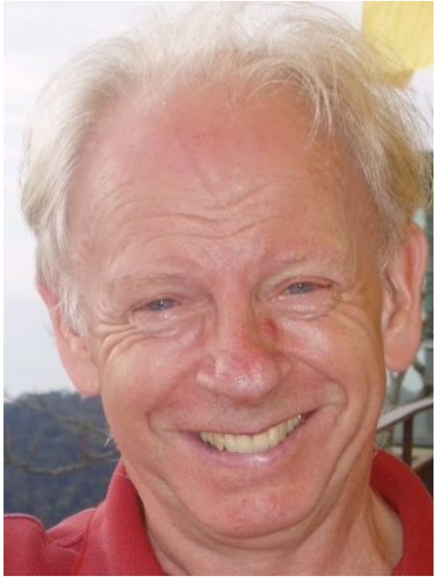
Stephen. But that's nonsense. How can you possibly understand the human condition just by looking inwards at yourself, and making up a fictional situation, that probably has nothing to do with what actually happened?

Caroline (sighs). Stephen, you’re a typical bloody scientist, with no imagination.

P*eter* (arriving with the drinks). Well, how are you two getting along?

Obviously at this point, not very well. The problem is that they have different world views on truth and how it can be reached. They start from very different views about what constitutes knowledge, how knowledge is acquired, and how it is validated. As always, the ancient Greeks had a word for thinking about the nature of knowledge: epistemology. We shall see that this is an important driver of how we teach.

2.1 Art, theory, research, and best practices in teaching



For my comments on why this chapter is important for the rest of the book, please click on the podcast below

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=57

All teaching is a mix of art and science. It is an art because any teacher or instructor is faced with numerous and constantly changing variables, which require rapid judgement and decision-making. Good teachers usually have a passion for teaching so the emotional as well as the cognitive side is important. In many cases, it's also about personal relationships, the extent to which an instructor can empathise with students or appreciate their difficulties in learning, and the extent to which the instructor can communicate effectively.

There is also a science of teaching, based on theory and research. We shall see in fact there are many, often conflicting theories, driven primarily by epistemological differences about the nature of knowledge, and by different value systems. Then over the last 100 years there has been a great deal of empirical research into how students learn, and effective teaching methods, which at its best is driven by a strong, explicit theoretical base, and at its worse by mindless data-collection (such as RateMyProfessor).

As well as research-based practices, there are what are known as best practices, based on teachers' experience of teaching. While in many cases these have been validated by research or are driven by theories of learning, this is not always the case. As a result, what some people see as best practices are not always universally shared by others, even if best practices are seen in general as current accepted wisdom. Teaching math in primary schools in one example. Lectures are another. In Chapter 3, Section 3, strong evidence is provided that lectures have many limitations, yet many instructors still believe that this is the most appropriate way to teach their subject.

However, even the most extensively trained teachers don't always make good teachers if they don't have the talent and emotional connection with learners, and untrained teachers (which covers virtually all university instructors), sometimes succeed, even with little experience, because they have a knack or in-born talent. However, although such instructors are often held up as the triumph of art over science in teaching, they are in practice very rare. Many of these untutored, brilliant instructors have learned rapidly on the job by trial and error, with the inevitable casualties along the way.

For all these reasons, there is no one best way to teach that will fit all circumstances, which is why arguments over 'modern' or 'traditional' approaches to teaching reading or math, for example, are often so sterile. Good teachers usually have an arsenal of tools, methods and approaches that they can draw on, depending on the circumstances. Also teachers and instructors will differ over what constitutes good teaching, depending on their understandings of what knowledge is, what matters most in learning, and their priorities in terms of desirable learning outcomes.

Nevertheless, these apparent contradictions do not mean that we cannot develop guidelines and techniques to improve the quality of teaching, or that we have no principles or evidence on which to base decisions about teaching, even in a rapidly changing digital age. The aim of this book is to provide such guidelines, while recognizing that one size will not fit all, and that every teacher or instructor will need to select and adapt the suggestions in this book to their own unique context.

For this approach to work, though, we need to explore some fundamental issues about teaching and learning, some of which are rarely addressed in everyday discussions about education. The first and probably most important is epistemology.

Activity 2.1: What do you think makes a good teacher?

1. Write down, in order of priority, what you consider to be the three most important characteristics of a good teacher.

2. Explain why your answer differs from mine.

For the reasons given above, I give no no feedback (and certainly no 'right or wrong answers') to these questions.

2.2 Epistemology and theories of learning

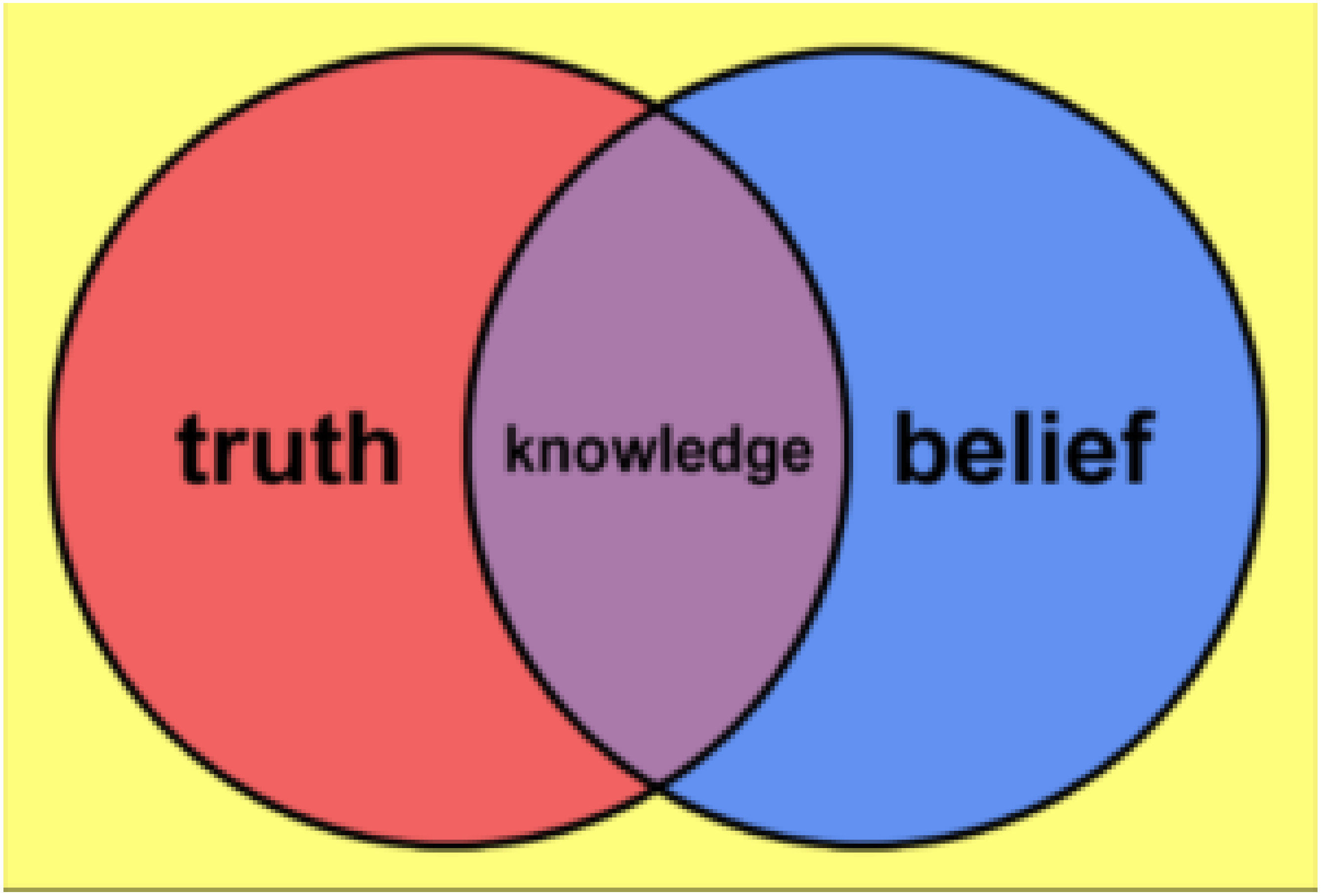


Figure 2.2.1 Image: © Freethought Kampala, 2017, via Libguides, University of Pittsburgh

2.2.1 What is epistemology?

In the dinner party scenario, Stephen and Caroline had quite different beliefs about the nature of knowledge. The issue here is not who was right, but that we all have implicit beliefs about the nature of knowledge, what constitutes truth, how that truth is best validated, and, from a teaching perspective, how best to help people to acquire that knowledge. The basis of that belief will vary, depending on the subject matter, and, in some areas, such as social sciences, even within a common domain of knowledge.

Our choice of teaching approaches and even the use of technology are absolutely dependent on beliefs and assumptions we have about the nature of knowledge, about the requirements of our subject discipline, and about how we think students learn. The way we teach in higher education will be driven primarily by our beliefs or rather, by the commonly agreed consensus within an academic discipline about what constitutes valid knowledge in the subject area.

The nature of knowledge centres on the question of *how* we know what we know. What makes us believe that something is 'true'? Questions of this kind are epistemological in nature. Hofer and Pintrich (1997) state:

> *Epistemology is a branch of philosophy concerned with the nature and justification of knowledge*.

The famous argument at the British Association in 1860 between Thomas Huxley and the Bishop of Oxford, Samuel Wilberforce, over the origin of species is a classic example of the clash between beliefs about the foundations of knowledge. Wilberforce argued that Man was created by God; Huxley argued that Man evolved through natural selection. Bishop Wilberforce believed he was right because 'true' knowledge was determined through faith and interpretation of holy scripture; Professor Huxley believed he was right because 'true' knowledge was derived through empirical science and rational skepticism.

An important part of higher education is aimed at developing students' understanding, within a particular discipline, of the criteria and values that underpin academic study of that discipline, and these include questions of what constitutes valid knowledge in that subject area. For many experts in a particular field, these assumptions are often so strong and embedded that the experts may not even be openly conscious of them unless challenged. But for novices, such as students, it often takes a great deal of time to understand fully the underlying value systems that drive choice of content and methods of teaching.

Our epistemological position therefore has direct practical consequences for how we teach.

2.2.2 Epistemology and theories of learning

Most teachers in the school/k-12 sector will be familiar with the main theories of learning, but because instructors in post-secondary education are hired primarily for their subject experience, or research or vocational skills, it is essential to introduce and discuss, if only briefly, these main theories. In practice, even without formal training or knowledge of different theories of learning, all teachers and instructors will approach teaching within one of these main theoretical approaches, whether or not they are aware of the educational jargon surrounding these approaches. Also, as new technologies and new modes of teaching such as online learning, technology-based teaching, and informal digital networks of learners have evolved, new theories of learning are beginning to emerge.

With a knowledge of alternative theoretical approaches, teachers and instructors are in a better position to make choices about how to approach their teaching in ways that will best fit the perceived needs of their students, within the very many different learning contexts that teachers and instructors face. This is particularly important when addressing many of the requirements of learners in a digital age that are set out in Chapter 1. Furthermore, the choice of or preference for a particular epistemology or a particular theoretical approach to teaching will have major implications for the way that technology is used to support teaching.

In fact, there is a huge amount of literature on theories of learning, and I am aware that the treatment in this book is cursory, to say the least. Those who would prefer a more detailed introduction to theories of learning should explore Schunk (2016) or Harasim (2017). The aim of my book though is not to be comprehensive in terms of in-depth coverage of all learning theories, but to provide a basis on which to suggest and evaluate different ways of teaching to meet the diverse needs of learners in a digital age.

The important point here is that every theory of teaching or learning is underpinned by a particular assumption or understanding of what constitutes 'true' knowledge: in other words by a particular epistemological position. In the following sections I examine four of the most common theories of learning, and the underlying epistemologies that drive them.

References

Harasim, L. (2017) *Learning Theory and Online Technologies 2nd edition* New York/London: Taylor and Francis

Hofer, B. and Pintrich, P. (1997) 'The development of epistemological theories: beliefs about knowledge and knowing and their relation to learning' *Review of Educational Research* Vol. 67, No. 1, pp. 88-140

Schunk, D. (2016) *Learning Theories: An Educational Perspective: 7th edition* London: Pearson Education

Activity 2.2 Epistemologies at a dinner party

1. Draw two columns. Under one column, write down a list of the justifications that Caroline used for her book in Scenario B. Similarly, in the other column, write down Stephen's objections.
2. What are the common themes underlying each person's justification for their arguments? (Try not to make a value judgement about which were the 'best' arguments.)
3. Would it be possible to reconcile both approaches?

Feedback to come

2.3 Objectivism and behaviourism

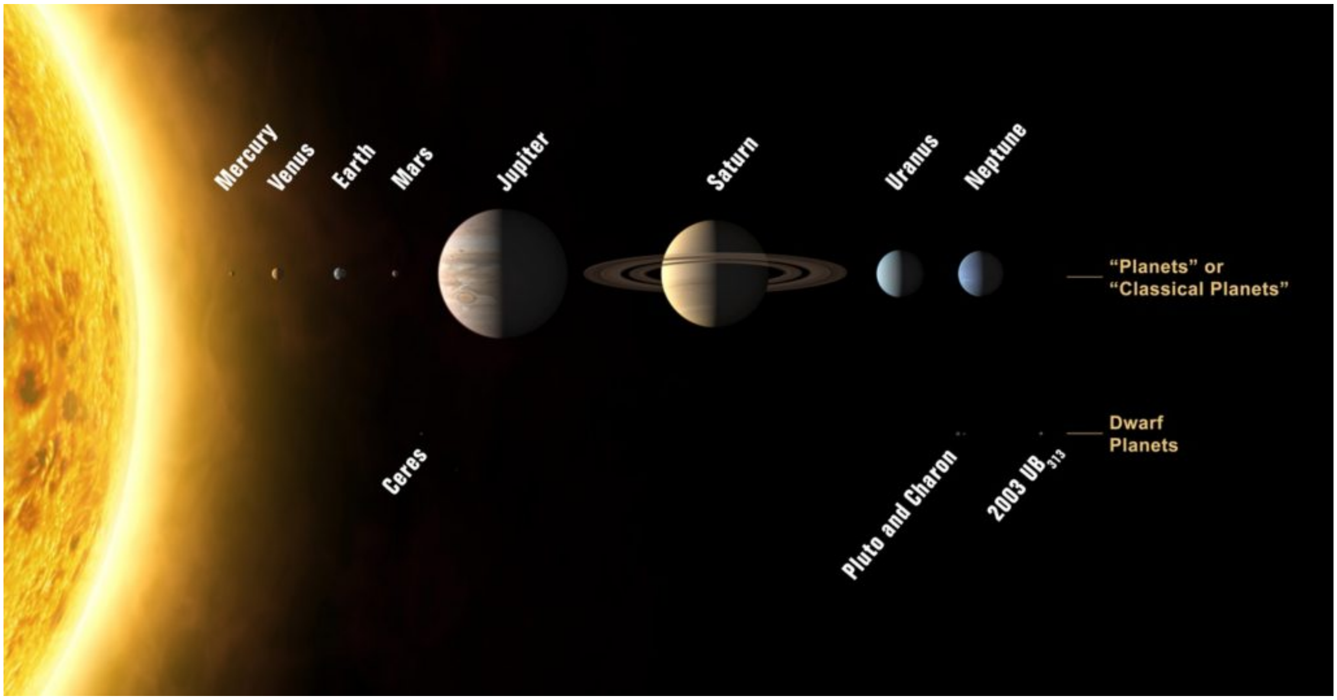


Figure 2.3.1 The solar system: an objective fact?
Image: © International Astronomical Union/Wikipedia

2.3.1 The objectivist epistemology

Objectivists believe that there exists an objective and reliable set of facts, principles and theories that either have been discovered and delineated or will be over the course of time. This position is linked to the belief that truth exists outside the human mind, or independently of what an individual may or may not believe. Thus the laws of physics are constant, although our knowledge of them may evolve as we discover the 'truth' out there.

2.3.2 Objectivist approaches to teaching

A teacher operating from a primarily *objectivist* view is more likely to believe that a course must present a body of knowledge to be learned. This may consist of facts, formulas, terminology, principles, theories and the like.

The effective transmission of this body of knowledge becomes of central importance. Lectures and textbooks must be authoritative, informative, organized, and clear. The student's responsibility is accurately to comprehend, reproduce and add to the knowledge handed down to him or her, within the guiding epistemological framework of the discipline, based on empirical evidence and the testing of hypotheses. Course assignments and exams would require students to find 'right answers' and justify them. Original or creative thinking must still operate within the standards of an objectivist approach – in other words, new knowledge development must meet the rigorous standards of empirical testing within agreed theoretical frameworks.

An 'objectivist' teacher has to be very much in control of what and how students learn, choosing what is important to learn, the sequence, the learning activities, and how learners are to be assessed.

2.3.3 Behaviourism

Although initially developed in the 1920s, behaviourism still dominates approaches to teaching and learning in many places, particularly in the USA. Behaviourism is an objectivist learning theory. Behaviourist psychology is an attempt to model the study of human behaviour on the methods of the physical sciences, and therefore concentrates attention on those aspects of behaviour that are capable of direct observation and measurement. At the heart of behaviourism is the idea that certain behavioural responses become associated in a mechanistic and invariant way with specific stimuli. Thus a certain stimulus will evoke a particular response. At its simplest, it may be a purely physiological reflex action, like the contraction of an iris in the eye when stimulated by bright light.

However, most human behaviour is more complex. Nevertheless behaviourists have demonstrated in labs that it is possible to reinforce through reward or punishment the association between any particular stimulus or event and a particular behavioural response. The bond formed between a stimulus and response will depend on the existence of an appropriate means of reinforcement at the time of association between stimulus and response. This depends on random behaviour (trial and error) being appropriately reinforced as it occurs.

This is essentially the concept of operant conditioning, a principle most clearly developed by Skinner (1968). He showed that pigeons could be trained in quite complex behaviour by rewarding particular, desired responses that might initially occur at random, with appropriate stimuli, such as the provision of food pellets. He also found that a chain of responses could be developed, without the need for intervening stimuli to be present, thus linking an initially remote stimulus with a more complex behaviour. Furthermore, inappropriate or previously learned behaviour could be extinguished by withdrawing reinforcement. Reinforcement in humans can be quite simple, such as immediate feedback for an activity or getting a correct answer to a multiple-choice test.

Figure 2.3.2 YouTube video/film of B.F. Skinner demonstrating his teaching machine, 1954
Click on image to see video

You can see a fascinating five minute film of B.F. Skinner describing his teaching machine in a 1954 film captured on YouTube, either by clicking on the picture above or at: http://www.youtube.com/watch?v=jTH3ob1IRFo

Underlying a behaviourist approach to teaching is the belief that learning is governed by invariant principles, and these principles are independent of conscious control on the part of the learner. Behaviourists attempt to maintain a high degree of objectivity in the way they view human activity, and they generally reject reference to unmeasurable states, such as feelings, attitudes, and consciousness. Human behaviour is above all seen as predictable and controllable. Behaviourism thus stems from a strongly objectivist epistemological position.

Skinner's theory of learning provides the underlying theoretical basis for the development of teaching machines, measurable learning objectives, computer-assisted instruction, and multiple choice tests. It often is implicit in the application of artificial intelligence to modifying human behaviour. Behaviourism's influence is still strong in corporate and military training, and in some areas of science, engineering, and medical training. It can be of particular value for rote learning of facts or standard procedures such as multiplication tables, for dealing with children or adults with limited cognitive ability due to brain disorders, or for compliance with industrial or business standards or processes that are invariant and do not require individual judgement. It is also the underlying methodology of social media such as Facebook for influencing behaviour, through 'likes', number of hits and connections, and other 'status' rewards.

Behaviourism, with its emphasis on reward and punishment as drivers of learning, and on pre-defined and measurable outcomes, is the basis of populist conceptions of learning among many parents, politicians, and, it should be noted, computer scientists interested in automating learning. It is not surprising then that there has also been a tendency until recently to see technology, and in particular computer-aided instruction, as being closely associated with behaviourist approaches to learning, although we shall see in Chapter 5, Section 4 that computers do not necessarily have to be used in a behaviourist way.

Lastly, although behaviourism is an 'objectivist' approach to teaching, it is not the only way of teaching 'objectively'. For instance, problem-based learning can still take a highly objective approach to knowledge and learning.

References

Skinner, B. (1968) *The Technology of Teaching*, New York: Appleton-Century-Crofts

Activity 2.3 Defining the limits of behaviourism

1. What areas of knowledge do you think would be best 'taught' or learned through a behaviourist approach?

2. What areas of knowledge do you think would NOT be appropriately taught through a behaviourist approach?

3. What are your reasons?

Feedback to come

2.4 Cognitivism

Figure 2.4.1 Benjamin Bloom Image: Wikipedia

2.4.1 What is cognitivism?

An obvious criticism of behaviourism is that it treats humans as a black box, where inputs into the black box, and outputs from the black box, are known and measurable, but what goes on inside the black box is ignored or not considered of interest. However, humans have the ability for conscious thought, decision-making, emotions, and the ability to express ideas through social discourse, all of which are highly significant for learning. Thus we will likely get a better understanding of learning if we try to find out what goes on inside the black box.

Cognitivists therefore have focused on identifying mental processes – internal and conscious representations of the world – that they consider are essential for human learning. Fontana (1981) summarises the cognitive approach to learning as follows:

> '*The cognitive approach … holds that if we are to understand learning we cannot confine ourselves to observable behaviour, but must also concern ourselves with the learner's ability mentally to re-organize his psychological field (i.e. his inner world of concepts, memories, etc.) in response to*

> *experience. This latter approach therefore lays stress not only on the environment, but upon the way in which the individual interprets and tries to make sense of the environment. It sees the individual not as the somewhat mechanical product of his environment, but as an active agent in the learning process, deliberately trying to process and categorize the stream of information fed into him by the external world.'* (p. 148)

Thus the search for rules, principles or relationships in processing new information, and the search for meaning and consistency in reconciling new information with previous knowledge, are key concepts in cognitive psychology. Cognitive psychology is concerned with identifying and describing mental processes that affect learning, thinking and behaviour, and the conditions that influence those mental processes.

2.4.2 Cognitivist learning theory

The most widely used theories of cognitivism in education are based on Bloom's taxonomies of learning objectives (Bloom et al., 1956), which are related to the development of different kinds of learning skills, or ways of learning. Bloom and his colleagues claimed that there are three important domains of learning:

- cognitive (thinking)
- affective (feeling)
- psycho-motor (doing).

Cognitivism focuses on the 'thinking' domain. In more recent years, Anderson and Krathwohl (2000) have slightly modified Bloom et al.'s original taxonomy, adding 'creating' new knowledge:

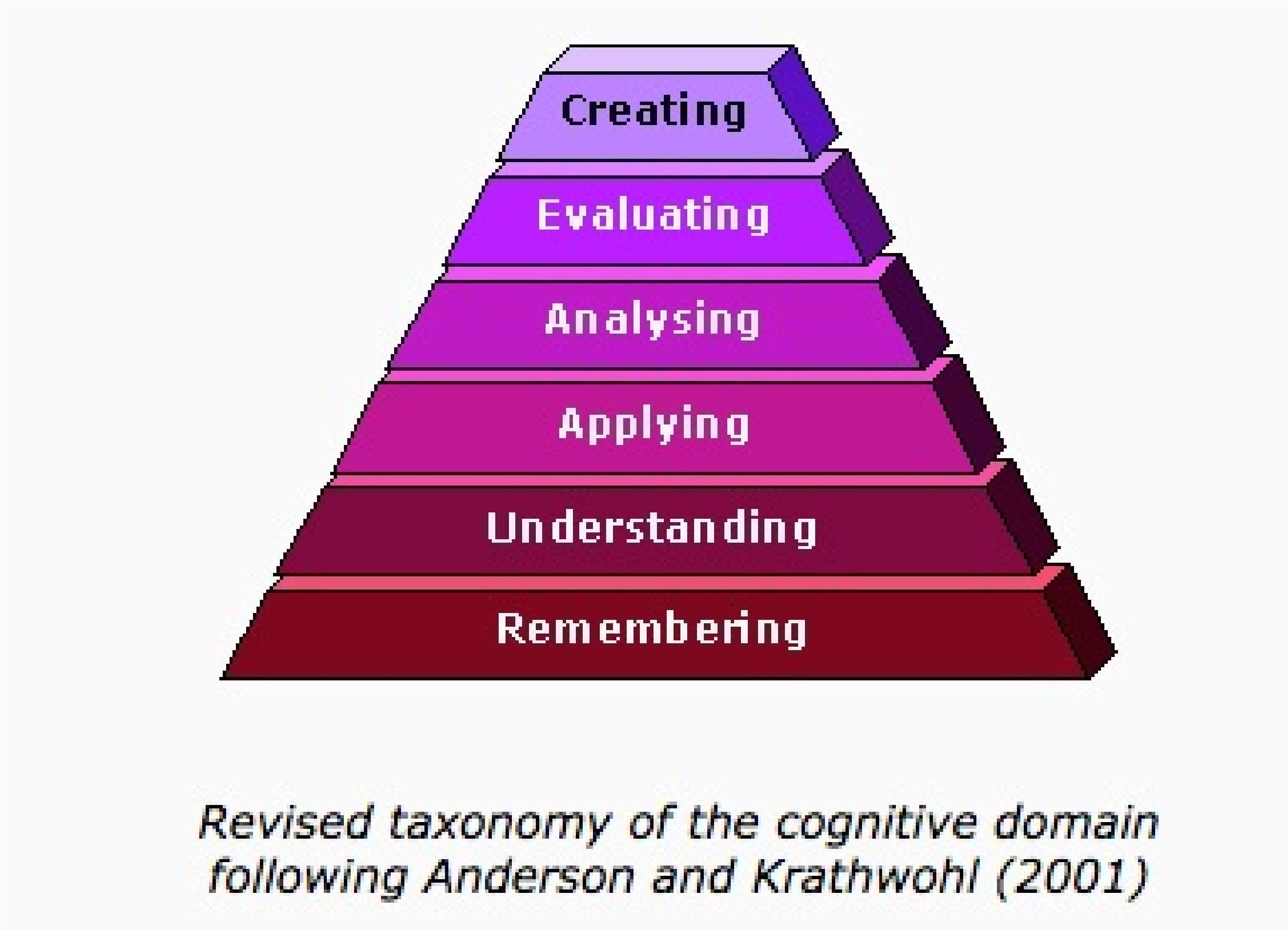


Figure 2.4.2 Cognitive domain
Image: © Atherton J S (2013) CC-NC-ND

Bloom et al. also argued that there is a hierarchy of learning, meaning that learners need to progress through each of the levels, from remembering through to evaluating/creating. As psychologists delve deeper into each of these cognitive activities to understand the underlying mental processes, it becomes an increasingly reductionist exercise (see Figure 2.4.3 below).

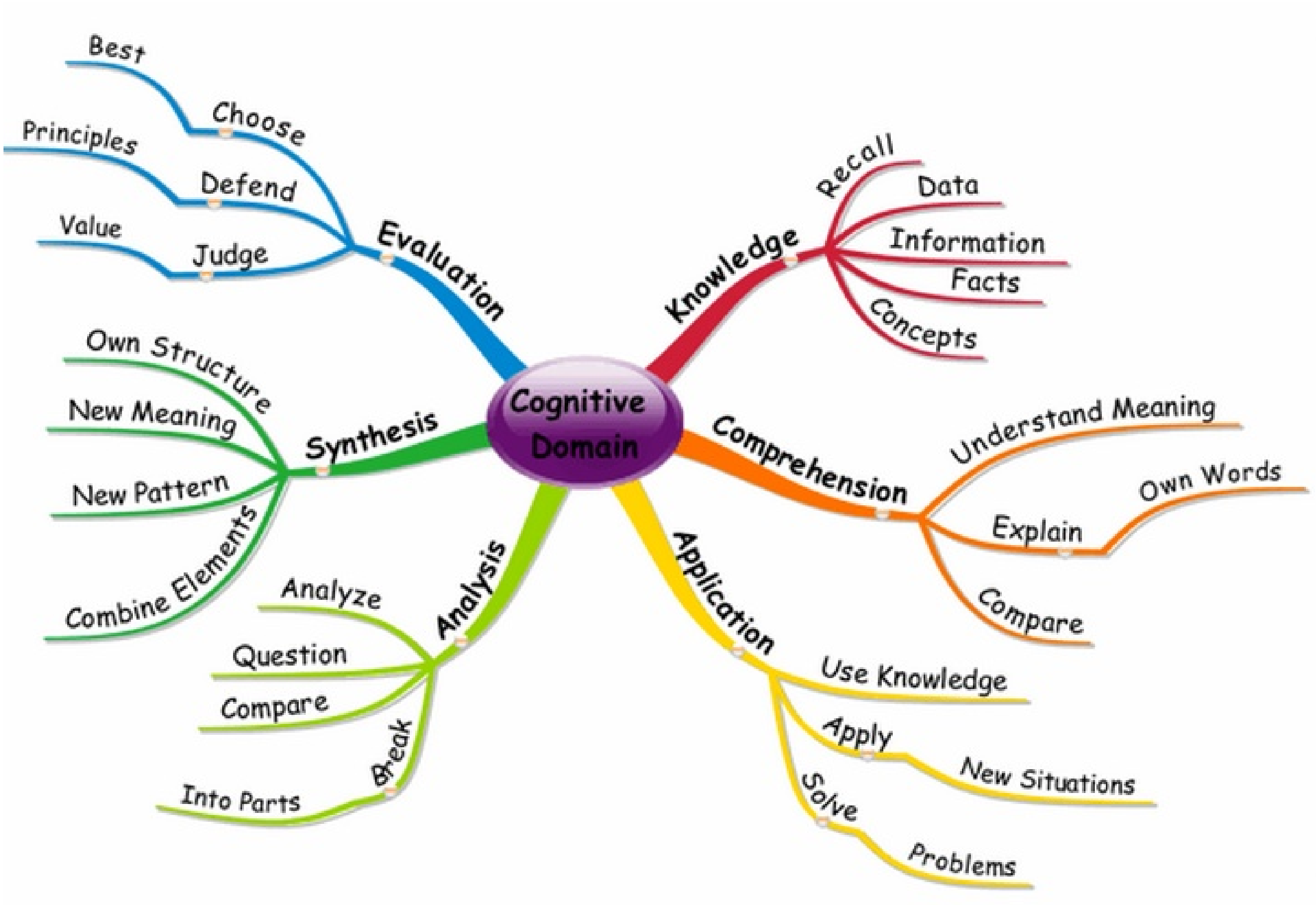


Figure 2.4.3 © Faizel Mohidin, [UsingMindMaps](), 2011.

2.4.3 Applications of cognitivist learning theory

Cognitive approaches to learning, with a focus on comprehension, abstraction, analysis, synthesis, generalization, evaluation, decision-making, problem-solving and creative thinking, seem to fit much better with higher education than behaviourism, but even in school/k-12 education, a cognitivist approach would mean for instance focusing on teaching learners *how* to learn, on developing stronger or new mental processes for future learning, and on developing deeper and constantly changing understanding of concepts and ideas.

Cognitive approaches to learning cover a very wide range. At the objectivist end, cognitivists consider basic mental processes to be genetic or hard-wired, but can be programmed or modified by external factors, such as new experiences. Early cognitivists in particular were interested in the concept of mind as computer, and more recently brain research has led to a search for linking cognition to the development and reinforcement of neural networks in the brain.

In terms of practice, this concept of mind as computer has led to several technology-based developments in teaching, including:

- *intelligent tutoring systems*, a more refined version of teaching machines, based on breaking down learning into a series of manageable steps, and analysing learners' responses to direct them to the most appropriate next step. Adaptive learning is the latest extension of such developments;

- *artificial intelligence*, which seeks to represent in computer software the mental processes used in human learning (which of course if successful would result in computers replacing many human activities – such as teaching, if learning is considered in an objectivist framework);
- *pre-determined learning outcomes*, based on an analysis and development of different kinds of cognitive activities, such as comprehension, analysis, synthesis, and evaluation;
- *problem-based learning*, based on an analysis of the thinking processes successful problem-solvers use to solve problems;
- *instructional design* approaches that attempt to manage the design of teaching to ensure successful achievement of pre-determined learning outcomes or objectives.

Cognitivists have increased our understanding of how humans process and make sense of new information, how we access, interpret, integrate, process, organize and manage knowledge, and have given us a better understanding of the conditions that affect learners' mental states.

References

Anderson, L. and Krathwohl, D. (eds.) (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* New York: Longman

Atherton J. S. (2013) Learning and Teaching; Bloom's taxonomy, retrieved 7 May 2019

Bloom, B. S.; Engelhart, M. D.; Furst, E. J.; Hill, W. H.; Krathwohl, D. R. (1956). *Taxonomy of educational objectives: The classification of educational goals*. *Handbook I: Cognitive domain.* New York: David McKay Company

Fontana, D. (1981) *Psychology for Teachers* London: Macmillan/British Psychological Society

Activity 2.4 Defining the limits of cognitivism

1. What areas of knowledge do you think would be best 'taught' or learned through a cognitivist approach?
2. What areas of knowledge do you think would NOT be appropriately taught through a cognitivist approach?
3. What are your reasons?

Feedback to come

2.5 Constructivism

Figure 2.5.1 Project work is one form of constructivist learning
Image: © Jim Olive, Environmental Protection Agency/Wikipedia, 1972

2.5.1 What is constructivism?

Both behaviourist and some elements of cognitive theories of learning are *deterministic*, in the sense that behaviour and learning are believed to be rule-based and operate under predictable and constant conditions over which the individual learner has no or little control. However, constructivists emphasise the importance of consciousness, free will and social influences on learning. Carl Rogers (1969) stated that:

> *every individual exists in a continually changing world of experience in which he is the center.*

The external world is interpreted within the context of that private world. The belief that humans are essentially active, free and strive for meaning in personal terms has been around for a long time, and is an essential component of constructivism.

Constructivists believe that knowledge is essentially subjective in nature, constructed from our perceptions and mutually agreed upon conventions. According to this view, we construct new knowledge rather than simply acquire it via memorization or through transmission from those who know to those who don't know. Constructivists believe that meaning or understanding is achieved by assimilating information, relating it to our existing knowledge, and cognitively processing it (in other words, thinking or reflecting on new information). *Social* constructivists believe that this process works best through discussion and social interaction, allowing us to test and challenge our own understandings with those of others. For a constructivist, even physical laws exist because they have been constructed by people from evidence, observation, and deductive or intuitive thinking, and, most importantly, because certain communities of people (in this example, scientists) have mutually agreed what constitutes valid knowledge.

Constructivists argue that individuals consciously strive for meaning to make sense of their environment in terms of past experience and their present state. It is an attempt to create order in their minds out of disorder, to resolve incongruities, and to reconcile external realities with prior experience. The means by which this is done are complex and multi-faceted, from personal reflection, seeking new information, to testing ideas through social contact with others. Problems are resolved, and incongruities sorted out, through strategies such as seeking relationships between what was known and what is new, identifying similarities and differences, and testing hypotheses or assumptions. Reality is always tentative and dynamic.

One consequence of constructivist theory is that each individual is unique, because the interaction of their different experiences, and their search for personal meaning, results in each person being different from anyone else. Thus behaviour is not predictable or deterministic, at least not at the individual level (which is a key distinguishing feature from cognitivism, which seeks general rules of thinking that apply to all humans). The key point here is that for constructivists, learning is seen as essentially a *social* process, requiring communication between learner, teacher and others. This social process cannot effectively be replaced by technology, although technology may facilitate it.

2.5.2 Constructivist approaches to teaching

For many educators, the social context of learning is critical. Ideas are tested not just on the teacher, but with fellow students, friends and colleagues. Furthermore, knowledge is mainly acquired through social processes or institutions that are socially constructed: schools, universities, and increasingly these days, online communities. Thus what is taken to be 'valued' knowledge is also socially constructed.

Constructivists believe that learning is a constantly dynamic process. Understanding of concepts or principles develops and becomes deeper over time. For instance, as a very young child, we understand the concept of heat through touch. As we get older we realise that it can be quantified, such as minus 20 centigrade being very cold (unless you live in Manitoba, where -20C would be considered normal). As we study science, we begin to understand heat differently, for instance, as a form of energy transfer, then as a form of energy associated with the motion of atoms or molecules. Each 'new' component needs to be integrated with prior understandings and also integrated with other related concepts, including other components of molecular physics and chemistry.

Thus 'constructivist' teachers place a strong emphasis on learners developing personal meaning through reflection, analysis and the gradual building of layers or depths of knowledge through conscious and ongoing mental processing. Reflection, seminars, discussion forums, small group work, and projects are key methods used to support constructivist learning in campus-based teaching (discussed in more detail in Chapter 3), and online collaborative learning, and communities of practice are important constructivist methods in online learning (Chapter 4).

Although problem-solving can be approached in an objectivist way, by pre-determining a set of steps or processes to go through pre-determined by ‘experts’, it can also be approached in a constructivist manner. The level of teacher guidance can vary in a constructivist approach to problem-solving, from none at all, to providing some guidelines on how to solve the problem, to directing students to possible sources of information that may be relevant to solving that problem, to getting students to brainstorm particular solutions. Students will probably work in groups, help each other and compare solutions to the problem. There may not be considered one ‘correct’ solution to the problem, but the group may consider some solutions better than others, depending on the agreed criteria of success for solving the problem.

It can be seen that there can be ‘degrees’ of constructivism, since in practice the teacher may well act as first among equals, and help direct the process so that ‘suitable’ outcomes are achieved. The fundamental difference is that students have to work towards constructing their own meaning, testing it against ‘reality’, and further constructing meaning as a result.

Constructivists also approach technology for teaching differently from behaviourists. From a constructivist perspective, brains have more plasticity, adaptability and complexity than current computer software programs. Other uniquely human factors, such as emotion, motivation, free will, values, and a wider range of senses, make human learning very different from the way computers operate. Following this reasoning, education would be much better served if computer scientists tried to make software to support learning more reflective of the way human learning operates, rather than trying to fit human learning into the current restrictions of behaviourist computer programming. This will be discussed in more detail in Chapter 4, Section 4.

Although constructivist approaches can be and have been applied to all fields of knowledge, they are more commonly found in approaches to teaching in the humanities, social sciences, education, and other less quantitative subject areas.

References

Rogers, C. (1969) *Freedom to Learn* Columbus, OH: Charles E. Merrill Publishing Co.

There are many books on constructivism but some of the best are the original works of some of the early educators and researchers, in particular:

Piaget, J. and Inhelder, B., (1958) *The Growth of Logical Thinking from Childhood to Adolescence* New York: Basic Books, 1958

Searle, J. (1996) *The construction of social reality* New York: Simon & Shuster

Vygotsky, L. (1978) *Mind in Society: Development of Higher Psychological Processes* Cambridge MA: Harvard University Press

Activity 2.5 Defining the limits of constructivism

1. What areas of knowledge do you think would be best ‘taught’ or learned through a constructivist approach?

2. What areas of knowledge do you think would NOT be appropriately taught through a constructivist approach?

3. What are your reasons?

Feedback to come

2.6 Connectivism

Figure 2.6.1 Stephen Downes Image: Wikipedia

Figure 2.6.2 George Siemens Image: Wikipedia

2.6.1 What is connectivism?

Another epistemological position, connectivism, has emerged in recent years that is particularly relevant to a digital society. Connectivism is still being refined and developed, and it is currently highly controversial, with many critics.

In connectivism it is the collective connections between all the 'nodes' in a network that result in new forms of knowledge. According to Siemens (2005), knowledge is created beyond the level of individual human participants, and is constantly shifting and changing. Knowledge in networks is not controlled or created by any formal organization, although organizations can and should 'plug in' to this world of constant information flow, and draw meaning from it. Knowledge in connectivism is a chaotic, shifting phenomenon as nodes come and go and as information flows across networks that themselves are interconnected with myriad other networks.

The significance of connectivism is that its proponents argue that the Internet changes the essential nature of knowledge. '*The pipe is more important than the content within the pipe,*' to quote Siemens again. Downes (2007) makes a clear distinction between constructivism and connectivism:

> *In connectivism, a phrase like "constructing meaning" makes no sense. Connections form naturally, through a process of association, and are not "constructed" through some sort of intentional action. …Hence, in connectivism, there is no real concept of transferring knowledge, making knowledge, or building knowledge. Rather, the activities we undertake when we conduct practices in order to learn are more like growing or developing ourselves and our society in certain (connected) ways.*

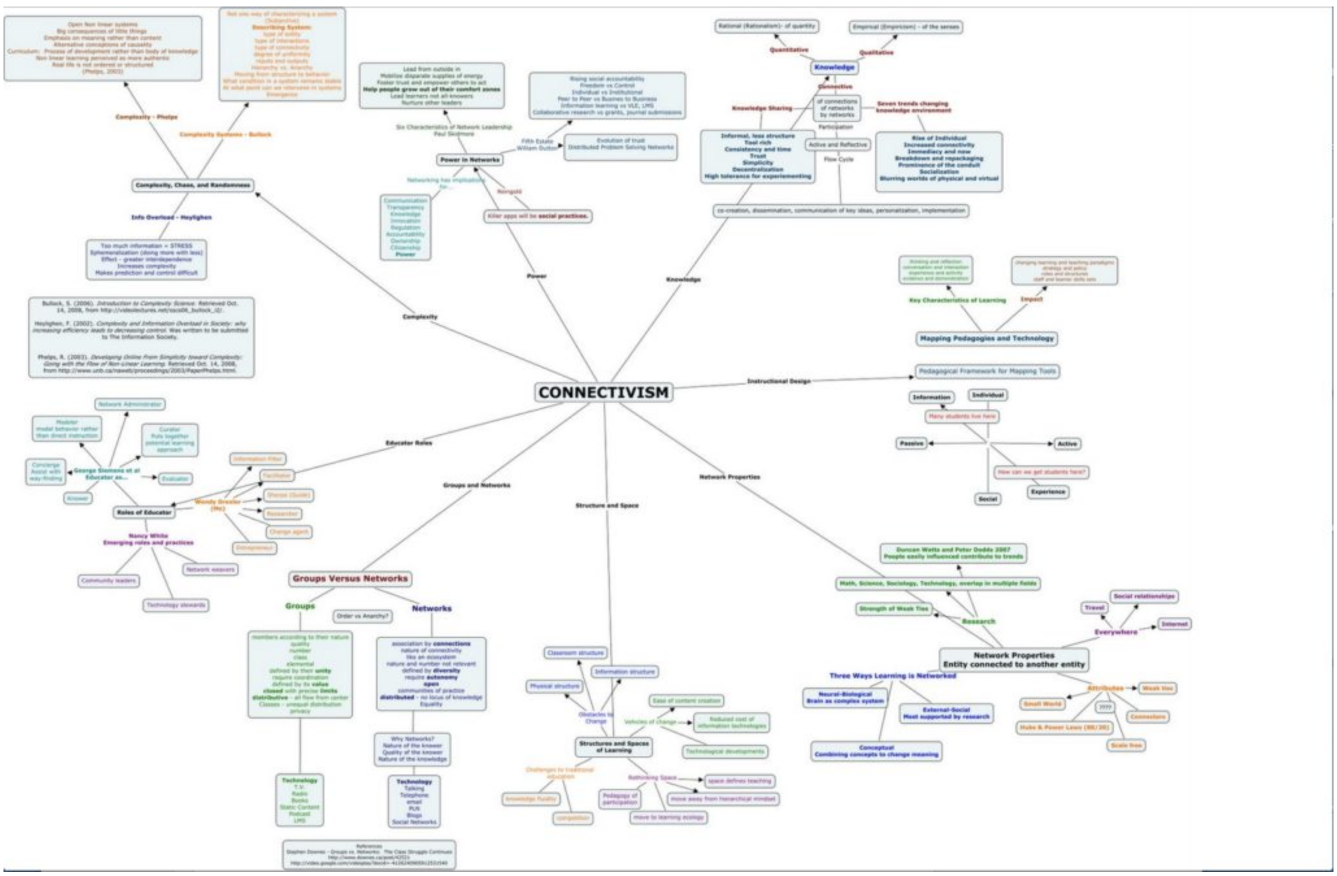


Figure 2.6.3: A map of connectivism Image: © pkab.wordpress.com. Click and drag for a larger image.

2.6.2 Connectivism and learning

For Siemens (2005), it is the connections and the way information flows that result in knowledge existing beyond the individual. Learning becomes the ability to tap into significant flows of information, and to follow those flows that are significant. He argues that:

> *Connectivism presents a model of learning that acknowledges the tectonic shifts in society where learning is no longer an internal, individualistic activity….Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database).*

Siemens (2005) identifies the principles of connectivism as follows:

- Learning and knowledge rests in diversity of opinions.
- Learning is a process of connecting specialized nodes or information sources.
- Learning may reside in non-human appliances.
- Capacity to know more is more critical than what is currently known
- Nurturing and maintaining connections is needed to facilitate continual learning.
- Ability to see connections between fields, ideas, and concepts is a core skill.
- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
- Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision.

Downes (2007) states that:

> *at its heart, connectivism is the thesis that knowledge is distributed across a network of connections, and therefore that learning consists of the ability to construct and traverse those networks….[Connectivism] implies a pedagogy that:*
>
> > *(a) seeks to describe 'successful' networks (as identified by their properties, which I have characterized as diversity, autonomy, openness, and connectivity) and*
> >
> > *(b) seeks to describe the practices that lead to such networks, both in the individual and in society – which I have characterized as modelling and demonstration (on the part of a teacher) – and practice and reflection (on the part of a learner).*

2.6.3 Applications of connectivism to teaching and learning

Siemens, Downes and Cormier constructed the first massive open online course (MOOC), Connectivism and Connective Knowledge 2011, partly to explain and partly to model a connectivist approach to learning.

Connectivists such as Siemens and Downes tend to be somewhat vague about the role of teachers or instructors, as the focus of connectivism is more on individual participants, networks and the flow of information and the new forms of knowledge that result. The main purpose of a teacher appears to be to provide the initial learning environment and context that brings learners together, and to help learners construct their own personal learning environments that enable them to connect to 'successful' networks, with the assumption that learning will automatically occur as a result, through exposure to the flow of information and the individual's autonomous reflection on its meaning. There is no need for formal institutions to support this kind of learning, especially since such learning often depends heavily on social media readily available to all participants.

There are numerous criticisms of the connectivist approach to teaching and learning (see Chapter 5, Section 4). Some of these criticisms may be overcome as practice improves, as new tools for assessment, and for organizing co-operative and collaborative work with massive numbers, are developed, and as more experience is gained. More importantly, connectivism is really the first theoretical attempt to radically re-examine the implications for learning of the Internet and the explosion of new communications technologies.

References and further reading

AlDahdouh, A., et al. (2015) Understanding knowledge network, learning and connectivism, *International Journal of Instructional Technology and Distance Learning*, Vol. 12, No.10

Downes, S. (2007) *What connectivism is* Half An Hour, February 3

Downes, S. (2014) *The MOOC of One*, Stephen's Web, March 10

Siemens, G. (2005) Connectivism: a theory for the digital age *International Journal of Instructional Technology and Distance Learning*, Vol. 2, No. 1.

Activity 2.6 Defining the limits of connectivism

1. What areas of knowledge do you think would be best 'taught' or learned through a connectivist approach?

2. What areas of knowledge do you think would NOT be appropriately taught through a connectivist approach?

3. What are your reasons?

You might like to come back to your answer after you have read Chapter 6 on MOOCs. Otherwise no feedback is provided for this activity.

2.7 Is the nature of knowledge changing?

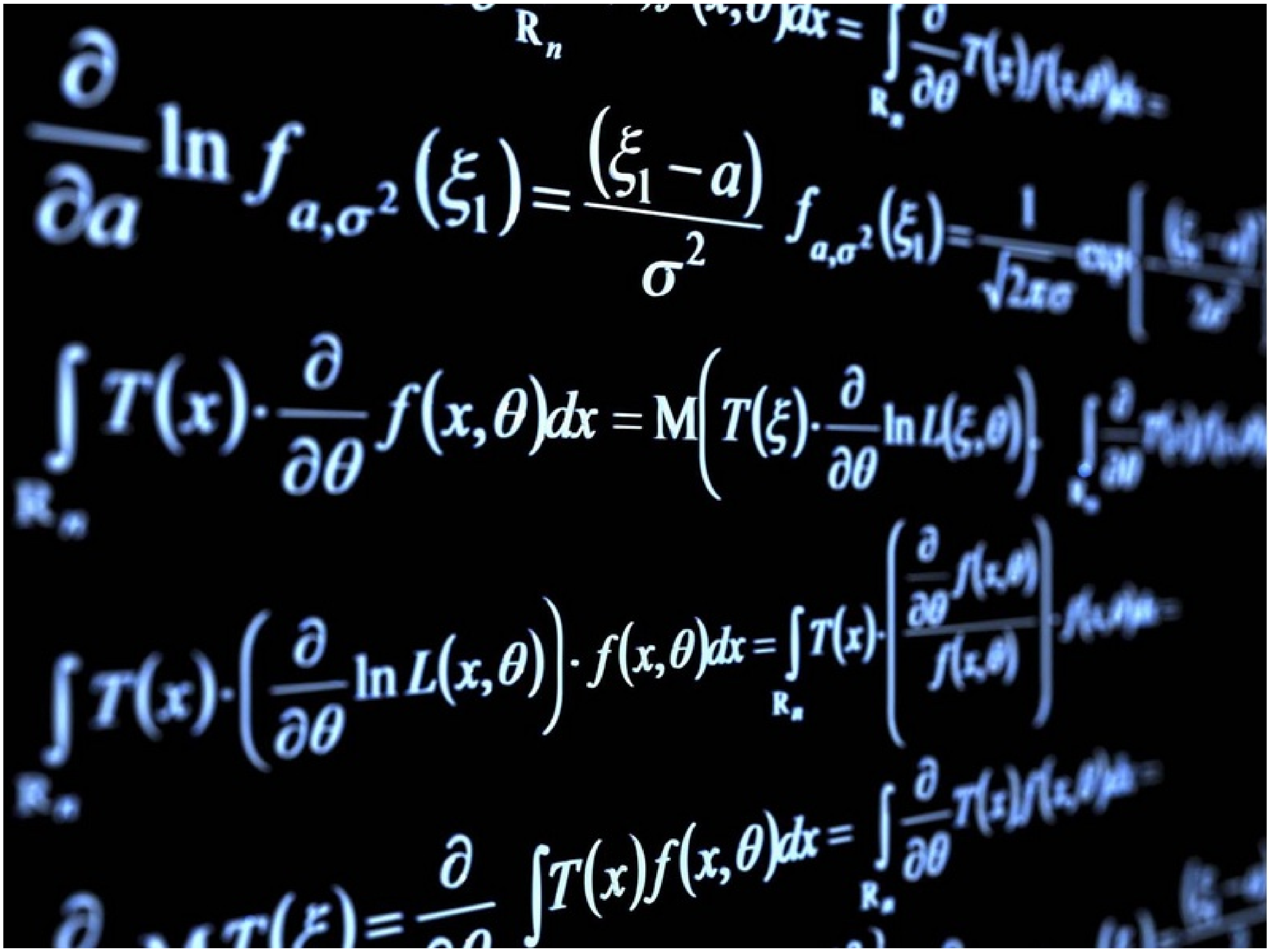


Figure 2.7 Academic knowledge is a second-order form of knowledge that seeks abstractions and generalizations based on reasoning and evidence Image: © Wallpoper/Wikipedia

2.7.1 Knowledge and technology

Before moving on to the more pragmatic elements of teaching in a digital age, it is necessary to address the question of whether the development of digital technologies has actually changed the nature of knowledge, because if that is the case, then this will influence strongly what needs to be taught as well as how it will be taught.

Connectivists such as Siemens and Downes argue that the Internet *has* changed the nature of knowledge. They argue that 'important' or 'valid' knowledge now is different from prior forms of knowledge, particularly academic knowledge. Downes (2007) has argued that new technologies allow for the de-institutionalisation of learning. Chris Anderson, the editor of Wired Magazine and now Curator of Ted Talks, has argued (2008) that massive meta-data correlations can replace 'traditional' scientific approaches to creating new knowledge:

> Google's founding philosophy is that we don't know why this page is better than that one: If the statistics of incoming links say it is, that's good enough. No semantic or causal analysis is required. …This is a world where massive amounts of data and applied mathematics replace every other tool that might be brought to bear. Out with every theory of human behavior, from linguistics to sociology. Forget taxonomy, ontology, and psychology. Who knows why people do what they do? The point is they do it, and we can track and measure it with unprecedented fidelity. With enough data, the numbers speak for themselves.
>
> The big target here isn't advertising, though. It's science. The scientific method is built around testable hypotheses. These models, for the most part, are systems visualized in the minds of scientists. The models are then tested, and experiments confirm or falsify theoretical models of how the world works. This is the way science has worked for hundreds of years. Scientists are trained to recognize that correlation is not causation, that no conclusions should be drawn simply on the basis of correlation between X and Y (it could just be a coincidence). Instead, you must understand the underlying mechanisms that connect the two. Once you have a model, you can connect the data sets with confidence. Data without a model is just noise. But faced with massive data, this approach to science — hypothesize, model, test — is becoming obsolete.'

(It should be noted this was written before derivative-based investments caused financial markets to collapse, mainly because those using them didn't understand the underlying logic that created the data.)

Jane Gilbert's book, 'Catching the Knowledge Wave' (2005), directly addresses the assumption that the nature of knowledge is changing. Drawing on publications by Manuel Castells (2009) and Jean-François Lyotard (1984), she writes (p. 35):

> 'Castells says that…knowledge is not an object but a series of networks and flows…the new knowledge is a process not a product…it is produced not in the minds of individuals but in the interactions between people…..
>
> According to Lyotard, the traditional idea that acquiring knowledge trains the mind would become obsolete, as would the idea of knowledge as a set of universal truths. Instead, there will be many truths, many knowledges and many forms of reason. As a result… the boundaries between traditional disciplines are dissolving, traditional methods of representing knowledge (books, academic papers, and so on) are becoming less important, and the role of traditional academics or experts are undergoing major change.'

Back in the 1960s Marshall McLuhan (1964) argued that the medium is the message; the way information is represented and transmitted is changed and so is our focus and understanding as information moves between and within different media. If information and knowledge are now represented and more significantly now flow differently, how does that affect educational processes such as teaching and learning?

One way knowledge is certainly changing is in the way it is represented. It should be remembered that Socrates (according to Plato) criticised writing because it could not lead to 'true' knowledge which came only from verbal dialogue and oratory. Writing however is important because it provides a permanent record of knowledge. The printing press was important because it enabled the written word to spread to many more people. As a consequence, scholars could challenge and better interpret, through reflection, what others had written, and more accurately and carefully argue their own positions. Many scholars believe that one consequence of the development of mass printing was the Renaissance and the age of enlightenment, and modern academia consequently came to depend very heavily on the print medium.

Now we have other ways to record and transmit knowledge that can be studied and reflected upon, such as video, audio, animations, and graphics, and the Internet does expand enormously the speed and range by which these representations of knowledge can be transmitted. We shall also see in Chapter 8 and Chapter 9 that that media are not neutral, but represent meaning in different ways.

2.7.2 Knowledge as a commodity

All the above authors agree that the 'new' knowledge in the knowledge society is about the commercialisation or commodification of knowledge: 'it is defined not through what it is, but through what it can do.' (Gilbert, p.35). 'The capacity to own, buy and sell knowledge has contributed, in major ways, to the development of the new, knowledge-based societies.' (p.39)

In a knowledge-based society, particular emphasis is placed on the utility of knowledge for commercial purposes. As a result there is more emphasis on certain types of immediately practical knowledge over longer term research, for instance, but because of the strong relationship between pure and applied knowledge, this is probably a mistake, even in terms of economic development.

The issue is not so much the nature of knowledge, but how students or learners come to acquire that knowledge and learn how it can be used. As I argued in Chapter 1, this requires more emphasis on developing and learning skills of how best to apply knowledge, rather than a focus on merely teaching content. Also it will be argued later in the book that students have many more sources of information besides the teacher or instructor and that a key educational issue is the management of vast amounts of knowledge. Since knowledge is dynamic, expanding and constantly changing, learners need to develop the skills and learn to use the tools that will enable them to continue to learn.

But does this mean that knowledge itself is now different? I will argue that in a digital age, some aspects of knowledge do change considerably, but others do not, at least in essence. In particular, I argue that academic knowledge, in terms of its values and goals, does not and should not change a great deal, but the way it is represented and applied will and should change.

2.7.3 The nature of academic knowledge

Academic knowledge is a specific form of knowledge that has characteristics that differentiate it from other kinds of knowledge, and particularly from knowledge or beliefs based solely on direct personal experience. In summary, academic knowledge is a second-order form of knowledge that seeks abstractions and generalizations based on reasoning and evidence.

Fundamental components of academic knowledge are

- transparency,
- codification,
- reproduction, and
- communicability.

Transparency means that the source of the knowledge can be traced and verified. Codification means that the knowledge can be consistently represented in some form (words, symbols, video) that enables interpretation by someone other than the originator. Knowledge can be reproduced or have multiple copies. Lastly, knowledge must be in a form such that it can be communicated and challenged by others.

Laurillard (2001) recognises the importance of relating the student's direct experience of the world to an understanding of academic concepts and processes, but she argues that teaching at a university level must go beyond direct experience to reflection, analysis and explanations of those direct experiences. Because every academic discipline has a specific set of conventions and assumptions about the nature of knowledge within its discipline, students in higher education need to change the perspectives of their everyday experience to match those of the subject domain.

As a result, Laurillard argues that university teaching is 'essentially a rhetorical activity, persuading students to change the way they experience the world' (p.28). Laurillard then goes on to make the point that because academic knowledge has this second-order character, it relies heavily on symbolic representation, such as language, mathematical symbols, 'or any symbol system that can represent a description of the world, and requires interpretation' (p.27) to enable this mediation to take place.

If academic knowledge requires mediation, then this has major significance for the use of technology. Language (i.e. reading and speaking) is only one channel for mediating knowledge. Media such as video, audio, and computing can also provide teachers with alternative channels of mediation.

Laurillard's reflections on the nature of academic knowledge are a counter-balance to the view that students can automatically construct knowledge through argument and discussion with their peers, or self-directed study, or the wisdom of the crowd. For academic knowledge, the role of the teacher is to help students understand not just the facts or concepts in a subject discipline, but the rules and conventions for acquiring and validating knowledge within that subject discipline. Academic knowledge shares common values or criteria, making academic knowledge itself a particular epistemological approach.

2.7.4 Academic versus applied knowledge

In a knowledge-based society, knowledge that leads to innovation and commercial activity is now recognised as critical to economic development. Again, there is a tendency to argue that this kind of knowledge – 'commercial' knowledge – is different from academic knowledge. I would argue that sometimes it is and sometimes it isn't.

I have no argument with the point of view that knowledge is the driver of most modern economies, and that this represents a major shift from the 'old' industrial economy, where natural resources (coal, oil, iron), machinery and cheap manual labour were the predominant drivers. I do though challenge the idea that the *nature* of knowledge has undergone radical changes.

The difficulty I have with the broad generalisations about the changing nature of knowledge is that there have *always* been different kinds of knowledge. One of my first jobs was in a brewery in the East End of London in 1959. I was one of several students hired during our summer vacation. One of my fellow student workers was a brilliant mathematician. Every lunch hour the regular brewery workers played cards (three card brag) for what seemed to us large sums of money, but they would never let us play with them. My student friend was desperate to get a game, and eventually, on our last week, they let him in. They promptly won all his wages. He knew the numbers and the odds, but there was still a lot of non-academic knowledge he didn't know about playing cards for money, especially against a group of friends playing together rather than against each other. Gilbert's point is that academic knowledge has always been more highly valued in education than 'everyday' knowledge. However, in the 'real' world, all kinds of knowledge are valued, depending on the context. Thus while beliefs about what constitutes 'important' knowledge may be changing, this does not mean that the nature of academic knowledge is changing.

Gilbert argues that in a knowledge society, there has been a shift in valuing applied knowledge over academic knowledge in the broader society, but this has not been recognised or accepted in education (and particularly the school system). She sees academic knowledge as associated with narrow disciplines such as mathematics and philosophy, whereas applied knowledge is knowing how to do things, and hence by definition tends to be multi-disciplinary. Gilbert argues (p. 159-160) that academic knowledge is:

> 'authoritative, objective, and universal knowledge. It is abstract, rigorous, timeless – and difficult. It is knowledge that goes beyond the here and now knowledge of everyday experience to a higher plane of understanding…..In contrast, applied knowledge is practical knowledge that is produced by putting academic knowledge into practice. It is gained through experience, by trying things out until they work in real-world situations.'

Other kinds of knowledge that don't fit the definition of academic knowledge are those kinds built on experience, traditional crafts, trial-and-error, and quality improvement through continuous minor change built on front-line worker experience – not to mention how to win at three card brag.

I agree that academic knowledge is different from everyday knowledge, but I challenge the view that academic knowledge is 'pure', not applied. It is too narrow a definition, because it thus excludes all the professional schools and disciplines, such as engineering, medicine, law, business, education that 'apply' academic knowledge. These are just as accepted and 'valued' parts of universities and colleges as the 'pure' disciplines of humanities and science, and their activities meet all the criteria for academic knowledge set out by Gilbert.

Making a distinction between academic and applied knowledge misses the real point about the kind of education needed in a knowledge society and a digital age. It is not just knowledge – both pure and applied – that is important, but also digital literacy, skills associated with lifelong learning, and attitudes/ethics and social behaviour.

Knowledge is not just 'stuff', or fixed content, but it is dynamic. Knowledge is also not just 'flow'. Content or 'stuff' does matter as well as the discussions or interpretations we have about content. Where does the 'stuff' come from that ebbs and flows over the discussions on the internet? It may not originate or end in the heads of individuals, but it certainly flows through them, where it is interpreted and transformed. Knowledge may be dynamic and changing, but at some point each person does settle, if only for a brief time, on what they think knowledge to be, even if over time that knowledge changes, develops or becomes more deeply understood. Thus 'stuff' or content does matter, though knowing (a) how to acquire content and (b) what to do with content we have acquired, is even more important.

Thus it is not sufficient just to teach academic content (applied or not). It is equally important also to enable students to develop the ability to know how to find, analyse, organise and apply information/content within their professional and personal activities, to take responsibility for their own learning, and to be flexible and adaptable in developing new knowledge and skills. All this is needed because of the explosion in the quantity of knowledge in any professional field that makes it impossible to memorise or even be aware of all the developments that are happening in the field, and the need to keep up-to-date within the field after graduating.

To do this learners must have access to appropriate and relevant content, know how to find it, and must have opportunities to apply and practice what they have learned. Thus learning has to be a combination of content, skills and attitudes, and increasingly this needs to apply to all areas of study. This does not mean that there is no room to search for universal truths, or fundamental laws or principles, but this needs to be embedded within a broader learning environment. This should include the ability to use digital technologies as an integral part of learning, but tied to appropriate content and skills within their area of study.

Also, the importance of non-academic knowledge in the growth of knowledge-based industries should not be ignored. These other forms of knowledge have proved just as valuable. For instance it is important within a company to manage the every-day knowledge of employees through better internal communication, encouraging external networking, and rewards for collaboration and participation in improving products and services.

2.7.5 The relevance of academic knowledge in the knowledge society

An over-emphasis on the functionality of knowledge will result in 'academic knowledge' being implicitly seen as irrelevant to the knowledge society. However, it has been the explosion in academic knowledge that has formed the basis of the knowledge society. It was academic development in sciences, medicine and engineering that led to the development of the Internet, biotechnology, digital financial services, computer software and telecommunications, for example. Indeed, it is no coincidence that those countries most advanced in knowledge-based industries were those that have the highest participation rates in university education.

Thus while academic knowledge is not 'pure' or timeless or objectively 'true', it is the principles or values that drive academic knowledge that are important. Although it often falls short, the goal of academic studies is to reach for deep understanding, general principles, empirically-based theories, timelessness, etc., even if knowledge is dynamic, changing and constantly evolving. Academic knowledge is not perfect, but does have value because of the standards it requires. Nor have academic knowledge or methods run out of steam. There is evidence all around us: academic knowledge is generating new drug treatments, new understandings of climate change, better technology, and certainly new knowledge generation.

Indeed, more than ever, we need to sustain the elements of academic knowledge, such as rigour, abstraction, evidence-based generalisation, empirical evidence, rationalism and academic independence. It is these elements of education that have enabled the rapid economic growth both in the industrial and the knowledge societies. The difference now is that these elements alone are not enough; they need to be combined with new approaches to teaching and learning.

2.7.6 Academic knowledge and other forms of knowledge

As mentioned earlier, there are many other forms of knowledge that are useful or valued besides academic knowledge. There is increasing emphasis from government and business on the development of vocational or trades skills. Teachers or instructors are responsible for developing these areas of knowledge as well. In particular, skills that require manual dexterity, performance skills in music or drama, production skills in entertainment, skills in sport or sports management, are all examples of forms of knowledge that have not traditionally been considered 'academic'.

However, one feature of a digital society is that increasingly these vocational skills are now requiring a much higher proportion of academic knowledge or intellectual and conceptual knowledge as well as performance skills. For example higher levels of ability in math and/or science are now demanded of many trades and professions such as network engineers, power engineers, auto mechanics, nurses and other health professionals. The 'knowledge' component of their work has increased over recent years.

The nature of the job is also changing. For instance, auto mechanics are now increasingly focused on diagnosis and problem-solving as the value component of vehicles becomes increasingly digitally based and components are replaced rather than repaired. Nurse practitioners now are undertaking areas of work previously done by doctors or medical specialists. Many workers now also need strong inter-personal skills, especially if they are in front-line contact with the public. At the same time, as we saw in Chapter

1, more traditionally academic areas are needing to focus more on skills development, so the somewhat artificial boundaries between pure and applied knowledge are beginning to break down.

In summary, a majority of jobs now require both academic and skills-based knowledge. Academic and skills-based knowledge also need to be integrated and contextualised. As a result, the demands on those responsible for teaching and instruction have increased, but above all, these new demands of teachers in a digital age mean that their own skills level needs to be increased to cope with these demands.

Activity 2.7 Epistemology and academic knowledge

1. Can you state the epistemological position that drives your teaching? Does it fit with any of the epistemological positions described in this chapter? How does that work out in practice in terms of what you do?

2. Can you justify the role of 'teacher' in a digital society where individuals can find all they need on the Internet and from friends or even strangers? How do you think that the role of the teacher might, could or should change as a result of the development of a digital society? Or are there 'constants' that will remain?

3. Briefly define the subject area or speciality in which you are teaching. Do you agree that academic knowledge is different from everyday knowledge? If so, to what extent is academic knowledge important for your learners? Is its importance growing or diminishing? Why? If it is diminishing, what is it being replaced with – or what should replace it?

Feedback to come

References

Anderson, C. (2008) The End of Theory: The Data Deluge Makes the Scientific Method Obsolete *Wired Magazine*, 16.07

Castells, M. (2009) *The Rise of the Network Society* Hoboken NJ: Wiley

Downes, S. (2007) *What connectivism is* Half An Hour, February 3

Gilbert, J. (2005) *Catching the Knowledge Wave: the Knowledge Society and the Future of Education* Wellington, NZ: New Zealand Council for Educational Research

Laurillard, D. (2001) *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies* New York/London: Routledge

Lyotard, J-F, (1984) *The Post-Modern Condition: A Report on Knowledge* Manchester: Manchester University Press

McLuhan, M. (1964) *Understanding Media* London/New York: Routledge

Surowiecki, J. (2004) *The Wisdom of Crowds: Why the Many Are Smarter Than the Few and How Collective Wisdom Shapes Business, Economies, Societies and Nations* New York: Random House

See also:

Rugg, G. (2014) Education versus training, academic knowledge versus craft skills: Some useful concepts *Hyde and Rugg*, February 23

2.8 Summary

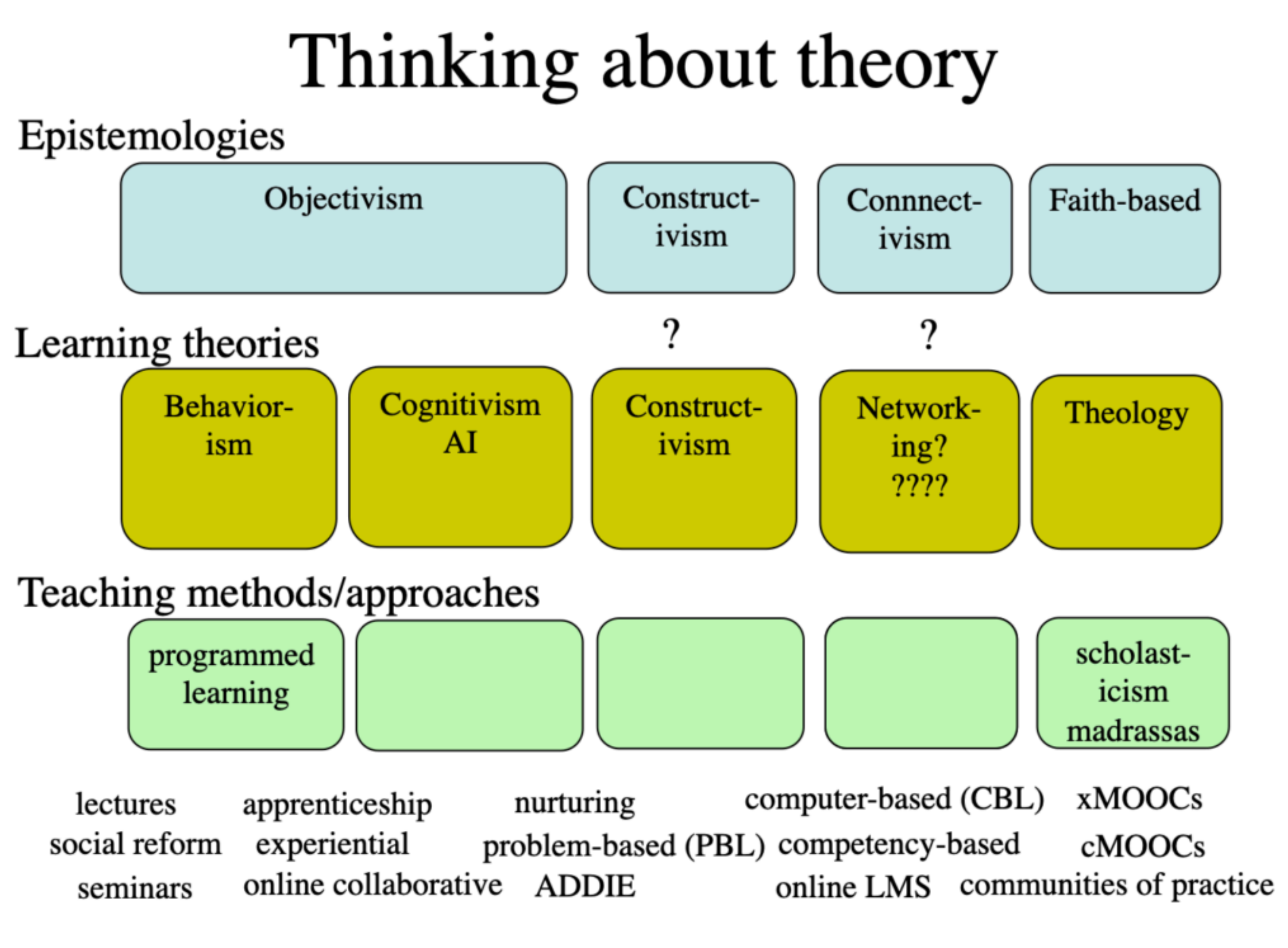


Figure 2.8.1 The green boxes are left open until we cover teaching methods (the bottom line) in Chapters 3 and 4

I have chosen just a few epistemological approaches that influence teaching and learning, but I could have chosen many others. Theologies reflect another epistemological approach, based on faith. Elements of scholasticism can still be found in elite universities such as Oxford and Cambridge, particularly in their tutorial system.

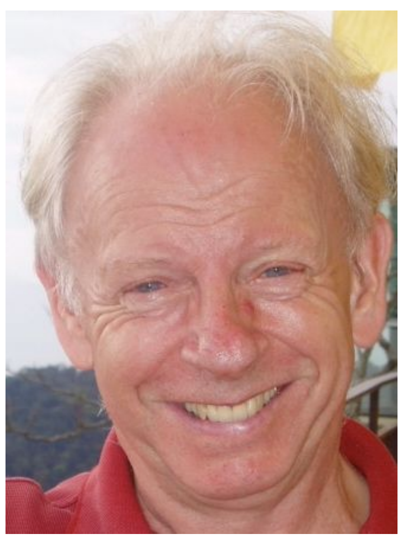
It can be seen then that there are different epistemologies that influence teaching today. Furthermore, much to the consternation and confusion of many students, teachers themselves will have different epistemological positions, not just across different disciplines, but sometimes within the same discipline. For instance, subject areas such as psychology and economics may contain different epistemological foundations in different parts of the curriculum: statistics is validated differently from Freudian analysis or behavioural factors that influence investor behaviour.

Epistemological positions are rarely explicitly discussed with students, are not always consistent even within a subject discipline, and are not mutually exclusive. For instance a teacher may deliberately choose to use a more objectivist approach with novice students, then move to a more constructivist approach when the students have learned the basic facts and concepts within a topic through an objectivist approach. Even within the same lesson, the teacher may shift epistemological positions, often causing confusion for students.

At this point, I'm not taking sides (although I do favour in general a more constructivist philosophy). Arguments can be made for or against any of these epistemological positions. However, we need to be aware that knowledge and consequently teaching is not a pure, objective concept, but driven by different values and beliefs about the nature of knowledge.

Arguments are also being made today that academic knowledge is now redundant and is being or will be replaced by networked learning or more applied learning. I have made the case though that there are strong reasons to sustain and further develop academic knowledge, but with a focus as much on the development of skills as on learning content.

Different theories of learning reflect different positions on the nature of knowledge. With the possible exception of connectivism, there is some form of empirical evidence to support each of the theories of learning outlined in this chapter. However, while the theories suggest different ways in which all people learn, they do not automatically tell teachers or instructors how to teach. Indeed, theories of behaviourism, cognitivism and constructivism were all developed outside of education, in experimental labs, psychology, neuroscience, and psychotherapy. Educators have had to work out how to move from the theoretical position to the practical one of applying these theories within an educational experience. In other words, they have had to develop teaching methods that build on such learning theories.



For my personal comments on the relationship between epistemologies, theories of learning and teaching methods, please click on the podcast below

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=78

The next chapter examines a range of teaching methods that have been developed, their epistemological roots, and their implications for teaching in a digital age.

Reference

Entwistle, N. (2010) 'Taking Stock: An Overview of Research Findings' in Christensen Hughes, J. and Mighty, J. (eds.) *Taking Stock: Research on Teaching and Learning in Higher Education* Montreal and Kingston: McGill-Queen's University Press

For more on the relationship between epistemologies, learning theories and methods of teaching, see:

Bates, T. (2015) Thinking about theory and practice, Open Learning and Distance Education Resources, July 29

Activity 2.8 Choosing a theory of learning

Entwistle (2010) states:

> *'There are some important questions to ask when considering how much weight to place on evidence or how valuable a theory will be for pedagogy. For example:*
>
> - *Is the theory derived from data or observations in an educational context?*
> - *Is the theory presented in language that is readily intelligible to teachers?*
> - *Can the aspects identified as affecting learning be readily changed [by the teacher]?*
> - *Does the theory have direct implications for teaching and learning [in the particular context in which you are working]?*
> - *How realistic and practical are the suggestions?*
> - *Will the theory spark off new ideas about teaching?*

It is not sufficient for a pedagogical theory simply to explain how people learn; it also has to provide clear implications about how to improve the quality and efficiency of learning.'

Using Entwistle's criteria and your own knowledge and experience of teaching, answer the questions below.

1. Which theory of learning do you like best, and why? State what main subject you are teaching.

2. Does your preferred way of teaching match any of these theoretical approaches? Write down some of the activities you do when teaching that 'fit' with this theory. Can you think of other possible activities you now could use within this theoretical framework for teaching?

3. Does your teaching generally combine different theories – sometimes behaviourist, sometimes cognitive, etc.? If so, what are the reasons or contexts for taking one specific approach rather than another?

4. How useful are these theories in terms of teaching practice? In your view, are they just jargon or useless theorising, or 'labelling' of commonly understood practice, or do they provide strong guidelines for how you should teach?

5. How do you think new digital technologies, such as social media, affect these theories? Do new technologies make these theories redundant? Does connectivism replace other theories or merely add another way of looking at teaching and learning?

Feedback to come.

Key Takeaways

1. Teaching is a highly complex occupation, which needs to adapt to a great deal of variety in context, subject matter and learners. It does not lend itself to broad generalizations. Nevertheless it is possible to provide guidelines or principles based on best practices, theory and research, that must then be adapted or modified to local conditions.

2. Our underlying beliefs and values, usually shared by other experts in a subject domain, shape our approach to teaching. These underlying beliefs and values are often implicit and are often not directly shared with our students, even though they are seen as essential components of becoming an 'expert' in a particular subject domain.

3. It is argued that academic knowledge is different from other forms of knowledge, and is even more relevant today in a digital age.

4. However, academic knowledge is not the only kind of knowledge that is important in today's society, and as teachers we have to be aware of other forms of knowledge and their potential importance to our students, and make sure that we are providing the full range of contents and skills needed for students in a digital age.

Chapter 3: Methods of teaching: campus-focused

Purpose of the chapter

This chapter discusses a selection of teaching methods that are often used in a campus-based learning environment.

When you have read this chapter you should be able to:

- describe several different methods of teaching used in campus-based teaching;
- discuss the general strengths and weaknesses of each approach;
- identify the extent to which each approach meets the needs of learners in a digital age;
- choose an appropriate teaching method (or mix of methods) for your teaching context.

What is covered in this chapter

Five perspectives on teaching are examined and related to epistemologies and theories of learning, with a particular emphasis on their relevance to a digital age. In particular this chapter covers the following topics:

- Scenario C: A stats lecturer fights the system
- 3.1 Five perspectives on teaching
- 3.2 The origins of the classroom design model
- 3.3 Transmissive lectures: learning by listening
- 3.4 Interactive lectures, seminars, and tutorials: learning by talking
- 3.5 Learning by doing: Experiential learning
- 3.6 Learning by doing: Apprenticeship
- 3.7 Learning by being: The nurturing and social reform models of teaching
- 3.8 Main conclusions

Also in this chapter you will find the following activities:

- Activity 3.1 There is no activity for this section
- Activity 3.2 Thinking outside the [classroom] box
- Activity 3.3 The future of lectures

- Activity 3.4 Developing conceptual learning
- Activity 3.5 Assessing experiential design models
- Activity 3.6 Applying apprenticeship to university teaching
- Activity 3.7 Nurturing, social reform and connectivism
- Activity 3.8 'Labelling' your own teaching

Key Takeaways

Most instructors will mix and match different methods, depending on the needs of both the subject matter and the needs of their students at a particular time. There are though some core conclusions to be drawn from this comparative review of different approaches to teaching.

1. No single method is likely to meet all the requirements teachers face in a digital age.
2. Nevertheless, some forms of teaching fit better with the development of the skills needed in a digital age. In particular, methods that focus on conceptual development, such as dialogue and discussion, knowledge management, and experiential learning in real-world contexts are more likely to develop the high level conceptual skills required in a digital age, rather than information transmission.
3. It is not just conceptual skills though that are needed. It is the combination of conceptual, practical, personal and social skills in highly complex situations that are needed. This again means combining a variety of teaching methods.
4. Nearly all of these teaching methods are media or technology independent. In other words, they can be used in classrooms or online. What matters from a learning perspective is not so much the choice of technology as the efficacy and expertise in appropriately choosing and using the teaching method.
5. Nevertheless, we shall see in the next chapter that new technologies offer new possibilities for teaching, including offering more practice or time on task, reaching out to new target groups, and increasing the productivity of both teachers and the system as a whole.

Scenario C: A stats lecturer fights the system

Figure 3 C Image: Verywellmind.com

Clive (looking carefully at his partner, Jean): So what went wrong at work today?

Jean: So you noticed – nice.

Clive: Now don't take it out on me. How could I have avoided the slamming of the door, the shouting at the cat, and the almost instant demand for a large glass of wine – which incidentally is sitting on your desk?

Jean (grabbing the wine). Well, today was the last straw. I got the results of the student end-of-term evaluation of my new class I've been teaching.

Clive: Bad, eh?

Jean: Well, first the rankings are odd: about 30 per cent As, about 5 per cent Bs, 15 per cent Cs, 15 per cent D's and 35 per cent E's – NOT a normal curve of distribution! They either loved me or hated me, but the average – which is all Harvey, the stupid head of department, looks at – came out as a D, which means any chance of a promotion next year just went straight out the window. I'm now going to have to explain myself to that old buffoon who last taught a class when slate tablets were the latest technology.

Clive: I'm not going to say I told you so, but…..

Jean: DON'T go there. I know I'm bloody mad to have stopped lecturing and tried to engage the students more. I could kill that faculty development guy who persuaded me to change how I teach. I didn't mind all the extra work, not even the continual fighting with the guy from Facilities who kept telling me to put all the tables and chairs back properly – he was just a jerk – and I loved the actual teaching, which was stimulating and deeply satisfying, but what really finished me was when the department wouldn't change the exam. I've been trying to get the kids to question what is meant by a sample, discuss alternative ways of looking at significance, solve problems, and then they go and give the poor kids multiple-choice questions that just assessed their memory of statistical techniques and formulae. No wonder most of the students were mad at me.

Clive: But you've always claimed that the students enjoyed your new way of teaching.

Jean: Well, I was fooled by them. From the student comments on the evaluation, it seemed that about a third of them really *did* like the lessons and some even said it opened up their eyes to what statistics is all about, but apparently what the rest wanted was just a crib sheet they could use to answer the exam questions.

Clive: So what are you going to do now?

Jean: I honestly don't know. I know what I'm doing is right, now I've been through all the changes. Those kids *won't* have crib sheets when they start work, they *will* have to interpret data, and when they get into advanced level science and engineering courses they won't be able to use statistics properly if I just teach to the exam. They will know a bit about statistics but not how to do it properly.

Clive: So you'll have to get the department to agree to changing the exam.

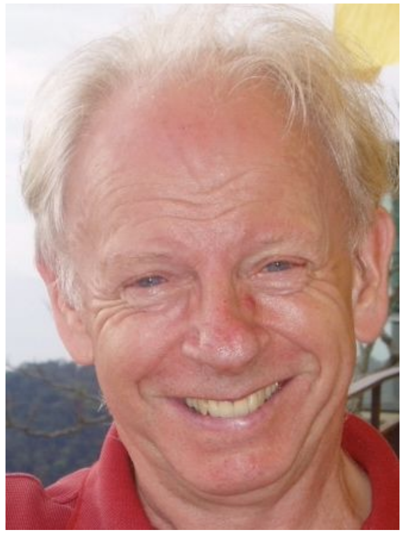
Jean: Yeah, good luck with that, because everyone else will have to change how they teach if we do that.

Clive: But I thought the whole reason for you changing your teaching was that the university was worried it wasn't producing graduates with the right kind of skills and knowledge needed today.

Jean: You're right, but the problem is Harvey won't support me – he's old school down to his socks and underpants and thinks that what I am doing is just trendy – and without his support there's no way the rest of the department is going to change.

Clive: OK, so just relax for now and have a glass of wine and we'll go out somewhere nice for dinner. That will help clear my mind of the thought of Harvey in his socks and underpants. Then you can hear about *my* day.

3.1 Five perspectives on teaching



For my personal comments on why I wrote this chapter on campus-based teaching methods, please click on the podcast below

An audio element has been excluded from this version of the text. You can listen to it online here: *https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=83*

The first thing to be said about teaching methods is that there is no law or rule that says teaching methods are driven by theories of learning. Especially in post-secondary education, most instructors would be surprised if their teaching was labelled as behaviourist or constructivist. On the other hand, it would be less than accurate to call such teaching 'theory-free'. We have seen how views about the nature of knowledge are likely to impact on preferred teaching methods. But it would be unwise to press this too hard. A great deal of teaching, at least at a post-secondary level, is based on an apprenticeship model of copying the same methods used by one's own teachers, then gradually refining them from experience, without a great deal of attention being paid to theories of how students actually learn.

Dan Pratt (1998) studied 253 teachers of adults, across five different countries, and identified '*five qualitatively different perspectives on teaching,… presenting each perspective as a legitimate view of teaching*':

- **transmission**: effective delivery of content (an objectivist approach)
- **apprenticeship**: modelling ways of being (learning by doing under supervision)

- **developmental:** cultivating ways of thinking (constructivist/cognitivist)
- **nurturing:** facilitating self-efficacy (a fundamental tenet of connectivist MOOCs)
- **social reform**: seeking a better society.

It can be seen that each of these perspectives relates to theories of learning to some extent, and they help to drive methods of teaching. So in practical terms, I will start by looking at some common methods of teaching, and assessing their appropriateness for developing the knowledge and skills outlined in Chapter 1.

I will organise these various methods of teaching into two chapters. The first chapter will discuss design models that derive from more traditional school or campus-based teaching, and the second chapter will be focused on design models that make more use of Internet technologies, although we will see in Chapter 10 that these distinctions are already beginning to break down.

References

Pratt, D. and Associates (1998) *Five Perspectives on Teaching in Adult and Higher Education* Malabar FL: Krieger Publishing Company

3.2 The origins of the classroom design model

Figure 3.2.1 Miss Bowls's class in an unidentified girls' school, England Date: circa 1905
Image: Southall Board, Flickr

Our institutions are a reflection of the times in which they were created. Francis Fukuyama, in his monumental writing on political development and political decay (2011, 2014), points out that institutions that provide essential functions within a state often become so fixed over time in their original structures that they fail to adapt and adjust to changes in the external environment. We need therefore to examine in particular the roots of our modern educational systems, because teaching and learning in the present day is still strongly influenced by institutional structures developed many years ago. Thus, we need to examine the extent to which our traditional campus-based models of teaching remain fit for a digital age.

The large urban school, college or university, organized by age stratification, learners meeting in groups, and regulated units of time, was an excellent fit for an industrial society. In many ways it matched the way work was organised in factories. In effect, we still have a predominantly industrial model of educational design, which in large part remains our default design model even today.

Some design models are so embedded in tradition and convention that we are often like fish in water – we just accept that this is the environment in which we have to live and breath. The classroom model is a very good example of this. In a classroom based model, learners are organised in classes that meet on a regular basis at the same place at certain times of the day for a given length of time over a given period (a term or semester).

This is a design decision that was taken more than 150 years ago. It was embedded in the social, economic and political context of the 19th century. This context included:

- the industrialization of society which provided 'models' for organizing both work and labour, such as factories and mass production;
- the movement of people from rural to urban occupations and communities, with increased density resulting in larger institutions;
- the move to mass education to meet the needs of industrial employers and an increasingly large and complex range of state-managed activities, such as government, health and education;
- voter enfranchisement and hence the need for a better educated voting public;
- over time, demand for more equality, resulting in universal access to education.

However, over the span of 150 years, our society has slowly changed. Many of these factors or conditions no longer exist, while others persist, but often in a less dominant way than in the past. Thus we still have factories and large industries, but we also have many more small companies, greater social and geographical mobility, and above all a massive development of new technologies that allow both work and education to be organized in different ways.

This is not to say that the classroom design model is inflexible. Teachers for many years have used a wide variety of teaching approaches within this overall institutional framework. But in particular, the way in which our institutions are structured strongly affects the way we teach. We need to examine which of the methods built around a classroom model are still appropriate in today's society, and, more of a challenge, whether we could build new or modified institutional structures that would better meet the needs of today.

References

Fukuyama, F. (2011) *The Origins of Political Order: From Prehuman Times to the French Revolution* New York: Farrar Strauss and Giroux

Fukuyama, F. (2014) *Political Order and Political Decay: From the Industrial Revolution to the Globalisation of Democracy* New York: Farrar Strauss and Giroux

Activity 3.2 Thinking outside the [classroom] box

If classrooms, schools and university campuses are the physical products of an industrial age, what type of learning environment would be a product of a digital age? In other words, if we were starting from scratch today, how would you design an environment for teaching and learning that would reflect the age in which we live?

Obviously there is no right or wrong answer to this, but later you may want to look at Chapter 6 on learning environments to see if your 'digital' learning environment contains all the necessary components.

You may also want to consider the social, economic and political context of the 21st century in terms of identifying an appropriate learning environment. How much would the campus experience still be necessary? (For instance, how would the environment deal with the effects of too much screen time on children's development?)

Listen to the podcast below for my response to this:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=86

3.3 Transmissive lectures: learning by listening

Figure 3.3.1 The lecture is one of the most traditional forms of classroom teaching. Image: Lecture Hall, Baruch College, New York City – Wikipedia

3.3.1 Definition

> *[Lectures] are more or less continuous expositions by a speaker who wants the audience to learn something.'*
>
> Bligh, 2000

This specific definition is important as it excludes contexts where a lecture is deliberately designed to be interrupted by questions or discussion between instructors and students. This form of more interactive lecturing will be discussed in the next section (Chapter 3, Section 4).

3.3.2 The origins of the lecture

Transmissive lectures can be traced back as far as ancient Greek and Roman times, and certainly from at least the start of the European university, in the 13th century. The term ‘lecture’ comes from the Latin, meaning a reading. In the 13th century, most books were extremely rare. They were painstakingly handcrafted and illustrated by monks, often from fragments or collections of earlier and exceedingly rare and valuable scrolls from ancient Greek or Roman times, or were translated from Arabic sources, since much documentation was destroyed in Europe during the Dark Ages following the fall of the Roman empire. As a result, a university would often have only one copy of a book, and it may have been the only copy available in the world. The library and its collection therefore became critical to the reputation of a university, and professors had to borrow the only text from the library and literally read from it to the students, who dutifully wrote down their own version of the lecture.

Lectures themselves belong to an even longer oral tradition of learning, where knowledge is passed on by word of mouth from one generation to the next. In such contexts, accuracy and authority (or power in controlling access to knowledge) are critical for ‘accepted’ knowledge to be successfully transmitted. Thus accurate memory, repetition and a reference to authoritative sources become exceedingly important in terms of validating the information transmitted. The great sagas of the ancient Greeks and, much later, of the Vikings, are examples of the power of oral transmission of knowledge, continued even today through the myths and legends of many indigenous communities.

Figure 3.3.2 A medieval lecture
Artist: Laurentius de Voltolina;
Liber ethicorum des Henricus de Alemannia; Kupferstichkabinett SMPK, Berlin/Staatliche Museen Preussiischer Kulturbesitz, Min. 1233

This illustration from a thirteenth-century manuscript shows Henry of Germany delivering a lecture to university students in Bologna, Italy, in 1233. What is striking is how similar the whole context is to lectures today, with students taking notes, some talking at the back, and one clearly asleep. Certainly, if Rip Van Winkle awoke in a modern lecture theatre after 800 years of sleeping, he would know exactly where he was and what was happening.

Nevertheless, the lecture format has been questioned for many years. Samuel Johnson *(1709-1784)* over 200 years ago said of lectures:

> ‘*People have nowadays…got a strange opinion that everything should be taught by lectures. Now, I cannot see that lectures can do as much good as reading the books from which the lectures are taken…Lectures were once useful, but now, when all can read, and books are so numerous, lectures are unnecessary*.’

Boswell, 1791

What is remarkable is that even after the invention of the printing press, radio, television, and the Internet, the transmissive lecture, characterised by the authoritative instructor talking to a group of students, still remains the dominant methodology for teaching in many institutions, even in a digital age, where information is available at a click of a mouse. It could be argued that anything that has lasted this long must have something going for it. On the other hand, we need to question whether the transmissive lecture is still the most appropriate means of teaching, given all the changes that have taken place in recent years, and in particular given the kinds of knowledge and skills needed in a digital age.

3.3.3 What does research tell us about the effectiveness of lectures?

Whatever you may think of Samuel Johnson's opinion, there has indeed been a great deal of research into the effectiveness of lectures, going back to the 1960s, and continued through until today. The most authoritative analysis of the research on the effectiveness of lectures remains Bligh's (2000). He summarized a wide range of meta-analyses and studies of the effectiveness of lectures compared with other teaching methods and found consistent results:

- the lecture is as effective as other methods for transmitting information (the corollary of course is that other methods – such as video, reading, independent study, or Wikipedia – are just as effective as lecturing for transmitting information);
- most lectures are not as effective as discussion for promoting thought;
- lectures are generally ineffective for changing attitudes or values or for inspiring interest in a subject;
- lectures are relatively ineffective for teaching behavioural skills.

Bligh also examined research on student attention, on memorizing, and on motivation, and concluded (p.56):

> '*We see evidence… once again to suppose that lectures should not be longer than twenty to thirty minutes – at least without techniques to vary stimulation.*'

These research studies have shown that in order to understand, analyze, apply, and commit information to long-term memory, the learner must actively engage with the material. In order for a lecture to be effective, it must include activities that compel the student to mentally manipulate the information. Many lecturers of course do this, by stopping and asking for comments or questions throughout the lecture – but many do not.

Again, although these findings have been available for a long time, and You Tube videos now last approximately eight minutes and TED talks 20 minutes at a maximum, teaching in many educational institutions is still organized around a standard 50 minute lecture session or longer, with, if students are lucky, a few minutes at the end for questions or discussion. There are two important conclusions from the research:

- even for the sole purpose for which lectures may be effective – the transmission of information – the 50 minute lecture needs to be well organized, with frequent opportunities for student questions and discussion (Bligh provides excellent suggestions on how to do this in his book);

- for all other important learning activities, such as developing critical thinking, deep understanding, and application of knowledge – the kind of skills needed in a digital age – lectures are ineffective. Other forms of teaching and learning – such as opportunities for discussion and student activities – are necessary.

3.3.4 Does new technology make lectures more relevant?

Over the years, institutions have made massive investments in adding technologies to support lecturing. Powerpoint presentations, multiple projectors and screens, clickers for recording student responses, even 'back-chat' channels on Twitter, enabling students to comment on a lecture – or more often, the lecturer – in real time (surely the worst form of torture for a speaker), have all been tried. Students have been asked to bring tablets or lap-tops to class, and universities in particular have invested millions of dollars in state of the art lecture theatres. Nevertheless, all this is just lipstick on a pig. The essence of a lecture remains the transmission of information, all of which is now readily and, in most cases, freely available in other media and in more learner-friendly formats.

I worked in a college where in one program all students had to bring laptops to class. At least in these classes, there were some activities to do related to the lecture that required the students to use the laptops during class time. However, in most classes this took less than 25 per cent of the lesson time. Most of the other time, students were talked at, and as a result used their laptops for other, mainly non-academic activities, especially playing online poker.

Faculty often complain about students use of technology such as mobile phones or tablets, for 'non-relevant' multitasking in class, but this misses the point. If most students have mobile phones or laptops, why are they still having to come to a lecture hall in person? Why can't they get a podcast or a video of the lecture? Second, if they are coming, why are the lecturers not requiring them to use their mobile phones, tablets, or laptops for study purposes, such as finding sources? Why not break the students into small groups and get them to do some online research then come back with group answers to share with the rest of the class? If lectures are to be offered, the aim should be to make the lecture engaging in its own right, so the students are not distracted by their non-academic online activity.

3.3.5 Is there then no role for lectures in a digital age?

Lectures though still have their uses. One example is an inaugural lecture I attended for a newly appointed research professor. In this lecture, the professor summarised all the research he and his team had done, resulting in treatments for several cancers and other diseases. This was a public lecture, so he had to satisfy not only other leading researchers in the area, but also a lay public with often no science background. He did this by using excellent visuals and analogies. The lecture was followed by a small wine and cheese reception for the audience. The lecture worked for several reasons:

- first of all, it was a celebratory occasion bring together family, colleagues and friends;
- second, it was an opportunity to pull together nearly 20 years of research into a single, coherent narrative or story;
- third, the lecture was well supported by an appropriate use of graphics and video;
- lastly, he put a great deal of work into preparing this lecture and thinking about who would be

in the audience – much more preparation than would have been the case if this was just one of many lectures in a course.

McKeachie and Svinicki (2006, p. 58) believe that lecturing is best used for:

- providing up-to-date material that can't be found in one source;
- summarizing material found in a variety of sources;
- adapting material to the interests of a particular group;
- initially helping students discover key concepts, principles or ideas;
- modelling expert thinking.

The last point is important. Faculty often argue that the real value of a lecture is to provide a model for students of how the faculty member, as an expert, approaches a topic or problem. Thus the important point of the lecture is not the transmission of content (facts, principles, ideas), which the students could get from just reading, but an expert way of thinking about the topic. The trouble with this argument for lectures is three-fold:

- students are rarely aware that this is the purpose of the lecture, and therefore focus on memorizing the content, rather than the 'modelling' of expert thinking;
- faculty themselves are not explicit about how they are doing the modelling (or fail to offer other ways in which modelling could be used, so students can compare and contrast);
- students get no practice themselves in modelling this skill, even if they are aware of the modelling.

Perhaps more importantly, looking at McKeachie and Svinicki's suggestions, would it not be better for the students, rather than the lecturer, to be doing these activities in a digital age?

So, yes, there are a few occasions when lectures work very well. But in a digital age they should not be the default model for regular teaching. There are much better ways to teach that will result in better learning over the length of a course or program.

3.3.6 Why are lectures still the main form of educational delivery?

Given all of the above, some explanation needs to be offered for the persistence of the lecture into the 21st century. Here are some suggestions:

- in fact, in many areas of education, the lecture *has* been replaced, particularly in many elementary or primary schools;
- architectural inertia: a huge investment has been made by institutions in facilities that support the lecture model. What is to happen to all that real estate if it is not used? (As Winston Churchill said, '*We shape our buildings and our buildings shape us*');
- in North America, the Carnegie unit of teaching, which is based on a notion of one hour per week of classroom time per credit over a 13 week period. It is easy then to divide a three credit course into 39 one hour lectures over which the curriculum for the course must be covered. It is on this basis that teaching load and resources are decided;

- faculty in post-secondary education have no other model for teaching. This is the model they are used to, and because appointment is based on training in research or work experience, and not on qualifications in teaching, they have no knowledge of how students learn or confidence or experience in other methods of teaching;
- many experts prefer the oral tradition of teaching and learning, because it enhances their status as an expert and source of knowledge; being allowed an hour of other people's time to hear your ideas without major interruption is very satisfying on a personal level (at least for me when I'm lecturing);
- see Scenario C at the start of this chapter.

3.3.7 Is there a future for lectures in a digital age?

That depends on how far into the future one wants to look. Given the inertia in the system, lectures are likely still to predominate for another ten years, but after that, in most institutions, courses based on three lectures a week over 13 weeks will have disappeared. There are several reasons for this:

- all content can be easily digitalized and made available on demand at very low cost (see Chapter 11);
- institutions will be making greater use of dynamic video (not talking heads) for demonstration, simulations, animations, etc. Thus most content modules will be multi-media;
- third, open textbooks incorporating multi-media components and student activities will provide the content, organization and interpretation that are the rationale for most lectures;
- lastly, and most significantly, the priority for teaching will have changed from information transmission and organization to knowledge management, where students have the responsibility for finding, analyzing, evaluating, sharing and applying knowledge, under the direction of a skilled subject expert. Project-based learning, collaborative learning and situated or experiential learning will become much more widely prevalent. Also many instructors will prefer to use the time they would have spent on a series of lectures in providing more direct, individual and group learner support, thus bringing them into closer contact with learners.

This does not mean that lectures will disappear altogether, but they will be special events, and probably multi-media, synchronously and asynchronously delivered. Special events might include:

- a professor's summary of her latest research,
- the introduction to a course,
- a point mid-way through a course for taking stock and dealing with common difficulties, or
- the wrap-up to a course.

Lectures will provide a chance for instructors to make themselves known, to impart their interests and enthusiasm, and to motivate learners, but this will be just one, relatively small, but important component of a much broader learning experience for students.

For a different and informed perspective on the role and future of lectures, see Christine Gross-Loh, 2016.

References

Bates, A. (1985) *Broadcasting in Education: An Evaluation* London: Constables

Bligh, D. (2000) *What's the Use of Lectures?* San Francisco: Jossey-Bass

Boswell, J. (1791), *The Life of Samuel Johnson*, New York: Penguin Classics (edited by Hibbert, C., 1986)

Gross-Loh, C. (2016) Should colleges really eliminate the college lecture? *The Atlantic*, 14 July

McKeachie, W. and Svinicki, M. (2006) *McKeachie's Teaching Tips: Strategies, Research and Theory for College and University Teachers* Boston/New York: Houghton Mifflin

Activity 3.3 The future of lectures

1. Do you agree that lectures are dead – or soon will be?

2. Look at the skills needed in a digital age described in Chapter 1. Which of these skills could lectures help develop? Would they need to be redesigned or modified to do this and if so, how?

For feedback on the second question click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=89

References

Bligh, D. (2000) *What's the Use of Lectures?* San Francisco: Jossey-Bass

Boswell, J. (1791), *The Life of Samuel Johnson*, New York: Penguin Classics (edited by Hibbert, C., 1986)

Gross-Loh, C. (2016) Should colleges really eliminate the college lecture? *The Atlantic*, 14 July

McKeachie, W. and Svinicki, M. (2006) *McKeachie's Teaching Tips: Strategies, Research and Theory for College and University Teachers* Boston/New York: Houghton Mifflin

3.4 Interactive lectures, seminars, and tutorials: learning by talking

Figure 3.4.1 A tutorial at Oriel College, Oxford University: Image: University of Oxford

3.4.1 The theoretical and research basis for dialogue and discussion

Researchers have identified a distinction, often intuitively recognised by instructors, between meaningful and rote learning (Asubel et al., 1978). Meaningful learning involves the learner going beyond memorization and surface comprehension of facts, ideas or principles, to a deeper understanding of what those facts, ideas or principles mean to them. Marton and Saljö, who have conducted a number of studies that examined how university students actually go about their learning, make the distinction between deep and surface approaches to learning (see, for instance, Marton and Saljö, 1997). Students who adopt a deep approach to learning tend to have a prior intrinsic interest in the subject. Their motivation is to learn because they want to know more about a topic. Students with a surface approach to learning are more instrumental. Their interest is primarily driven by the need to get a pass grade or qualification.

Subsequent research (e.g. Entwistle and Peterson, 2004) showed that as well as students' initial motivation for study, a variety of other factors also influence students' approaches to learning. In particular, *surface* approaches to learning are more commonly found when there is a focus on:

- information transmission,
- tests that rely mainly on memory,
- a lack of interaction and discussion.

On the other hand, *deeper* approaches to learning are found when there is a focus on:

- analytical or critical thinking or problem-solving,
- in-class discussion,
- assessment based on analysis, synthesis, comparison and evaluation.

Constructivists believe that knowledge is mainly acquired through social processes which are necessary to move students beyond surface learning to deeper levels of understanding. *Connectivist* approaches to learning also place heavy emphasis on networking learners, with all participants learning through interaction and discussion between each other, driven both by their individual interests and the extent to which these interests connect to the interests of other participants. The very large numbers participating in connectivist MOOCs (see Chapter 5) means that there is a high probability of converging interests for all participants, although those interests may vary considerably over the whole group.

Laurillard (2001), and Harasim (2017), have emphasised that academic knowledge requires students to move constantly from the concrete to the abstract and back again, and to build or construct knowledge based on academic criteria such as logic, evidence and argument. This in turn requires a strong teacher presence within a dialectical environment, in which argument and discussion within the rules and criteria of the subject discipline are encouraged and developed by the instructor or teacher. Laurillard calls this a rhetorical exercise, an attempt to get learners to think about the world differently. Conversation and discussion are critical if this is to be achieved.

The combination of theory and research here suggests the need for frequent interaction between students, and between teacher and students, for the kinds of learning needed in a digital age. This interaction usually takes the form of semi-structured discussion. I will now examine how this kind of learning has traditionally been facilitated by educators.

3.4.2 Seminars and tutorials

3.4.2.1 Definitions

> *A **seminar** is a group meeting (either face-to-face or online) where a number of students participate at least as actively as the teacher, although the teacher may be responsible for the design of the group experience, such as choosing topics and assigning tasks to individual students.*

> *A **tutorial** is either a one-on-one session between a teacher and a student, or a very small group*

(three or four) of students and an instructor, where the learners are at least as active in discussion and presentation of ideas as the teacher.

3.4.2.2 Seminars

Seminars can range from six or more students, up to 30 students in the same group. Because the general perception is that seminars work best when numbers are relatively small, they tend to be found more at graduate level or the last year of undergraduate programs.

Figure 3.4.1 Socrates and his students: Painter: Johann Friedrich Greuter, 1590: (San Francisco, Achenbach Foundation for Graphic Arts)

Seminars and tutorials again have a very long history, going back at least to the time of Socrates and Aristotle. Both were tutors to the aristocracy of ancient Athens. Aristotle was the private tutor to Alexander the Great when Alexander was young. Socrates was the tutor of Plato, the philosopher, although Socrates denied he was a teacher, rebelling against the idea common at that time in ancient Greece that 'a teacher was a vessel that poured its contents into the cup of the student'. Instead, according to Plato, Socrates used dialogue and questioning 'to help others recognize on their own what is real, true, and good.' (Stanford Encyclopedia of Philosophy.) Thus it can be seen that seminars and tutorials reflect a strongly constructivist approach to learning and teaching.

The format can vary a great deal. One common format, especially at graduate level, although similar practices can be found at the school/k-12 level, is for the teacher to set advance work for a selected number of students, and then have the selected students present their work to the whole group, for discussion, criticism and suggestions for improvement. Although there may be time for only two or three student presentations in each seminar, over a whole semester every student gets their turn. Another format is to ask all the students in a group to do some specified advanced reading or study, then for the teacher to introduce questions for general discussion within the seminar that requires students to draw on their earlier work.

3.4.2.3 Tutorials

Tutorials are a particular kind of seminar that are identified with Ivy League universities, and in particular Oxford or Cambridge. There may be as few as two students and a professor in a tutorial and the meeting often follows closely the Socratic method of the student presenting his or her findings and the professor rigorously questioning every assumption made by the student – and also drawing in the other student to the discussion.

Both these forms of dialogical learning can be found not only in classroom contexts, but also online. Online discussion will be discussed in more detail in Chapter 4, Section 4. However, in general, the pedagogical similarities between online and face-to-face discussions are much greater than the differences.

3.4.3 Are seminars a practical method in a massive education system?

For many faculty, the ideal teaching environment is Socrates sitting under the linden tree, with three or four dedicated and interested students. Unfortunately, the reality of mass higher education makes this impossible for all but the most elite and expensive institutions.

However, seminars for 25-30 students are not unrealistic, even in public undergraduate education. More importantly, they enable the kind of teaching and learning that are most likely to facilitate the types of skills needed from our students in a digital age. Seminars are flexible enough to be offered in class or online, depending on the needs of the students. They are probably best used when students have done individual work before the seminar. Of upmost importance, though, is the ability of teachers to teach successfully in this manner, which requires different skills from transmissive lecturing.

Although expansion of student numbers in higher education is part of the problem, it's not the whole problem. Other factors, such as senior professors teaching less, and focusing mainly on graduate students, lead to larger classes at undergraduate level that use transmissive lecturing. And if more senior or experienced instructors switched from transmissive lectures, and instead required students to find and analyse content for themselves, this would free up more time for them to spend on seminar-type teaching.

So it as much an organizational issue, a matter of choice and priorities, as an economic issue. The more we can move towards a seminar approach to teaching and learning and away from large, transmissive lectures, the better, if we are to develop students with the skills needed in a digital age.

References

Ausubel, D., Novak, J., & Hanesian, H. (1978). *Educational Psychology: A Cognitive View* (2nd Ed.). New York: Holt, Rinehart & Winston.

Entwistle, N. and Peterson, E. (2004) Conceptions of Learning and Knowledge in Higher Education: Relationships with Study Behaviour and Influences of Learning Environments *International Journal of Educational Research*, Vol. 41, No. 6, pp. 407-428

Harasim, L. (2017) *Learning Theory and Online Technologies* New York/London: Taylor and Francis

Laurillard, D. (2001) *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies* New York/London: Taylor and Francis

Marton, F. & Saljö, R. (1997). 'Approaches to learning', in F. Marton, D. Hounsell, & N. Entwistle (Eds.), *The experience of learning*. Edinburgh: Scottish Academic Press.

Activity 3.4 Developing conceptual learning

1. What kind of teacher interventions in group discussions can you suggest that could help learners develop deep, conceptual learning?

2. How could you reorganise a lecture class of 200 or more students to develop group work and the development of conceptual learning?

Click on the podcast below for my suggestions:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=92

3.5 Learning by doing: Experiential learning

Figure 3.5.1 Ryerson University's Law Practice program is a good example of a blended learning approach to experiential learning. For more details, click here

Learning by doing is one of Pratt's five teaching approaches. There are a number of different approaches or terms within the broad heading of experiential learning, such as cooperative learning, adventure learning and apprenticeship. I will use the term 'experiential learning' as a broad umbrella term to cover this wide variety of approaches to learning by doing. I will deal with apprenticeship as a separate section (Chapter 3.6) because of its traditional (if tacit) role in preparing university and college instructors, although it can be seen as just one of several methods of experiential learning.

3.5.1. What is experiential learning?

Simon Fraser University (2010) has defined experiential learning as:

> *the strategic, active engagement of students in opportunities to learn through doing, and reflection on those activities, which empowers them to apply their theoretical knowledge to practical endeavours in a multitude of settings inside and outside of the classroom.*

There are many different theorists in this area, such as John Dewey (1938) and more recently David Kolb (1984). There is a wide range of design models that aim to embed learning within real world contexts, including:

- laboratory, workshop or studio work;
- apprenticeship;
- problem-based learning;
- case-based learning;
- project-based learning;
- inquiry-based learning;
- cooperative (work- or community-based) learning.

The focus here is on some of the main ways in which experiential learning can be designed and delivered, with particular respect to the use of technology, and in ways that help develop the knowledge and skills needed in a digital age. (For a more detailed analysis of experiential learning, see Moon, 2004).

3.5.2 Core design principles

Experiential learning focuses on learners reflecting on their experience of doing something, so as to gain conceptual insight as well as practical expertise. Kolb's experiential learning model suggest four stages in this process:

- active experimentation;
- concrete experience;
- reflective observation;
- abstract conceptualization.

Experiential learning is a major form of teaching at the University of Waterloo. Its web site lists the conditions needed to ensure that experiential learning is effective, as identified by the Association for Experiential Education.

The next section examines different ways in which these principles have been applied.

3.5.3 Experiential design models

There are many different design models for experiential learning, but they also have many features in common.

3.5.3.1 Laboratory, workshop or studio work

Figure 3.5.2 Concordia University wood shop

Today, we take almost for granted that laboratory classes are an essential part of teaching science and engineering. Workshops and studios are considered critical for many forms of trades training or the development of creative arts. Labs, workshops and studios serve a number of important functions or goals, which include:

- to give students hands-on experience in choosing and using common scientific, engineering or trades equipment appropriately;
- to develop motor skills in using scientific, engineering or industrial tools or creative media;
- to give students an understanding of the advantages and limitations of laboratory experiments;
- to enable students to see science, engineering or trade work ‘in action’;
- to enable students to test hypotheses or to see how well concepts, theories, procedures actually work when tested under laboratory conditions;

- to teach students how to design and/or conduct experiments;
- to enable students to design and create objects or equipment in different physical media.

An important pedagogical value of laboratory classes is that they enable students to move from the concrete (observing phenomena) to the abstract (understanding the principles or theories that are derived from the observation of phenomena). Another is that the laboratory introduces students to a critical cultural aspect of science and engineering, that all ideas need to be tested in a rigorous and particular manner for them to be considered 'true'.

One major criticism of traditional educational labs or workshops is that they are limited in the kinds of equipment and experiences that scientists, engineers and trades people need today. As scientific, engineering and trades equipment becomes more sophisticated and expensive, it becomes increasingly difficult to provide students in schools especially but increasingly now in colleges and universities direct access to such equipment. Furthermore traditional teaching labs or workshops are capital and labour intensive and hence do not scale easily, a critical disadvantage in rapidly expanding educational opportunities.

Because laboratory work is such an accepted part of science teaching, it is worth remembering that teaching science through laboratory work is in historical terms a fairly recent development. In the 1860s neither Oxford nor Cambridge University were willing to teach empirical science. Thomas Huxley therefore developed a program at the Royal School of Mines (a constituent college of what is now Imperial College, of the University of London) to teach school-teachers how to teach science, including how to design laboratories for teaching experimental science to school children, a method that is still the most commonly used today, both in schools and universities.

At the same time, scientific and engineering progress since the nineteenth century has resulted in other forms of scientific testing and validation that take place outside at least the kind of 'wet labs' so common in schools and universities. Examples are nuclear accelerators, nanotechnology, quantum mechanics and space exploration. Often the only way to observe or record phenomena in such contexts is remotely or digitally. It is also important to be clear about the objectives of lab, workshop and studio work. There may now be other, more practical, more economic, or more powerful ways of achieving these objectives through the use of new technology, such as remote labs, simulations, and experiential learning. These will be examined in more detail later in this book.

3.5.3.2 Problem-based learning

The earliest form of systematised problem-based learning (PBL) was developed in 1969 by Howard Barrows and colleagues in the School of Medicine at McMaster University in Canada, from where it has spread to many other universities, colleges and schools. This approach is increasingly used in subject domains where the knowledge base is rapidly expanding and where it is impossible for students to master all the knowledge in the domain within a limited period of study. Working in groups, students identify what they already know, what they need to know, and how and where to access new information that may lead to resolution of the problem. The role of the instructor (usually called a tutor in classic PBL) is critical in facilitating and guiding the learning process.

Usually PBL follows a strongly systematised approach to solving problems, although the detailed steps and sequence tend to vary to some extent, depending on the subject domain. The following is a typical example:

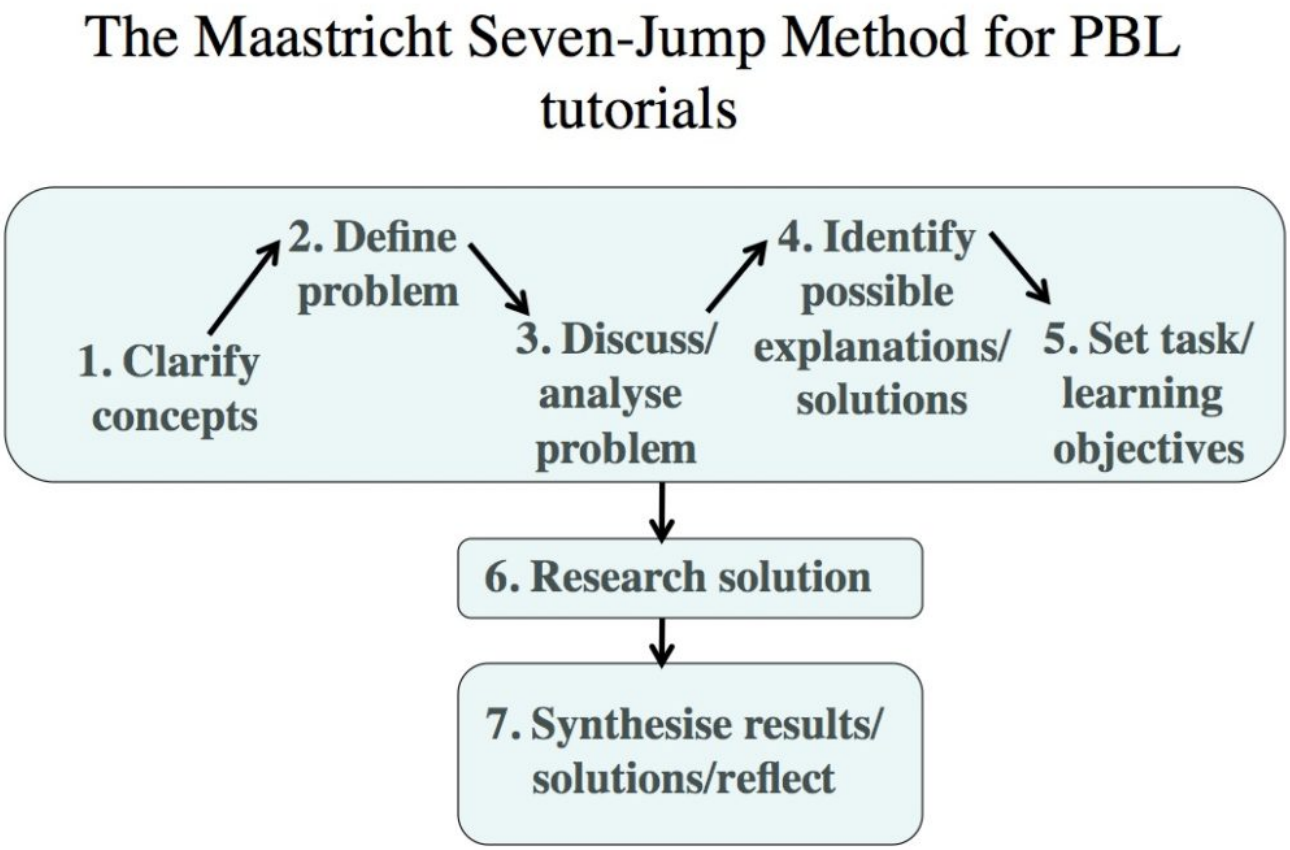


Figure 3.5.3 (derived from Gijeselaers, 1995)

Traditionally, the first five steps would be done in a small face-to-face class tutorial of 20-25 students, with the sixth step requiring either individual or small group (four or five students) private study, with a the seventh step being accomplished in a full group meeting with the tutor. However, this approach also lends itself to blended learning in particular, where the research solution (step 6) is done mainly online, although some instructors have managed the whole process online, using a combination of synchronous web conferencing and asynchronous online discussion.

Developing a complete problem-based learning curriculum is challenging, as problems must be carefully chosen, increasing in complexity and difficulty over the course of study, and problems must be chosen so as to cover all the required components of the curriculum. Students often find the problem-based learning approach challenging, particularly in the early stages, where their foundational knowledge base may not be sufficient to solve some of the problems. (The term ‘cognitive overload’ has been used to describe this situation.) Others argue that lectures provide a quicker and more condensed way to cover the same topics. Assessment also has to be carefully designed, especially if a final exam carries heavy weight in grading, to ensure that problem-solving skills as well as content coverage are measured.

However, research (see for instance, Strobel and van Barneveld, 2009) has found that problem-based learning is better for long-term retention of material and developing ‘replicable’ skills, as well as for improving students’ attitudes towards learning. There are now many variations on the ‘pure’ PBL approach, with problems being set after initial content has been covered in more traditional ways, such as lectures or prior reading, for instance.

The methodology of problem-based learning however is one essential tool for developing the knowledge and skills needed in a digital society.

3.5.3.3 Case-based learning

> *With case-based teaching, students develop skills in analytical thinking and reflective judgment by reading and discussing complex, real-life scenarios.*

University of Michigan Centre for Research on Teaching and Learning

Case-based learning is sometimes considered a variation of PBL, while others see it as a design model in its own right. As with PBL, case-based learning uses a guided inquiry method, but usually requires the students to have a degree of prior knowledge that can assist in analysing the case. There is usually more flexibility in the approach to case-based learning compared to PBL. Case-based learning is particularly popular in business education, law schools and clinical practice in medicine, but can be used in many other subject domains.

Herreid (2004) provides eleven basic rules for case-based learning.

1. Tells a story.
2. Focuses on an interest-arousing issue.
3. Set in the past five years
4. Creates empathy with the central characters.
5. Includes direct quotations from the characters.
6. Relevant to the reader.
7. Must have pedagogic utility.
8. Conflict provoking.
9. Decision forcing.
10. Has generality.
11. Is short.

Using examples from clinical practice in medicine, Irby (1994) recommends five steps in case-based learning:

- anchor teaching in a (carefully chosen) case;
- actively involve learners in discussing, analysing and making recommendations regarding the case;
- model professional thinking and action as an instructor when discussing the case with learners;
- provide direction and feedback to learners in their discussions;
- create a collaborative learning environment where all views are respected.

Case-based learning can be particularly valuable for dealing with complex, interdisciplinary topics or issues which have no obvious 'right or wrong' solutions, or where learners need to evaluate and decide on competing, alternative explanations. Case-based learning can also work well in both blended and fully online environments. Marcus, Taylor and Ellis (2004) used the following design model for a case-based blended learning project in veterinary science:

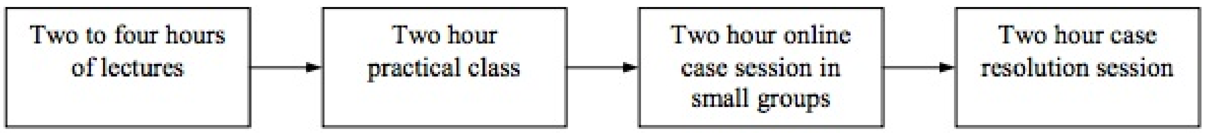


Figure 3.5.4 Blended learning sequence involving online learning resources, Marcus, Taylor and Ellis, 2004

Other configurations are of course also possible, depending on the requirements of the subject.

3.5.3.4 Project-based learning

Project-based learning is similar to case-based learning, but tends to be longer and broader in scope, and with even more student autonomy/responsibility in the sense of choosing sub-topics, organising their work, and deciding on what methods to use to conduct the project. Projects are usually based around real world problems, which give students a sense of responsibility and ownership in their learning activities.

Once again, there are several best practices or guidelines for successful project work. For instance, Larmer and Mergendoller (2010) argue that every good project should meet two criteria:

- students must perceive the work as personally meaningful, as a task that matters and that they want to do well;
- a meaningful project fulfills an educational purpose.

The main danger with project-based learning is that the project can take on a life of its own, with not only students but the instructor losing focus on the key, essential learning objectives, or important content areas may not get covered. Thus project-based learning needs careful design and monitoring by the instructor.

3.5.3.5 Inquiry-based learning

Inquiry-based learning (IBL) is similar to project-based learning, but the role of the teacher/instructor is somewhat different. In project-based learning, the instructor decides the 'driving question' and plays a more active role in guiding the students through the process. In inquiry-based learning, the learner explores a theme and chooses a topic for research, develops a plan of research and comes to conclusions, although an instructor is usually available to provide help and guidance when needed.

Banchi and Bell (2008) suggest that there are different levels of inquiry, and students need to begin at the first level and work through the other levels to get to 'true' or 'open' inquiry as follows:

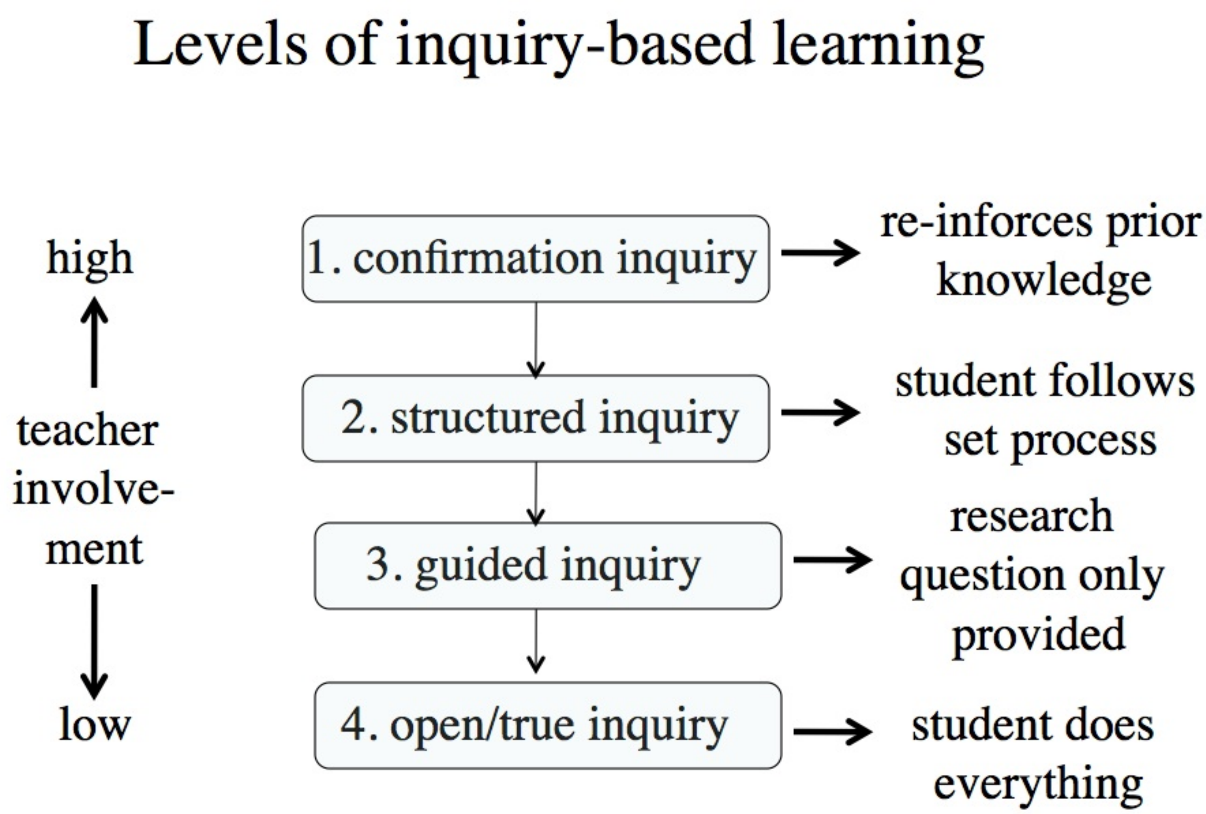


Figure 3.5.5 Levels of inquiry-based learning, from Banchi and Bell (2008)

It can be seen that the fourth level of inquiry describes the graduate thesis process, although proponents of inquiry-based learning have advocated its value at all levels of education.

3.5.4 Experiential learning in online learning environments

Some advocates of experiential learning are highly critical of online learning, because, they argue, it is impossible to embed learning in real world examples. However, this is an oversimplification, and there are contexts in which online learning can be used very effectively to support or develop experiential learning, in all its variations:

- *blended or flipped learning*: although group sessions often start off the process, and/or bring a problem or project to a conclusion, they are usually done in a classroom or lab setting. However students can increasingly conduct the research and information gathering by accessing resources online, by using online multimedia resources to create reports or presentations, and by collaborating online through group project work or through critique and evaluation of each other’s work;

- *fully online*: increasingly, instructors are finding that experiential learning can be applied fully online, through a combination of synchronous tools such as web conferencing, asynchronous tools such as discussion forums and/or social media for group work, e-portfolios and multimedia for reporting, and remote labs for experimental work.

Indeed, there are circumstances where it is impractical, too dangerous, or too expensive to use real world experiential learning. Online learning can be used to simulate real conditions and to reduce the time to master a skill. Flight simulators have long been used to train commercial pilots, enabling trainee pilots to spend less time mastering fundamentals on real aircraft. Commercial flight simulators are still extremely expensive to build and operate, but in recent years the costs of creating realistic simulations has dropped dramatically.

Figure 3.5.6 Virtual world border crossing, Loyalist College, Ontario

Instructors at Loyalist College have created a 'virtual' fully functioning border crossing and a virtual car in Second Life to train Canadian Border Services Agents. Each student takes on the role of an agent, with his/her avatar interviewing the avatars of the travellers wishing to enter Canada. Other students play the travellers. All communication is done by voice communications in Second Life, with the people playing the travellers in a separate room from the students. Each student interviews three or four travellers and the entire class observes the interactions and discusses the situations and the responses. A secondary site for auto searches features a virtual car that can be completely dismantled so students learn all possible places where contraband may be concealed. This learning is then reinforced with a visit to the auto shop at Loyalist College and the search of an actual car. The students in the customs and immigration track are assessed on their interviewing techniques as part of their final grades. Students participating in the first year of the Second Life border simulation achieved a grade standing that was 28 per cent higher than the previous class who did not utilize a virtual world. The next class, using Second Life, scored a further 9 per cent higher. More details can be found here.

Staff in the Emergency Management Division at the Justice Institute of British Columbia have developed a simulation tool called Praxis that helps to bring critical incidents to life by introducing real-world simulations into training and exercise programs. Because participants can access Praxis via the web, it provides the flexibility to deliver immersive, interactive and scenario-based training exercises anytime, anywhere. A typical emergency might be a major fire in a warehouse containing dangerous chemicals. 'Trainee' first responders, who will include fire, police and paramedical personnel, as well as city engineers and local government officials, are 'alerted' on their mobile phones or tablets, and have to respond in real time to a fast developing scenario, 'managed' by a skilled facilitator, following procedures previously taught and also available on their mobile equipment. The whole process is recorded and followed later by a face-to-face debriefing session.

Once again, design models are not in most cases dependent on any particular medium. The pedagogy transfers easily across different delivery methods. Learning by doing is an important method for developing many of the skills needed in a digital age.

3.5.5 Strengths and weaknesses of experiential learning models

How one evaluates experiential learning designs depends partly on one's epistemological position. Constructivists strongly support experiential learning models, whereas those with a strong objectivist position are usually highly skeptical of the effectiveness of this approach. Nevertheless, problem-based learning in particular has proved to be very popular in many institutions teaching science or medicine, and project-based learning is used across many subject domains and levels of education. There is evidence that experiential learning, when properly designed, is highly engaging for students and leads to better long-term memory. Proponents also claim that it leads to deeper understanding, and develops skills for a digital age such as problem-solving, critical thinking, improved communications skills, and knowledge management. In particular, it enables learners to manage better highly complex situations that cross disciplinary boundaries, and subject domains where the boundaries of knowledge are difficult to manage.

Critics though such as Kirschner, Sweller and Clark (2006) argue that instruction in experiential learning is often 'unguided', and pointed to several 'meta-analyses' of the effectiveness of problem-based learning that indicated no difference in problem-solving abilities, lower basic science exam scores, longer study hours for PBL students, and that PBL is more costly. They conclude:

> *In so far as there is any evidence from controlled studies, it almost uniformly supports direct, strong instructional guidance rather than constructivist-based minimal guidance during the instruction*

of novice to intermediate learners. Even with students with considerable prior knowledge, strong guidance when learning is most often found to be equally effective as unguided approaches.

Certainly, experiential learning approaches require considerable re-structuring of teaching and a great deal of detailed planning if the curriculum is to be fully covered. It usually means extensive re-training of faculty, and careful orientation and preparation of students. I would also agree with Kirschner et al. that just giving students tasks to do in real world situations without guidance and support is likely to be ineffective.

However, many forms of experiential learning can and do have strong guidance from instructors, and one has to be very careful when comparing matched groups that the tests of knowledge include measurement of the skills that are claimed to be developed by experiential learning, and are not just based on the same assessments as for traditional methods, which often have a heavy bias towards memorisation and comprehension.

On balance then, I would support the use of experiential learning for developing the knowledge and skills needed in a digital age, but as always, it needs to be done well, following best practices associated with the different design models.

References

Banchi, H., and Bell, R. (2008) 'The Many Levels of Inquiry' *Science and Children*, Vol. 46, No. 2

Dewey, J. (1938). *Experience & Education*. New York, NY: Macmillan

Gijselaers, W., (1995) 'Perspectives on problem-based learning' in Gijselaers, W, Tempelaar, D, Keizer, P, Blommaert, J, Bernard, E & Kapser, H (eds) *Educational Innovation in Economics and Business Administration: The Case of Problem-Based Learning*. Dordrecht, Kluwer.

Herreid, C. F. (2007). *Start with a story: The case study method of teaching college science.* Arlington VA: NSTA Press.

Irby, D. (1994) Three exemplary models of case-based teaching *Academic Medicine*, Vol. 69, No. 12

Kirshner, P., Sweller, J. amd Clark, R. (2006) Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching *Educational Psychologist*, Vo. 41, No.2

Kolb. D. (1984) *Experiential Learning: Experience as the source of learning and development* Englewood Cliffs NJ: Prentice Hall

Larmer, J. and Mergendoller, J. (2010) Seven essentials for project-based learning Educational Leadership, Vol. 68, No. 1

Marcus, G. Taylor, R. and Ellis, R. (2004) *Implications for the design of online case-based learning activities based on the student blended learning experience*: Perth, Australia: Proceedings of the ASCILITE conference, 2004

Moon, J.A. (2004) *A Handbook of Reflective and Experiential Learning: Theory and Practice* New York: Routledge

Simon Fraser University (2010) Task Force on Teaching and Learning: Recommendations Report Burnaby BC: Simon Fraser University

Strobel, J. , & van Barneveld, A. (2009). When is PBL More Effective? A Meta-synthesis of Meta-analyses Comparing PBL to Conventional Classrooms. *Interdisciplinary Journal of Problem-based Learning*, Vol. 3, No. 1

Activity 3.5 Assessing experiential design models

1. If you have experiences with experiential learning, what worked well and what didn't?

2. Are the differences between problem-based learning, case-based learning, project-based learning and inquiry-based learning significant, or are they really just minor variations on the same design model?

3. Do you have a preference for any one of the models? If so, why?

4. Do you agree that experiential learning can be done just as well online as in classrooms or in the field? If not, what is the 'uniqueness' of doing it face-to-face that cannot be replicated online? Can you give an example?

5. Kirschner, Sweller and Clark's paper is a powerful condemnation of PBL. Read it in full, then decide whether or not you share their conclusion, and if not, why not.

Click on the podcast below for my feedback on these questions.

An audio element has been excluded from this version of the text. You can listen to it online here: *https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=103*

3.6 Learning by doing: Apprenticeship

Figure 3.6.1 BMW Group UK Apprentice Recruitment, 2013
Image: © Motoring Insight, 2013

3.6.1 The importance of apprenticeship as a teaching method

Apprenticeship is one of the most common and well established forms of experiential learning. Bloom and his colleagues designated psycho-motor skills as the third domain of learning back in 1956. Learning by doing is particularly common in teaching motor skills, such as learning to ride a bicycle or play a sport, but examples can also be found in higher education, such as teaching practice, medical internships, and laboratory studies.

Apprenticeship is a particular way of enabling students to learn by doing. It is often associated with vocational training where a more experienced tradesman or journeyman models behaviour, the apprentice attempts to follow the the model, and the journeyman provides feedback. However, apprenticeship is the most common method used to train post-secondary education instructors in teaching (at least implicitly), so there is a wide range of applications for an apprenticeship approach to teaching.

Because a form of apprenticeship is the often implicit, default model also for university teaching, and in particular for pre-service training of university instructors, apprenticeship will be discussed separately from other forms of experiential learning, although it is really just one, very commonly used, version.

3.6.2 Key features of apprenticeship

Figure 3.6.2 An apprentice being supervised
Image: © BBC, 2014

> *'It is useful to remember that apprenticeship is not an invisible phenomenon. It has key elements: a particular way of viewing learning, specific roles and strategies for teachers and learners, and clear stages of development, whether for traditional or cognitive apprenticeship. But mostly it's important to remember that in this perspective, one cannot learn from afar. Instead, one learns amid the engagement of participating in the authentic, dynamic and unique swirl of genuine practice.'*

Pratt and Johnson, 1998

Schön (1983) argues that apprenticeship operates in '*situations of practice that…are frequently ill-defined and problematic, and characterized by vagueness, uncertainty and disorder*'. Learning in apprenticeship is not just about learning to do (active learning), but also requires an understanding of the contexts in which the learning will be applied. In addition there is a social and cultural element to the learning, understanding and embedding the accepted practices, customs and values of experts in the field. Pratt and Johnson (1998) identify the characteristics of a master practitioner, whom they define as:

> *a person who has acquired a thorough knowledge of and/or is especially skilled in a particular area of practice. Master practitioners:*
>
> 1. *possess great amounts of knowledge in their area of expertise, and are able to apply that knowledge in difficult practice settings;*
> 2. *have well-organized, readily accessible schemas (cognitive maps) which facilitate the acquisition of new information;*
> 3. *have well-developed repertoires of strategies for acquiring new knowledge, integrating and organizing their schemas, and applying their knowledge and skills in a variety of contexts….;*
> 4. *…are motivated to learn as part of the process of developing their identities in their communities of practice. They are not motivated to learn simply to reach some external performance goal or reward;*
> 5. *frequently display tacit knowledge in the form of:*
>   - *spontaneous action and judgements;*
>   - *being unaware of having learned to do these things;*
>   - *being unable or having difficulty in describing the knowing which their actions reveal.*

Pratt and Johnson further distinguish two different but related forms of apprenticeship: traditional and cognitive. A *traditional* apprenticeship experience, based on developing a motor or manual skill, involves learning a procedure and gradually developing mastery, during which the master and learner go through several stages.

3.6.3 University apprenticeship

An *intellectual or cognitive* apprenticeship model is somewhat different because this form of learning is less easily observable than learning motor or manual skills. Pratt and Johnson argue that in this context, master and learner must say what they are thinking during applications of knowledge and skills, and must make explicit the context in which the knowledge is being developed, because context is so critical to the way knowledge is developed and applied. Pratt and Johnson suggest five stages for cognitive and intellectual modelling (p. 99):

1. modelling by the master and development of a mental model/schema by the learner;
2. learner approximates replication of the model with master providing support and feedback (scaffolding/coaching);

3. learner widens the range of application of the model, with less support from master;
4. self-directed learning within the specified limits acceptable to the profession;
5. generalizing: learner and master discuss how well the model might work or would have to be adapted in a range of other possible contexts.

Pratt and Johnson provide a concrete example of how this apprenticeship model might work for a novice university professor (pp. 100-101). They argue that for cognitive apprenticeship it is important to create a forum or set of opportunities for:

> *articulate discussion and authentic participation in the realities of practice from within the practice, not from just one single point of view. Only from such active involvement, and layered and cumulative experience does the novice move towards mastery.*

The main challenge of the apprenticeship model in a university setting is that it is not usually applied in a systematic matter. The hope that young or new university teachers will have automatically learned how to teach just by observing their own professors teach leaves far too much to chance.

[Removed from Version 1: 3.5.4 Apprenticeship in online environments]

3.6.4 Strengths and weaknesses

The main advantages of an apprenticeship model of teaching can be summarised as follows:

- teaching and learning are deeply embedded within complex and highly variable contexts, allowing rapid adaptation to real-world conditions;
- it makes efficient use of the time of experts, who can integrate teaching within their regular work routine;
- it provides learners with clear models or goals to aspire to;
- it acculturates learners to the values and norms of the trade or profession.

On the other hand, there are some serious limitations with an apprenticeship approach, particularly in preparing for university teaching:

- much of a master's knowledge is tacit, partly because their expertise is built slowly through a very wide range of activities;
- experts often have difficulty in expressing consciously or verbally the schema and 'deep' knowledge that they have built up and taken almost for granted, leaving the learner often to have to guess or approximate what is required of them to become experts themselves;
- experts often rely solely on modelling with the hope that learners will pick up the knowledge and skills from just watching the expert in action, and don't follow through on the other stages that make an apprenticeship model more likely to succeed;
- there is clearly a limited number of learners that one expert can manage, given that the experts themselves are fully engaged in applying their expertise in often demanding work conditions which may leave little time for paying attention to the needs of novice learners in

the trade or profession;

- traditional vocational apprenticeship programs have a very high attrition rate: for instance, in British Columbia, more than 60 per cent of those that enter a formal campus-based vocational apprenticeship program withdraw before successful completion of the program. As a result, there are large numbers of experienced tradespeople in the workforce without full accreditation, limiting their career development and slowing down economic development where there are shortages of fully qualified skilled workers;
- in trades or occupations undergoing rapid change in the workplace, the apprenticeship model can slow adaptation or change in working methods, because of the prevalence of traditional values and norms being passed down by the 'master' that may no longer be as relevant in the new conditions facing workers. This limitation of the apprenticeship model can be clearly seen in the post-secondary education sector, where traditional values and norms around teaching are increasingly in conflict with external forces such as new technology and the massification of higher education.

Nevertheless, the apprenticeship model, when applied thoroughly and systematically, is a very useful model for teaching in highly complex, real-world contexts.

References

Bloom, B.S. (Ed.). Engelhart, M.D., Furst, E.J., Hill, W.H., Krathwohl, D.R. (1956). *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain.* New York: David McKay Co Inc.

Pratt, D. and Johnson, J. (1998) 'The Apprenticeship Perspective: Modelling Ways of Being' in Pratt, D. (ed.) *Five Perspectives on Teaching in Adult and Higher Education* Malabar FL: Krieger Publishing Company

Schön, D. (1983) *The Reflective Practitioner: How Professionals Think in Action* New York: Basic Books

Activity 3.6 Applying apprenticeship to university teaching

1. Do you agree that learning to teach in a university depends heavily on an apprenticeship model? In what ways does it resemble apprenticeship and in what ways does it differ? In what ways could it be improved?

2. What are the key features required for an apprenticeship model to work?

Click on the podcast below for my response to this activity

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=96

3.7 Learning by being: The nurturing and social reform models of teaching:

Figure 3.7.1 Image: Michigan State University, 2019

In this section I will briefly discuss the last two of Pratt's five teaching perspectives, nurturing and social reform.

3.7.1 The nurturing perspective

A nurturing perspective on teaching can best be understood in terms of the role of a parent. Pratt (1998) states:

> *We expect 'successful' parents to understand and empathize with their child; and that they will provide kind, compassionate, and loving guidance through content areas of utmost difficulty….The nurturing educator works with other issues…in different contexts and different age groups, but*

> *the underlying attributes and concerns remain the same. Learners' efficacy and self-esteem issues become the ultimate criteria against which learning success is measured, rather than performance-related mastery of a content body.*

There is a strong emphasis on the teacher focusing on the interests of the learner, on empathizing with how the learner approaches learning, of listening carefully to what the learner is saying and thinking when learning, and providing appropriate, supportive responses in the form of '*consensual validation of experience*'. This perspective is driven partly by the observation that people learn autonomously from a very early age, so the trick is to create an environment for the learner that encourages rather than inhibits their 'natural' tendency to learn, and directs it into appropriate learning tasks, decided by an analysis of the learner's needs. This is further elaborated in Chapter 6, on Building an Effective Learning Environment.

3.7.2 The social reform perspective

Pratt (1998, p. 173) states:

> *Teachers holding a social reform perspective are most interested in creating a better society and view their teaching as contributing to that end. Their perspective is unique in that it is based upon an explicitly stated ideal or set of principles linked to a vision of a better social order. Social reformers do not teach in one single way, nor do they hold distinctive views about knowledge in general…these factors all depend on the particular ideal that inspires their actions*.

This then in some ways is less a theory of teaching as an epistemological position, that society needs change, and the social reformer knows how to bring about this change through teaching and education. Indeed, as Figure 3.7.2 below illustrates, the social reform model of learning can be driven as much by the passions and concerns of learners as by those of their instructors.

Indian students from different institutions participate in a climate protest in Hyderabad, India. (Image: AP)

Figure 3.7.2

3.7.3 Past and future: the relevance of the nurturing and social reform methods for connectivism

These two perspectives on teaching again have a long history, with echoes of:

- Jean-Jacques Rousseau (1762): '*education should be carried out, so far as possible, in harmony with the development of the child's natural capacities by a process of apparently autonomous discovery*' (Stanford Encyclopedia of Philosophy)
- Malcolm Knowles (1984): '*As a person matures his self concept moves from one of being a dependent personality toward one of being a self-directed human being.*'
- Paulo Freire (2004): '*education makes sense because women and men learn that through learning they can make and remake themselves, because women and men are able to take responsibility for themselves as beings capable of knowing—of knowing that they know and knowing that they don't.*'
- Ivan Illich (1971) (in his criticism of the institutionalization of education): '*The current search for new educational* funnels *must be reversed into the search for their institutional inverse: educational* webs *which heighten the opportunity for each one to transform each*

> *moment of his living into one of learning, sharing, and caring*.'

The reason why the nurturing and social reform perspectives on teaching are important is because they reflect many of the assumptions or beliefs around connectivism (Chapter 2.6). Indeed, as early as 1971, Illich made this remarkable statement for the use of advanced technology to support "learning webs":

> *The operation of a peer-matching network would be simple. The user would identify himself by name and address and describe the activity for which he sought a peer. A computer would send him back the names and addresses of all those who had inserted the same description. It is amazing that such a simple utility has never been used on a broad scale for publicly valued activity*.

Well, those conditions certainly exist today. Learners do not necessarily need to go through institutional gateways to access information or knowledge, which is increasing available and accessible through the Internet. As we shall see in Chapter 5, MOOCs help to identify those common interests and connectivist MOOCs in particular aim to provide the networks of common interests and the environment for self-directed learning. The digital age provides the technology infrastructure and support needed for this kind of learning.

3.7.4 The roles of learners and teachers

Of all the perspectives on teaching these two are the most learner-centred. They are based on a profoundly optimistic view of human nature, that people will seek out and learn what they need, and will find the necessary support from caring, dedicated educators and/or from others with similar interests and concerns, and that individuals have the capacity and ability to identify and follow through with their own educational needs. It is also a more radical view of education, because it seeks to escape the political and controlling aspects of state or private institutions.

Within each of these two perspectives, there are differences of view about the centrality of teachers for successful learning. For Pratt, the teacher plays a central role in nurturing learning; for others such as Illich or Freire, professionally trained teachers are more likely to be the servant of the state than of the individual learner. For those supporting these perspectives on teaching, volunteer mentors or social groups organised around certain ideals or social goals provide the necessary support for learners.

3.7.5 Strengths and weaknesses of these two approaches

There are, as always, a number of drawbacks to these two perspectives on teaching:

- The teacher in a nurturing approach needs to adopt a highly dedicated and unselfish approach, putting the demands and needs of the learner first. This often means for teachers who are experts in their subject holding back the transmission and sharing of their knowledge until the learner is 'ready', thus denying to many subject experts their own identity and needs to a large extent;
- Pratt argues that '*although content is apparently neglected, children taught by nurturing educators do continue to master it at much the same rate as children taught by curriculum-driven teaching methodologies*', but no empirical evidence is offered to support this statement, although it does derive in Pratt's case from strong personal experience of teaching in this way;

- like all the other teaching approaches the nurturing perspective is driven by a very strong belief system, which will not necessarily be shared by other educators (or parents – or even learners, for that matter);
- a nurturing perspective necessitates probably the most labour-intensive of all the teaching models other than apprenticeship, requiring a deep understanding on the part of the teacher of each learner and that learner's needs; every individual learner is different and needs to be treated differently, and teachers need to spend a great deal of time identifying learners' needs, their readiness to learn, and building or creating supportive environments or contexts for that learning;
- there may well be a conflict between what the learner identifies as their personal learning needs, and the demands of society in a digital age. Dedicated teachers may be able to help a learner negotiate that divide, but in situations where learners are left without professional guidance, learners may end up just talking to other individuals with similar views that do not progress their learning (remembering that academic teaching is a rhetorical exercise, challenging learners to view the world differently);
- social reform depends to a large extent on learners and teachers embracing similar belief systems, and can easily descend into dogmatism without challenges from outside the 'in-community' established by self-referential groups.

Nevertheless, there are aspects of both perspectives that have significance for a digital age:

- both nurturing and social reform perspectives seems to work well for many adults in particular, and the nurturing approach also works well for younger children;
- nurturing is an approach that has been adopted as much in advanced corporate training in companies such as Google as in informal adult education (see for instance, Tan, 2012);
- we shall see in Chapter 5 that connectivist MOOCs strongly reflect both the nurturing approach and the ability to create webs of connections that enable the development of self-efficacy and attempts at social reform;
- both perspectives seem to be effective when learners are already fairly well educated and already have good prior knowledge and conceptual development;
- perspectives that focus on the needs of individuals rather than institutions or state bureaucracies can liberate thinking and learning and thus make the difference between 'good' and 'excellent' in creative thinking, problem-solving, and application of knowledge in complex and variable contexts.

References

Freire, P. (2004). *Pedagogy of Indignation*. Boulder CO: Paradigm

Illich, I. (1971) *Deschooling Society*, New York: Harper and Row

Knowles, M. (1984) *Andragogy in Action. Applying modern principles of adult education*, San Francisco: Jossey Bass

Pratt, D. and Associates (1998) *Five Perspectives on Teaching in Adult and Higher Education* Malabar FL: Krieger Publishing Company

Rousseau, J.-J. (1762) *Émile, ou de l'Éducation* (Trans. Allan Bloom). New York: Basic Books, 1979
Tan, C.-M. (2012) *Search Inside Yourself* New York: Harper Collins

Activity 3.7 Nurturing, social reform and connectivism

1. Do you have experience of teaching in one or both of these ways? If so, do you agree with the analysis of the strengths and weaknesses of each component?

2. Do you think that connectivism is a modern reflection of either of these models of teaching – or is connectivism a distinct and unique method of teaching in itself? If so, what distinguishes it as a teaching method from all the other methods I have covered?

There is no immediate feedback for these questions, although the issues will be raised again in Chapter 5.

3.8 Main conclusions

Figure 3.8 A workshop on blended learning, where instructors apply principles from a lecture on blended learning to designing a unit of teaching (a mix of transmissive and experiential learning methods reflecting a constructivist epistemology). Image: Tony Bates, 2017

3.8.1 Relating epistemology, learning theories and teaching methods

3.8.1.1 Pragmatism trumps ideology in teaching

Although there is often a direct relationship between a method of teaching, a learning theory and an epistemological position, this is by no means always the case. It is tempting to try to put together a table and neatly fit each teaching method into a particular learning theory, and each theory into a particular epistemology, but unfortunately education is not as tidy as computer science, so it would be misleading to try to do a direct ontological classification. For instance a transmissive lecture might be structured so as to further a cognitivist rather than a behaviourist approach to learning, or a lecture session may combine several elements, such as transmission of information, learning by doing, and discussion.

Purists may argue that it is logically inconsistent for a teacher to use methods that cross epistemological boundaries (and it may certainly be confusing for students) but teaching is essentially a pragmatic profession and teachers will do what it takes to get the job done. If students need to learn facts, principles, standard procedures or ways of doing things, before they can start an informed discussion about their meaning, or before they can start solving problems, then a teacher may well consider behaviourist methods to lay this foundation before moving to more constructivist approaches later in a course or program.

3.8.1.2 Teaching methods are not determined by technology

Secondly technology applications such as MOOCs or video recorded lectures may replicate exactly a particular teaching method or approach to learning used in the classroom. In many ways methods of teaching, theories of learning and epistemologies are independent of a particular technology or medium of delivery, although we shall see in Chapters 7, 8, 9 and 10 that technologies can be used to transform teaching, and a particular technology will in some cases further one method of teaching more easily than other methods, depending on the characteristics or 'affordances' of that technology.

Thus, teachers who are aware of not only a wide array of teaching methods, but also of learning theories and their epistemological foundation will be in a far better position to make appropriate decisions about how to teach in a particular context. Also, as we shall see, having this kind of understanding will also facilitate an appropriate choice of technology for a particular learning task or context.

3.8.2 Relating teaching methods to the knowledge and skills needed in a digital age

The main purpose of this chapter has been to enable you as a teacher to identify the classroom teaching methods that are most likely to support the development of the knowledge and skills that students or learners will need in a digital age. We still have a way to go before we have all the information and tools needed to make this decision, but we can at least have a stab at it from here, while recognising that such decisions will depend on a wide variety of factors, such as the nature of the learners and their prior knowledge and experience, the demands of particular subject areas, the institutional context in which teachers and learners find themselves, and the likely employment context for learners.

First, we can identify a number of different types of skills needed:

- conceptual skills, such as knowledge management, critical thinking, analysis, synthesis, problem-solving, creativity/innovation, experimental design;
- developmental or personal skills, such as independent learning, communications skills, ethics, networking, responsibility and teamwork;
- digital skills, embedded within and related to a particular subject or professional domain;
- manual and practical skills, such as machine or equipment operation, safety procedures, observation and recognition of data, patterns, and spatial factors.

We can also identify that in terms of content, we need teaching methods that enable students to manage information or knowledge, rather than methods that merely transmit information to students.

There are several key points for a teacher or instructor to note:

- the teacher needs to be able to identify/recognise the skills they are hoping to develop in their students;
- these skills are often not easily separated but tend to be contextually based and often integrated;
- teachers need to identify appropriate methods and contexts that will enable students to develop these skills;
- students will need practice to develop such skills;
- students will need feedback and intervention from the teacher and other students to ensure a high level of competence or mastery in the skill;
- an assessment strategy needs to be developed that recognises and rewards students' competency and mastery of such skills.

In a digital age, just choosing a particular teaching method such as seminars or apprenticeship is not going to be sufficient. It is unlikely that one method, such as transmissive lectures, or seminars, will provide a rich enough learning environment for a full range of skills to be developed within the subject area. It is necessary to provide a rich learning environment for students to develop such skills that includes contextual relevance, and opportunities for practice, discussion and feedback. As a result, we are likely to combine different methods of teaching.

Secondly, this chapter has focused mainly on classroom or campus-based approaches to teaching. In the next chapter a range of teaching methods that incorporate online/digital technologies will be examined. So it would be foolish at this stage to say that any single method, such as seminars, or apprenticeship, or nurturing, is the best method for developing the knowledge and skills needed in a digital age. At the same time, the limitations of transmissive lectures, especially if they are used as the main method for teaching, are becoming more apparent.

Activity 3.8 'Labelling' your own teaching

1. Think of what you consider in the past to have been your most successful unit of teaching (a class or a whole course). Can you identify the underlying epistemology? What theory or theories of learning would best describe how students learned in that context? What was the main teaching method(s) you used?
2. Look at one of the courses you are likely to be teaching next year. How would you change your teaching methods on that course, now you have read Chapters 1, 2 and 3?

There is no direct feedback from me on this activity as it is a reflective exercise.

Key Takeaways

This list of classroom or campus-based teaching methods is not meant to be exhaustive or comprehensive. The aim is to show that there many different ways to teach, and all are in some ways legitimate in certain circumstances. Most instructors will mix and match different methods, depending on the needs of both the subject matter and the needs of their students at a particular time. There are though some core conclusions to be drawn from this comparative review of different approaches to teaching.

1. No single method is likely to meet all the requirements teachers face in a digital age.
2. Nevertheless, some forms of teaching fit better with the development of the skills needed in a digital age. In particular, methods that focus on conceptual development, such as dialogue and discussion, knowledge management (rather than information transmission), and experiential learning in real-world contexts, are all methods more likely to develop the high level conceptual skills required in a digital age.
3. It is not just conceptual skills though that are needed. It is the combination of conceptual, practical, personal and social skills in highly complex situations that are needed. This again means combining a variety of teaching methods.
4. Nearly all of these teaching methods are media or technology independent. In other words, they can be used in classrooms or online. What matters from a learning perspective is not so much the choice of technology as the efficacy and expertise in appropriately choosing and using the teaching method.
5. Nevertheless, we shall see in the next chapter that new technologies offer new possibilities for teaching, including offering more practice or time on task, reaching out to new target groups, and increasing the productivity of both teachers and the system as a whole.

Chapter 4: Methods of teaching with an online focus

Purpose of the chapter

At the end of this chapter you should be able to:

1. Describe key approaches to the design of online teaching and learning.
2. Analyse each model in terms of its value for teaching in a digital age.
3. Decide which model or combination of models will fit best with your own teaching.
4. Use the model as a basis for designing your own teaching.

What is covered in this chapter

Also in this chapter you will find the following activities:

- Activity 4.8 Making choices

Key Takeaways

1. Traditional classroom teaching, and especially transmissive lectures, were designed for another age. Although lectures have served us well, we are now in a different age that requires different methods.

2. The key shift is towards greater emphasis on skills, particularly knowledge management, and less on memorising content. We need design models for teaching and learning that lead to the development of the skills needed in a digital age.

3. There is no one 'best' design model for all circumstances. The choice of design model needs to take account of the context in which it will be applied, but nevertheless, some design models are better than others for developing the knowledge and skills needed in a digital age. For the contexts with which I'm most associated, online collaborative learning, experiential learning and agile design best meet my criteria.

4. Design models in general are not dependent on a particular mode of delivery; they can operate in most cases as well online as in class.

5. In an increasingly volatile, uncertain, complex and ambiguous world, we need design models for teaching that are light and nimble.

Scenario D: Developing historical thinking

Signing: "Banned: Finger-guessing games, shouting games, music playing, dancing"
The lifting of the bans led to other behaviors such as drinking games that had to be banned again.
(1982 Summer Palace restaurant, Beijing)

Figure 4 D An artifact used by students in their history of Beijing, 1964-2014
Image: © zonaeuropa.com

Ralph Goodyear is a professor of history in a public research university in the central United States. He has a class of 72 undergraduate students taking HIST 305, 'Historiography'. For the first three weeks of the course, Goodyear had recorded a series of short 15 minute video lectures that covered the following topics/content:

- the various sources used by historians (e.g. earlier writings, empirical records including registries of birth, marriage and death, eye witness accounts, artifacts such as paintings, photographs, and physical evidence such as ruins);
- the themes around which historical analysis tend to be written;
- some of the techniques used by historians, such as narrative, analysis and interpretation;
- three different positions or theories about history (objectivist, marxist, post modernist).

Students downloaded the videos according to a schedule suggested by Goodyear. Students attended two one hour classes a week, where specific topics covered in the videos were discussed. Students also had an online discussion forum in the course space on the university's learning management system, where Goodyear had posted similar topics for discussion. Students were expected to make at least one substantive contribution to each online topic for which they received a mark that went towards their final grade. Students also had to read a major textbook on historiography over this three week period.

In the fourth week, he divided the class into twelve groups of six, and asked each group to research the history of any city outside the United States over the last 50 years or so. They could use whatever sources they could find, including online sources such as newspaper reports, images, research publications, and so on, as well as the university's own library collection. In writing their report, they had to do the following:

- pick a particular theme that covered the 50 years and write a narrative based around the theme;
- identify the sources they finally used in their report, and discuss why they selected some sources and dismissed others;
- compare their approach to the three positions covered in the lectures;
- post their report in the form of an online e-portfolio in the course space on the university's learning management system.

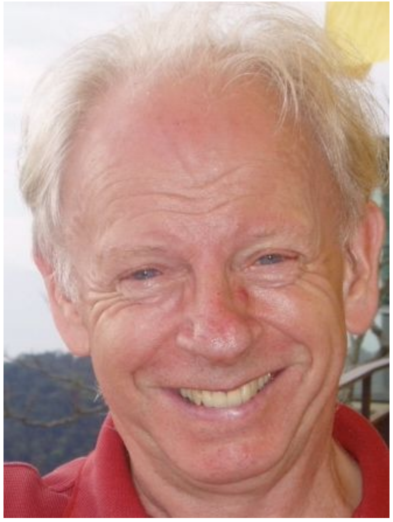
They had five weeks to do this.

The last three weeks of the course were devoted to presentations by each of the groups, with comments, discussion and questions, both in class and online (the in class presentations were recorded and made available online). At the end of the course, students assigned grades to each of the other groups' work. Goodyear took these student gradings into consideration, but reserved the right to adjust the grades, with an explanation of why he did the adjustment. Goodyear also gave each student an individual grade, based on both their group's grade, and their personal contribution to the online and class discussions.

Goodyear commented that he was surprised and delighted at the quality of the students' work. He said: 'What I liked was that the students weren't learning *about* history; they were *doing* it.'

Based on an actual case, but with some embellishments

4.1 Online learning and teaching methods



For my personal comments on some of the issues raised in this chapter, please click on the podcast below, which discusses the relationship between quality, modes of delivery, teaching methods and design.

An audio element has been excluded from this version of the text. You can listen to it online here: *https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=114*

Online learning is increasingly influencing both classroom/campus-based teaching but more importantly it is leading to new models or designs for teaching and learning.

When commercial movies were first produced, they were basically a transfer of previous music hall and vaudeville acts to the movie screen. Then along came D.W. Griffith's 'Birth of a Nation', which transformed the design of movies, by introducing techniques that were unique to cinema at the time, such as panoramic long shots, panning shots, realistic battle scenes, and what are now known as special effects.

A similar development has taken place with online learning. Initially, there were two separate influences: designs from classroom teaching; and designs inherited from print-based or multimedia distance education. Over time, though, new designs that fully exploit the unique characteristics of online learning are beginning to emerge.

What we do when we move teaching online is to change the learning environment. Thus, I am beginning to move from talking about teaching methods (which can be the same both in class and online) to design models, where the teaching method is deliberately adapted to the learning environment.

4.2 Old wine in new bottles: classroom-type online learning

Figure 4.2.1 Live video streaming of lecture Image: Planet eStream, 2019

We start with classroom teaching methods that have been moved into a technological format with little change to the overall design principles. I will argue that these are essentially old designs in new bottles.

4.2.1 Live, streamed video

This is basically a classroom lecture delivered at the time of delivery to remote students (although there may also be live students in the lecture theatre as well). The remote students may be watching on their own at home, work or in transit, or (more often) in small groups at another campus or local learning centre. There is no change in the design, although the instructor may need to make sure that the remote students are not ignored if there are questions or discussion. For an example, see here.

This is often the first step instructors take into online learning, because they do not have to do anything new other than learn how to set up and switch on the equipment. As the technology became cheaper and easier to use, the use of live streamed lectures doubled between 2016 and 2017 in Canada (Bates et al., 2018).

Some instructors require all students to be present during the live lecture in order to ensure discussion, but this can be counter-productive if the aim of going online is to increase flexibility for students. This can be countered by using an online asynchronous discussion forum in a learning management system (for more on this, see Chapter 4.4). In most cases, though, lecturers prefer also to record the live transmission so all students can access the lecture at any time (see the next section below).

4.2.2 Classes using lecture capture

This technology, which automatically records a classroom lecture, was originally designed to enhance the classroom model by making lectures available for repeat viewings online at any time for students regularly attending classes – in other words, a form of homework or revision.

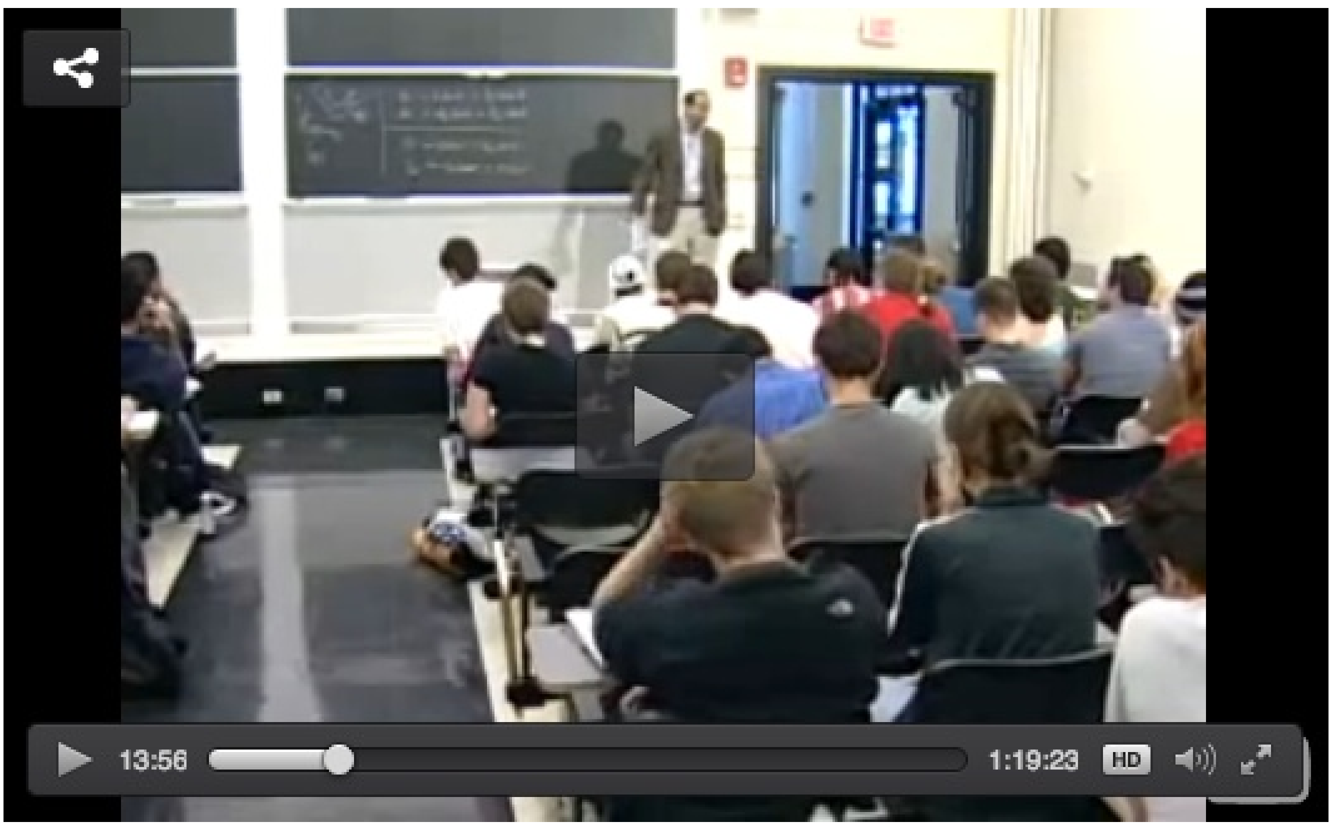


Figure 4.2.2 An MIT classroom lecture recorded and made available through MIT's OpenCourseWare. Click on image to see the lecture.

Flipped classrooms, which pre-record a lecture for students to watch on their own, followed by discussion in class, are an attempt to exploit more fully this potential. The main advantage of lecture capture is increased access, especially if students have long commutes or harsh weather to navigate. In some cases, it can reduce student drop-out dramatically. For an example of this see here.

One of the biggest impacts of lecture capture has been for ‘instructionist’ massive open online courses (xMOOCs), such as those offered by Coursera, Udacity and edX. However, even this type of MOOC is really a basic classroom design model (MOOCs are discussed in more detail in Chapter 5). The main difference with a MOOC is that in a MOOC the classroom is open to anyone – but then in principle so are many university lectures – but MOOCs are available to unlimited numbers at a distance. Thus, if an institution decided to put all its recorded lectures up on an openly accessible server or on YouTube, they would become MOOCs. Nevertheless, whether lecture captures are available only to students registered in a course or as a MOOC, the design of the teaching has not changed markedly, although increasingly lectures are recorded in smaller chunks, partly as a result of research on MOOCs (for more on this research see Chapter 8.4).

4.2.2 Courses using learning management systems

Learning management systems (LMSs) are software that enable instructors and students to log in and work within a password protected online learning environment. Most learning management systems, such as Blackboard, Desire2Learn and Moodle, are in fact used to replicate a classroom design model. They have weekly units or modules, the instructor selects and presents the material to all students in the class at the same time, a large class enrolment can be organized into smaller sections with their own instructors, there are opportunities for (online) discussion, students work through the materials at roughly the same pace, and assessment is by end-of-course tests or essays.

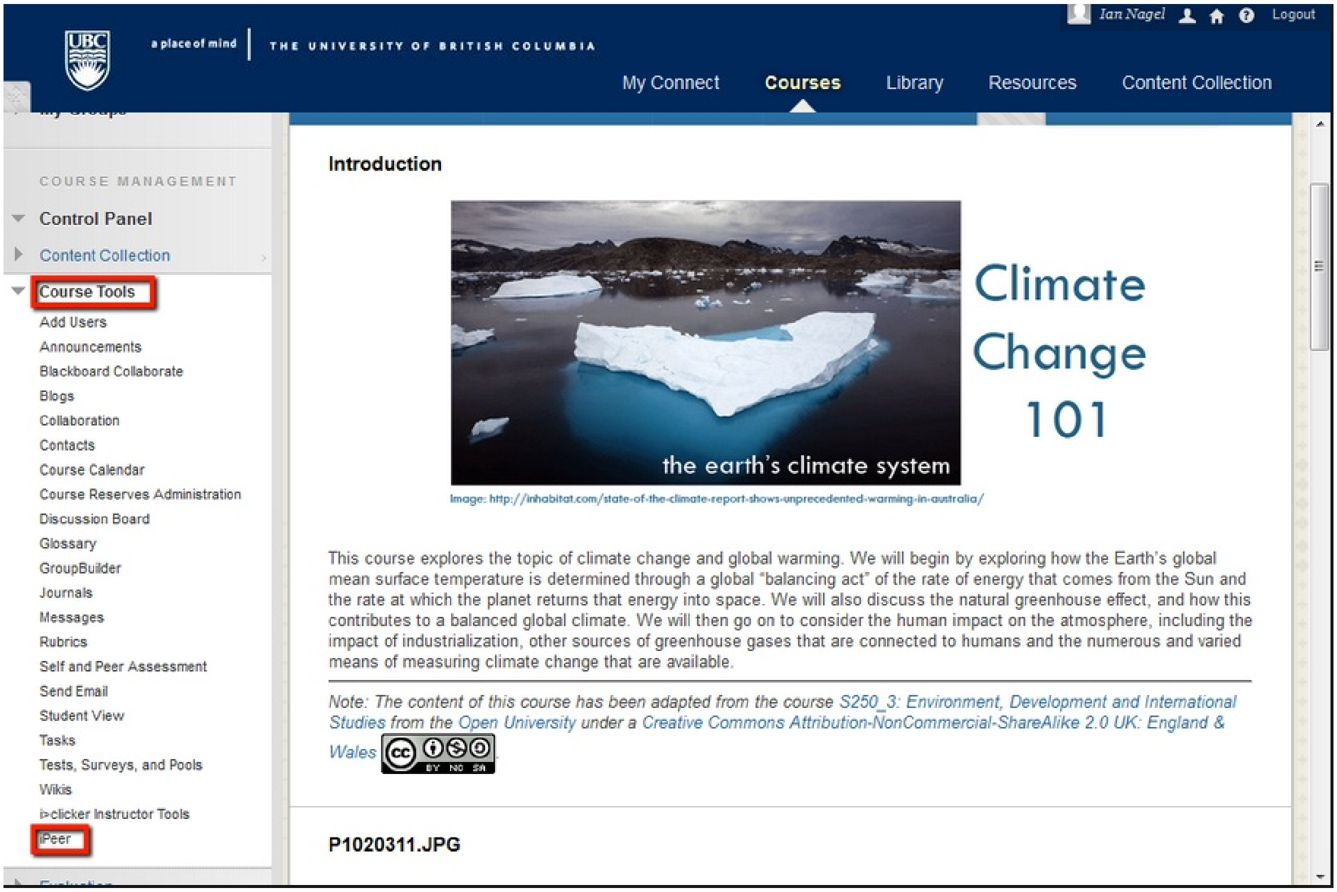


Figure 4.2.3 A screenshot of the University of British Columbia's LMS, Blackboard Connect

The main design differences are that the content is primarily text based rather than oral (although increasingly video and audio are now integrated into LMSs), the online discussion is mainly asynchronous rather than synchronous, and the course content is available at any time from anywhere with an Internet connection. These are important differences from a physical classroom, and skilled teachers and instructors can modify or adapt LMSs to meet different teaching or learning requirements (as they can in physical classrooms), but the basic organizing framework of the LMS remains the same as for a physical classroom.

Nevertheless, the LMS is still an advance over online designs that merely put lectures on the Internet as pre-recorded videos, or load up pdf copies of Powerpoint lecture notes, as is still the case unfortunately in many online programs. There is also enough flexibility in the design of learning management systems for them to be used in ways that break away from the traditional classroom model, which is important, as good online design should take account of the special requirements of online learners, so the design needs to be different from that of a classroom model.

4.2.3 The limitations of the classroom design model for online learning

Old wine can still be good wine, whether the bottle is new or not. What matters is whether classroom design meets the changing needs of a digital age. However, just adding technology to the mix, or delivering the same design online, does not automatically result in meeting changing needs.

It is important then to look at the design that makes the most of the educational affordances of new technologies, because unless the design changes significantly to take full advantage of the potential of the technology, the outcome is likely to be inferior to that of the physical classroom model which it is attempting to imitate. Thus even if the new technology, such as lecture capture and computer-based multiple-choice questions organised in a MOOC, result in helping more students memorise better or learn more content, for example, this may not be sufficient to meet the higher level skills needed in a digital age.

The second danger of just adding new technology to the classroom design is that we may just be increasing cost, both in terms of technology and the time of instructors, without changing outcomes.

The most important reason though is that students studying online are in a different learning environment or context than students learning in a classroom, and the design needs to take account of this. This will be discussed more fully in the rest of the book.

Education is no exception to the phenomenon of new technologies being used at first merely to reproduce earlier design models before they find their unique potential. However, changes to the basic design model are needed if the demands of a digital age and the full potential of new technology are to be exploited in education.

References

Bates, A. et al. (2018) *Tracking Online and Distance Education in Canadian Universities and Colleges: 2018* Halifax NS: Canadian Digital Learning Research Association

Activity 4.2 Moving the classroom model online

1. Do you agree that the classroom design model is a product of the 19th century and needs to changed for teaching in a digital age? Or is there still enough flexibility in the classroom model for our times?

2. Do you agree that courses using LMSs are basically a classroom model delivered online, or are they a unique design model in themselves. If so, what makes them unique?

3. What are the advantages and disadvantages of breaking up a 50 minute lecture into say five 10 minute chunks for recording? Would you call this a significant design change – if so, what makes it significant?

For my personal views on these three questions listen to the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=118

4.3 The ADDIE model

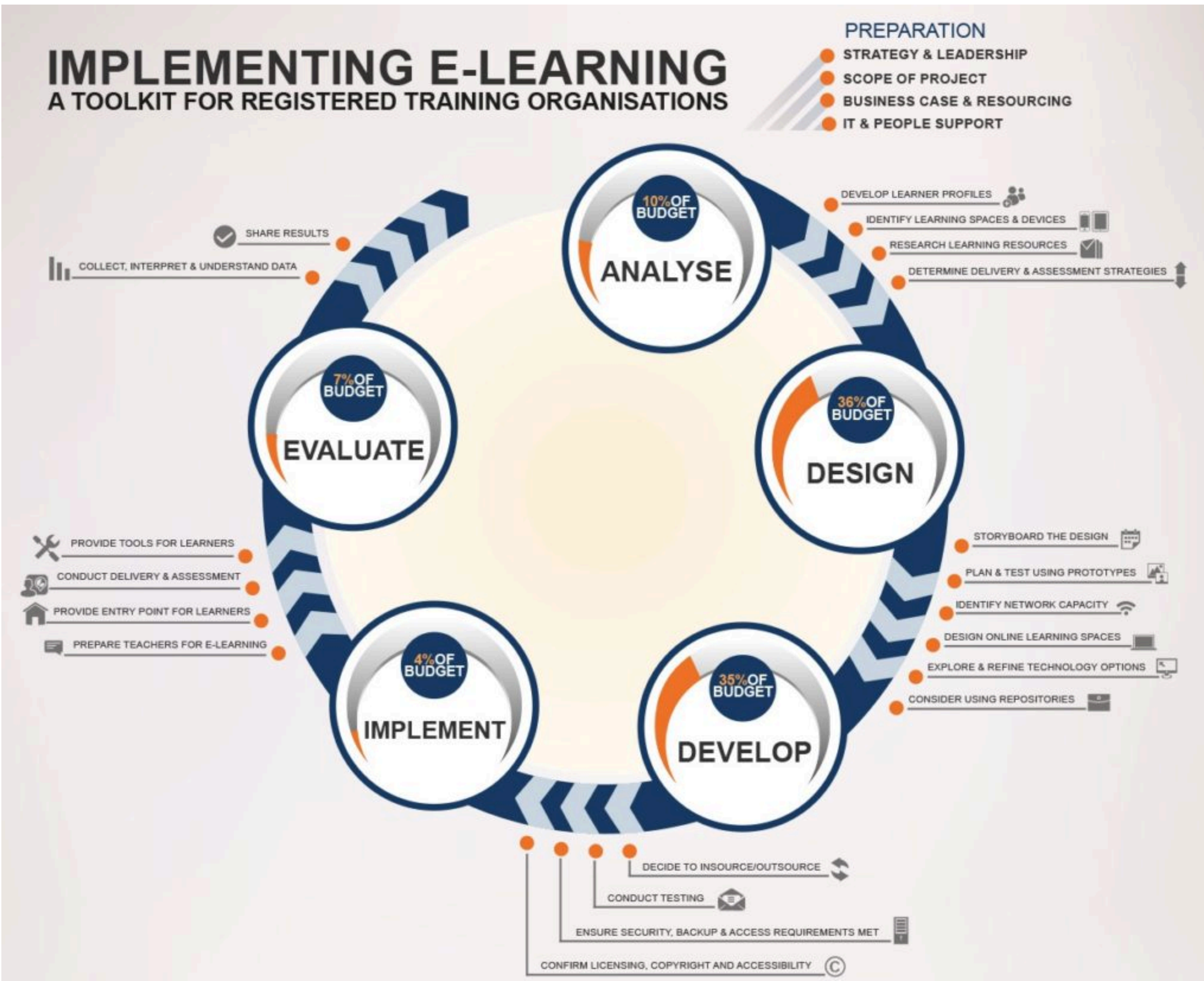


Figure 4.3.1 The ADDIE model.
© Flexible Learning Australia, 2014

There have been many books written about the ADDIE model (see for instance, Morrison, 2010; Dick and Carey, 2004). I give here just a very brief introduction.

4.3.1 What is ADDIE?

ADDIE stands for:

Analyse

- identify all the variables that need to be considered when designing the course, such as learner characteristics, learners' prior knowledge, resources available, etc. This stage is similar to the describing the learning environment outlined in Appendix 1 of this book;

Design

- this stage focuses on identifying the learning objectives for the course and how materials will be created and designed (for instance, it may include describing what content areas are to be covered and a storyboard outlining what will be covered in text, audio and video and in what order), and deciding on the selection and use of technology, such as an LMS, video or social media;

Develop

- the creation of content, including whether to develop in-house or outsource, copyright clearance for third party materials, loading of content into a web site or LMS, and so on;

Implement

- this is the actual delivery of the course, including any prior training or briefing of learner support staff, and student assessment;

Evaluate

- feedback and data is collected in order to identify areas that require improvement and this feeds into the design, development and implementation of the next iteration of the course.

4.3.2 Where is ADDIE used?

This is a design model used by many professional instructional designers for technology-based teaching. ADDIE has been almost a standard for professionally developed, high quality distance education programs, whether print-based or online. It is also heavily used in corporate e-learning and training. There are many variations on this model (my favourite is 'PADDIE', where planning and/or preparation are added at the start). The model is mainly applied on an iterative basis, with evaluation leading to re-analysis and further design and development modifications. One reason for the widespread use of the ADDIE model is that it is extremely valuable for large and complex teaching designs. ADDIE's roots go back to the Second World War and derive from system design, which was developed to manage the hugely complex Normandy landings.

Many open universities, such as the U.K. Open University and the OU of the Netherlands, Athabasca University and Thompson Rivers Open University in Canada, still make heavy use of ADDIE to manage the design of complex multi-media distance education courses. When the U.K. OU opened in

1971 with an initial intake of 20,000, it used radio, television, specially designed printed modules, text books, reproduced research articles in the form of selected readings that were mailed to students, and regional study groups, with teams of often 20 academics, media producers and technology support staff developing courses, and with delivery and learner support provided by an army of regional tutors and senior counsellors. Creating and delivering its first courses within two years of receiving its charter would have been impossible without a systematic instructional design model, and in 2014, with over 200,000 students, the OU was still using the ADDIE approach for many of its courses.

Although ADDIE and instructional design in general originated in the USA, the U.K. Open University's success in developing high quality learning materials influenced many more institutions that were offering distance education on a much smaller scale to adopt the ADDIE model, if in a more modest way, typically with a single instructor working with an instructional designer. As distance education courses became increasingly developed as online courses, the ADDIE model continued, and is now being used by instructional designers in many institutions for the re-design of large lecture classes, hybrid learning, and for fully online courses.

4.4.3 What are the benefits of ADDIE?

One reason it has been so successful is that it is heavily associated with good quality design, with clear learning objectives, carefully structured content, controlled workloads for faculty and students, integrated media, relevant student activities, and assessment strongly tied to desired learning outcomes. Although these good design principles can be applied with or without the ADDIE model, ADDIE is a model that allows these design principles to be identified and implemented on a systematic and thorough basis. It is also a very useful management tool, allowing for the design and development of large numbers of courses to a standard high quality.

4.4.5 What are the limitations of ADDIE?

The ADDIE approach can be used with any size of teaching project, but works best with large and complex projects. Applied to courses with small student numbers and a deliberately simple or traditional classroom design, it becomes expensive and possibly redundant, although there is nothing to stop an individual teacher following this strategy when designing and delivering a course.

A second criticism is that the ADDIE model is what might be called 'front-end loaded' in that it focuses heavily on content design and development, but does not pay as much attention to the interaction between instructors and students during course delivery. Thus it has been criticised by constructivists for not paying enough attention to learner-instructor interaction, and for privileging more behaviourist approaches to teaching.

Another criticism is that while the five stages are reasonably well described in most descriptions of the model, the model does not provide guidance on how to make decisions within that framework. For instance, it does not provide guidelines or procedures for deciding *how* to choose between different media, or *what* assessment strategies to use. Instructors have to go beyond the ADDIE framework to make these decisions.

The over-enthusiastic application of the ADDIE model can result in overly complex design stages, with many different categories of workers (faculty, instructional designers, editors, web designers) and consequently a strong division of labour, resulting in courses taking up to two years from initial approval to actual delivery. The more complex the design and management infrastructure, the more opportunities there are for cost over-runs and very expensive programming. It is a very good example of the industrial approach to course design.

My main criticism though is that the model is too inflexible for the digital age. How does a teacher respond to rapidly developing new content, new technologies or apps being launched on a daily basis, to a constantly changing student base? Although the ADDIE model has served us well in the past, and provides a good foundation for designing teaching and learning, it can be too pre-determined, linear and inflexible to handle more volatile learning contexts. I will discuss more flexible models for design in Section 4.7.

References

Dick, W., and Carey, L. (2004). *The Systematic Design of Instruction* Allyn & Bacon; 6 edition Allyn & Bacon

Morrison, Gary R. (2010) *Designing Effective Instruction, 6th Edition* New York: John Wiley & Sons

Activity 4.3 Using the ADDIE model

1. Take a course you are currently offering. How many of the stages of the ADDIE model did you go through? If you missed out on some of the stages, do you think the course would have been better if you had included these stages? Given the amount of work needed to work through each of the stages, do you think the results would be worth the effort?

2. If you are thinking of designing a new course, use the Flexible Learning Australia infographic to work through the four steps of analysis they recommend. Was this helpful? If so, you might want to continue with the other recommended steps.

3. If you have previously used the ADDIE model, are you happy with it? Do you agree with my criticisms? Is it flexible enough for the context in which you are working?

I do not provide feedback on these questions as they are for you to think about based on your own experience.

4.4 Online collaborative learning

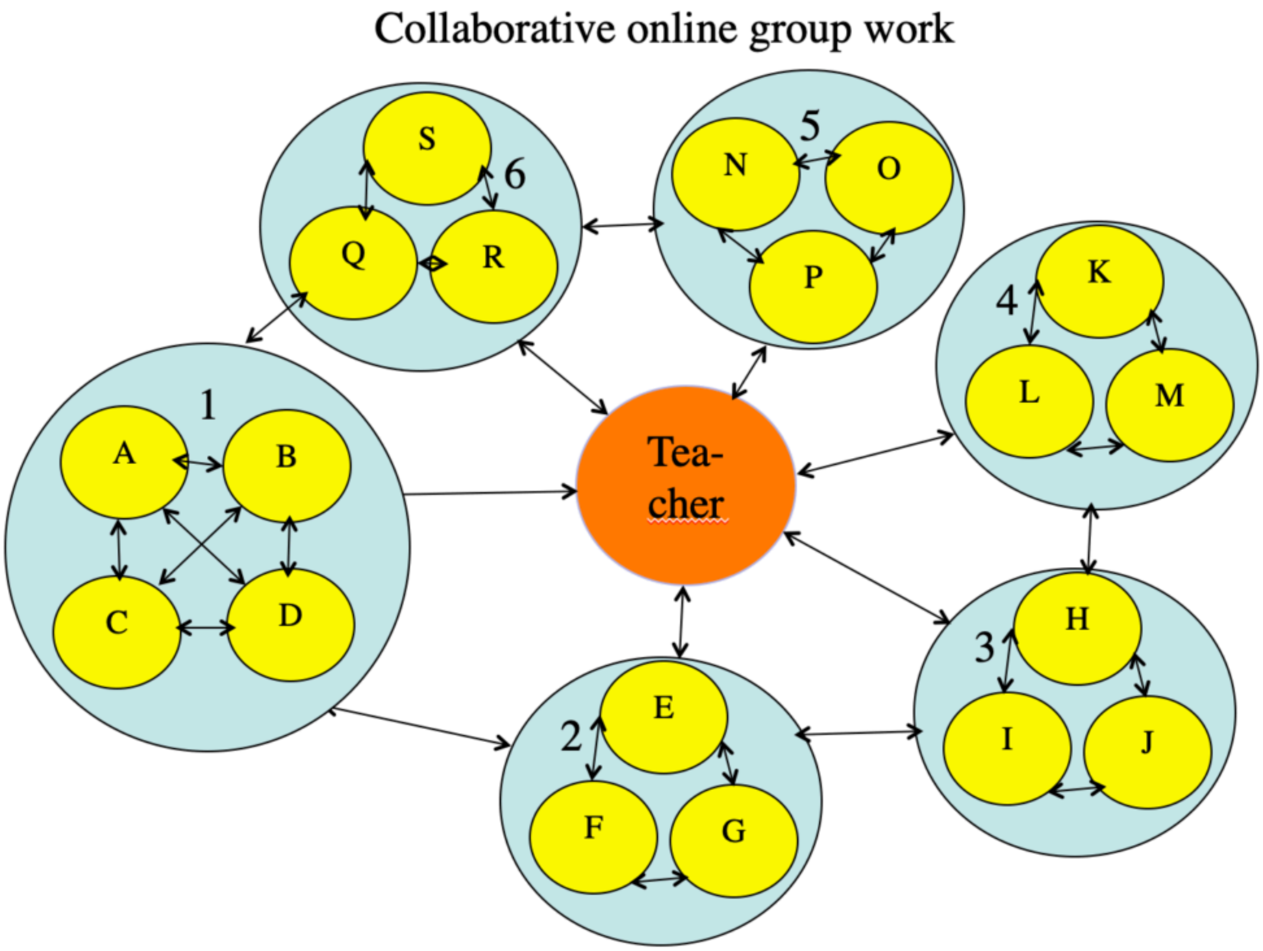


Figure 4.4.1. Collaborative group work. In this example the teacher has organized a class of 19 students into six groups. The teacher can interact with individual students or with each group as a whole. In online collaborative learning each group can have its own discussion area which can be 'closed' (except to the teacher) or open to the other students. In this model, all communication is textual, over the Internet, using online discussion forum software. However, the model could be applied to video-conferencing, but usually with smaller numbers of students due to bandwidth restrictions, or to classroom teaching. Each mode of delivery though will need its own variations in design for it to work well. Image: Tony Bates, 2019.

4.4.1 What is online collaborative learning?

The concurrence of both constructivist approaches to learning and the development of the Internet has led to the development of a particular form of constructivist teaching, originally called computer-mediated communication (CMC), or networked learning, but which has been developed into what Harasim (2017) now calls online collaborative learning theory (OCL). She describes OCL as follows (p. 90):

> *OCL theory provides a model of learning in which students are encouraged and supported to work together to create knowledge: to invent, to explore ways to innovate, and, by so doing, to seek the conceptual knowledge needed to solve problems rather than recite what they think is the right answer. While OCL theory does encourage the learner to be active and engaged, this is not considered to be sufficient for learning or knowledge construction……In the OCL theory, the teacher plays a key role not as a fellow-learner, but as the link to the knowledge community, or state of the art in that discipline. Learning is defined as conceptual change and is key to building knowledge. Learning activity needs to be informed and guided by the norms of the discipline and a discourse process that emphasises conceptual learning and builds knowledge.*

OCL builds on and integrates theories of cognitive development that focus on conversational learning (Pask, 1975), conditions for deep learning (Marton and Saljø, 1997; Entwistle, 2000), development of academic knowledge (Laurillard, 2001), and knowledge construction (Scardamalia and Bereiter, 2006).

From the very early days of online learning, some instructors have focused heavily on the communication affordances of the Internet (see for instance, Hiltz and Turoff, 1978). They have based their teaching on the concept of knowledge construction, the gradual building of knowledge mainly through asynchronous online discussion among students and between students and an instructor.

Online discussion forums go back to the 1970s, but really took off as a result of a combination of the invention of the WorldWide Web in the 1990s, high speed Internet access, and the development of learning management systems, most of which now include an area for online discussions. These online discussion forums have some differences though with classroom seminars:

- first, they are text based, not oral;
- second, they are asynchronous: participants can log in at any time, and from anywhere with an Internet connection;
- third, many discussion forums allow for 'threaded' connections, enabling a response to be attached to the particular comment which prompted the response, rather than just displayed in chronological order. This allows for dynamic sub-topics to be developed, with sometimes more than ten responses within a single thread of discussion. This enables participants to follow multiple discussion topics over a period of time.

4.4.2 Core design principles of OCL

Harasim emphasises the importance of three key phases of knowledge construction through discourse:

- **idea generating**: this is literally brainstorming, to collect the divergent thinking within a group;

- **idea organising:** this is where learners compare, analyse and categorise the different ideas previously generated, again through discussion and argument;
- i**ntellectual convergence:** the aim here is to reach a level of intellectual synthesis, understanding and consensus (including agreeing to disagree), usually through the joint construction of some artefact or piece of work, such as an essay or assignment.

This results in what Harasim calls a Final Position, although in reality the position is never final because for a learner, once started, the process of generating, organising and converging on ideas continues at an ever deeper or more advanced level. The role of the teacher or instructor in this process is seen as critical, not only in facilitating the process and providing appropriate resources and learner activities that encourage this kind of learning, but also, as a representative of a knowledge community or subject domain, in ensuring that the core concepts, practices, standards and principles of the subject domain are fully integrated into the learning cycle.

Harasim provides the following diagram to capture this process:

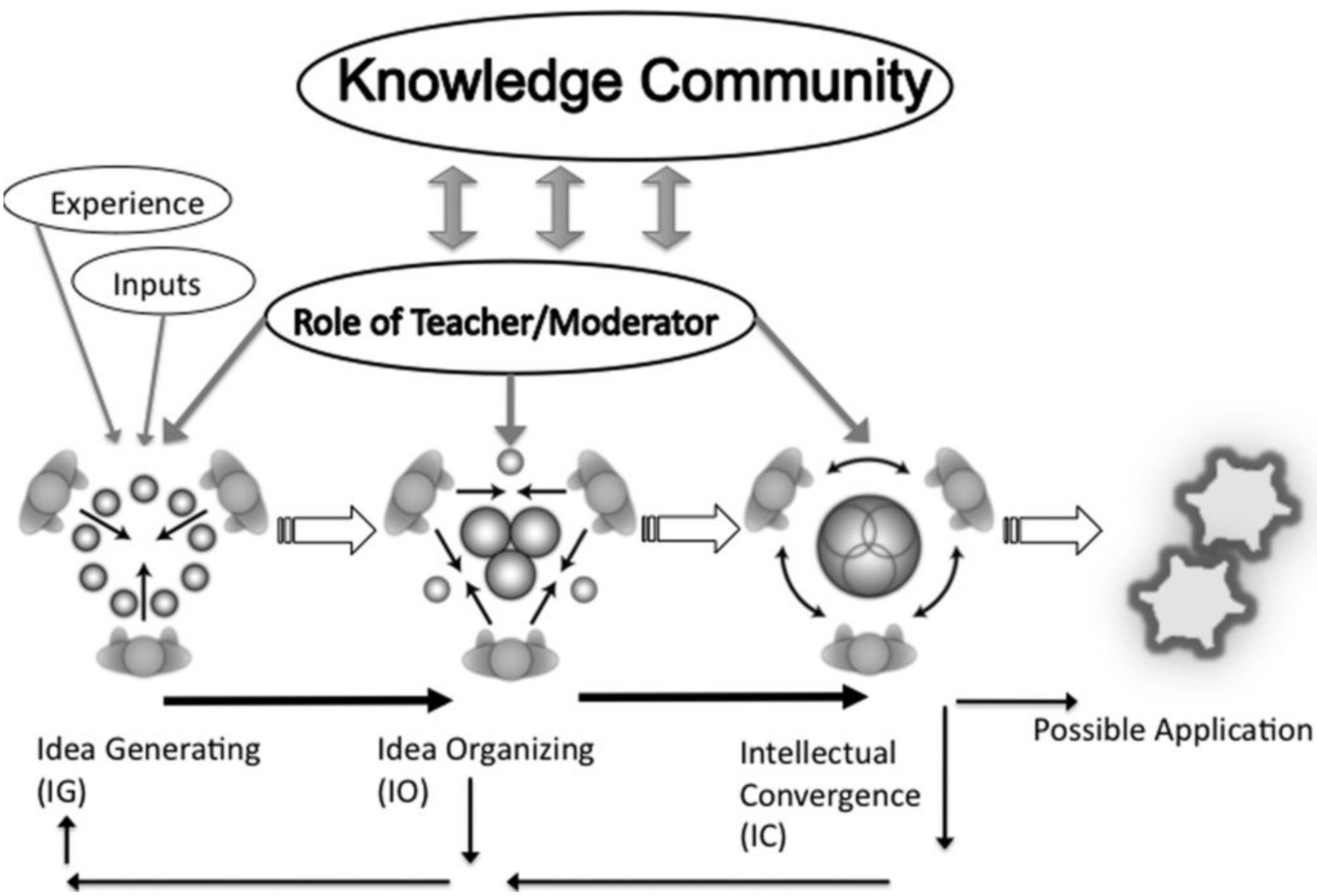


Figure 4.4.2: Harasim's pedagogy of group discussion (from Harasim, 2017, p. 95, with permission)

Another important factor is that in the OCL model, discussion forums are not an addition or supplement to core teaching materials, such as textbooks, recorded lectures, or text in an LMS, but are the core component of the teaching. Textbooks, readings and other resources are chosen to support the discussion, not the other way round.

This is a key design principle, and explains why often instructors or tutors complain, in more 'traditional' online courses, that students don't participate in discussions. Often this is because where online discussions are secondary to more didactic teaching, or are not deliberately designed and managed to lead to knowledge construction, students see the discussions as optional or extra work, because they have no direct impact on grades or assessment.

It is also a reason why awarding grades for participation in discussion forums misses the point. It is not the extrinsic activity that counts, but the intrinsic value of the discussion, that matters (see, for instance, Brindley, Walti and Blashke, 2009). Thus although instructors using an OCL approach may use learning management systems for convenience, they are used differently from courses where traditional didactic teaching is moved online.

4.4.3 Community of Inquiry

The Community of Inquiry Model (CoI) is somewhat similar to the OCL model. As defined by Garrison, Anderson and Archer (2000):

> *An educational community of inquiry is a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual understanding.*

Garrison, Anderson and Archer argue that there are three essential elements of a community of inquiry:

- **social presence:** is *"the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities."*
- **teaching presence:** is "*the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes*"
- **cognitive presence:** is *"the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse*".

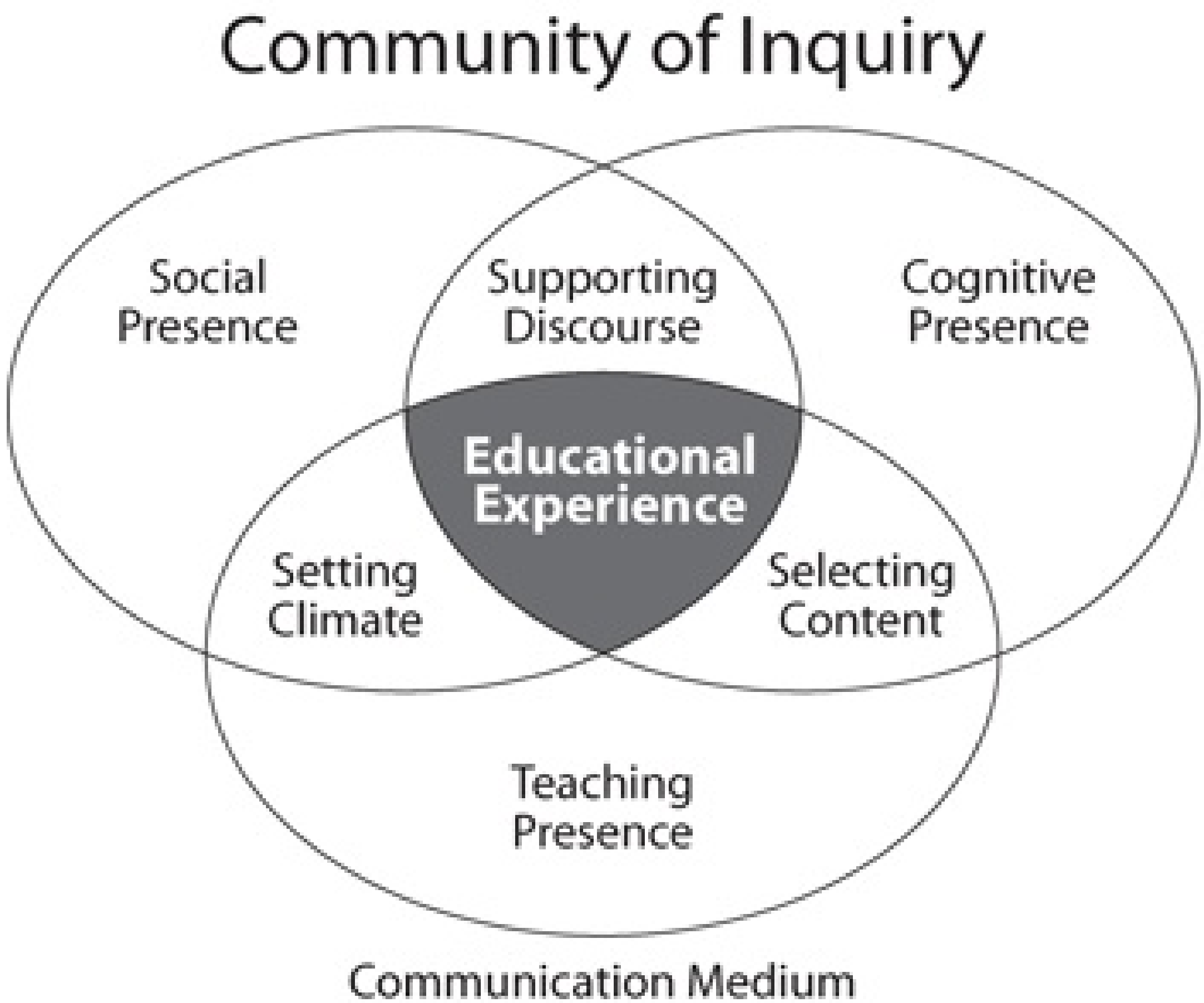


Figure 4.4.3: Community of Inquiry Image: © Terry Anderson/Marguerite Koole, 2013

However, CoI is more of a theory than a model, since it does not indicate what activities or conditions are needed to create these three 'presences'. The two models (OCL and CoI) are also more complementary rather than competing.

4.4.4 Developing meaningful online discussion

Since the publication of the original CoI paper in 2000, there have been a number of studies that have identified the importance of these 'presences' within especially online learning (click here for a wide selection). Although there has been a wide range of researchers and educators engaged in the area of online collaborative learning and communities of inquiry, there is a high degree of convergence and agreement about successful strategies and design principles. For academic and conceptual development, discussions need to be well organized by the teacher, and the teacher needs to provide the necessary support to enable the development of ideas and the construction of new knowledge for the students.

Partly as a result of this research, and partly as the result of experienced online instructors who have not necessarily been influenced by either the OCL or the Community of Inquiry literature, several other design principles have been associated with successful (online) discussion, such as:

- **appropriate technology** (for example, software that allows for threaded discussions);
- **clear guidelines on student online behaviour,** such as written codes of conduct for participating in discussions, and ensuring that they are enforced;
- **student orientation and preparation**, including technology orientation and explaining the purpose of discussion;
- **clear goals** for the discussions that are understood by the students, such as: 'to explore gender and class issues in selected novels' or 'to compare and evaluate alternative methods of coding';
- **choice of appropriate topics,** that complement and expand issues in the study materials, and are relevant to answering assessment questions;
- **setting an appropriate 'tone' or requirements for discussion** (for example, respectful disagreement, evidence-based arguments);
- **defining clearly learner roles and expectations,** such as 'you should log in at least once a week to each discussion topic and make at least one substantive contribution to each topic each week';
- **monitoring the participation of individual learners, and responding accordingly,** by providing the appropriate scaffolding or support, such as comments that help students develop their thinking around the topics, referring them back to study materials if necessary, or explaining issues when students seem to be confused or misinformed;
- **regular, ongoing instructor 'presence',** such as monitoring the discussions to prevent them getting off topic or too personal, and providing encouragement for those that are making real contributions to the discussion, heading off those that are trying to hog or dominate the discussions, and tracking those not participating, and helping them to participate;
- **ensuring strong articulation between discussion topics and assessment**.

These issues are discussed in more depth by Salmon (2000); Bates and Poole (2003); and Paloff and Pratt (2005; 2007).

4.4.5 Cultural and epistemological issues

Students come to the educational experience with different expectations and backgrounds. As a result there are often major cultural differences in students with regard to participating in discussion-based collaborative learning that in the end reflect deep differences with regard to traditions of learning and teaching. Thus teachers need to be aware that there are likely to be students in any class who may be struggling with language, cultural or epistemological issues, but in online classes, where students can come from anywhere, this is a particularly important issue.

In many countries, there is a strong tradition of the authoritarian role of the teacher and the transmission of information from the teacher to the student. In some cultures, it would be considered disrespectful to challenge or criticize the views of teachers or even other students. In an authoritarian, teacher-based culture, the views of other students may be considered irrelevant or unimportant. Other cultures have a strong oral tradition, or one based on story-telling, rather than on direct instruction.

Online environments then can present real challenges to students when a constructivist approach to the design of online learning activities is adopted. This may mean taking specific steps to help students who are unfamiliar with a constructivist approach to learning, such as asking a student to send drafts to the instructor by e-mail for approval before posting a 'class' contribution. For a fuller discussion of cross-cultural issues in online learning, see Jung and Gunawardena (2014) and the journal Distance Education, Vol. 22, No. 1 (2001), the whole edition of which is devoted to papers on this topic.

4.4.6 Strengths and weaknesses of online collaborative learning

This approach to the use of technology for teaching is very different from the more objectivist approaches found in computer-assisted learning, teaching machines, and artificial intelligence applications to education, which primarily aim to use computing to replace at least some of the activities traditionally done by human teachers. With online collaborative learning, the aim is not to replace the teacher, but to use the technology primarily to increase and improve communication between teacher and learners, with a particular approach to the development of learning based on knowledge construction assisted and developed through social discourse. This social discourse furthermore is not random, but managed in such a way as to 'scaffold' learning:

- by assisting with the construction of knowledge in ways that are guided by the instructor;
- that reflect the norms or values of the discipline;
- that also respect or take into consideration the prior knowledge within the discipline.

Thus there are two main strengths of this model:

- when applied appropriately, online collaborative learning can lead to deep, academic learning, or transformative learning, as well as, if not better than, discussion in campus-based classrooms. The asynchronous and recorded 'affordances' of online learning more than compensate for the lack of physical cues and other aspects of face-to-face discussion;
- online collaborative learning as a result can also directly support the development of a range of high level intellectual skills, such as critical thinking, analytical thinking, synthesis, and evaluation, which are key requirements for learners in a digital age.

There are though some limitations:

- it does not scale easily, requiring highly knowledgeable and skilled instructors, and a limited number of learners per instructor;
- it is more likely to accommodate to the epistemological positions of faculty and instructors in humanities, social sciences, education and some areas of business studies and health and

conversely it is likely to be less accommodating to the epistemological positions of faculty in science, computer science and engineering. However, if combined with a problem-based or inquiry-based approach, it might have acceptance even in some of the STEM subject domains.

4.4.7 Summary

Many of the strengths and challenges of collaborative learning apply both in face-to-face or online learning contexts. It could be argued that there is no or little difference between online collaborative learning and well-conducted traditional classroom, discussion-based teaching. Although there are necessary adaptations depending on the mode of delivery, many of the core principles of successful collaborative learning (see Barkley, Major and Cross, 2014) will apply in both online and face-to-face teaching. Once again, we see that the mode of delivery is less important than the design model, which can work well in both contexts. Indeed, it is possible to conduct successful collaborative learning synchronously or asynchronously, at a distance or face-to-face.

However, there is plenty of evidence that collaborative learning can be done just as well online, which is important, given the need for more flexible models of delivery to meet the needs of a more diverse student body in a digital age. Also, the necessary conditions for success in teaching this way are now well known, even though they are not always universally applied.

References

Barkley, E., Major, C.H., and Cross, K.P. (2017) *Collaborative Learning Techniques* San Francisco: Jossey-Bass/Wiley

Bates, A. and Poole, G. (2003) *Effective Teaching with Technology in Higher Education: Foundations for Success* San Francisco: Jossey-Bass

Brindley, J., Walti, C. and Blashke, L. (2009) Creating Effective Collaborative Learning Groups in an Online Environment International Review of Research in Open and Distance Learning, Vol. 10, No. 3

Entwistle, N. (2000) *Promoting deep learning through teaching and assessment: conceptual frameworks and educational contexts* Leicester UK: TLRP Conference

Garrison, R., Anderson, A. and Archer, W. (2000) Critical Inquiry in a Text-based Environment: Computer Conferencing in Higher Education The Internet and Higher Education, Vol. 2, No. 3

Harasim, L. (2017) *Learning Theory and Online Technologies 2nd edition* New York/London: Taylor and Francis

Hiltz, R. and Turoff, M. (1978) *The Network Nation: Human Communication via Computer* Reading MA: Addison-Wesley

Jung, I. and Gunawardena, C. (eds.) (2014) *Culture and Online Learning: Global Perspectives and Research* Sterling VA: Stylus

Laurillard, D. (2001) *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies* New York/London: Routledge

Marton, F. and Saljö, R. (1997) Approaches to learning, in *Marton, F., Hounsell, D. and Entwistle, N. (eds.) The experience of learning: Edinburgh: Scottish Academic Press* (out of press, but available online)

Paloff, R. and Pratt, K. (2005) *Collaborating Online: Learning Together in Community* San Francisco: Jossey-Bass

Paloff, R. and Pratt, K. (2007) *Building Online Learning Communities: Effective Strategies for the Virtual Classroom* San Francisco: Jossey-Bass

Pask, G. (1975) *Conversation, Cognition and Learning* Amsterdam/London: Elsevier (out of press, but available online here)

Salmon, G. (2000) *e-Moderating: The Key to Teaching and Learning Online* London: Taylor and Francis

Scardamalia, M. and Bereiter, C. (2006) Knowledge Building: Theory, pedagogy and technology in Sawyer, K. (ed.) *Cambridge Handbook of the Learning Sciences* New York: Cambridge University Press

Activity 4.4: Evaluating online collaborative learning models

1. Can you see the differences between 'Open Collaborative Learning' (OCL) and 'Communities of Inquiry'? Or are they really the same model with different names?

2. Do you agree that either of these models can be applied just as successfully online or face-to-face?

3. Do you see other strengths or weaknesses with these models?

4. Is this common sense dressed up as theory?

5. Does it make sense to apply either of these models to courses in the quantitative sciences such as physics or engineering? If so, under what conditions?

For my comments on these questions, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: *https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=125*

4.5 Competency-based learning

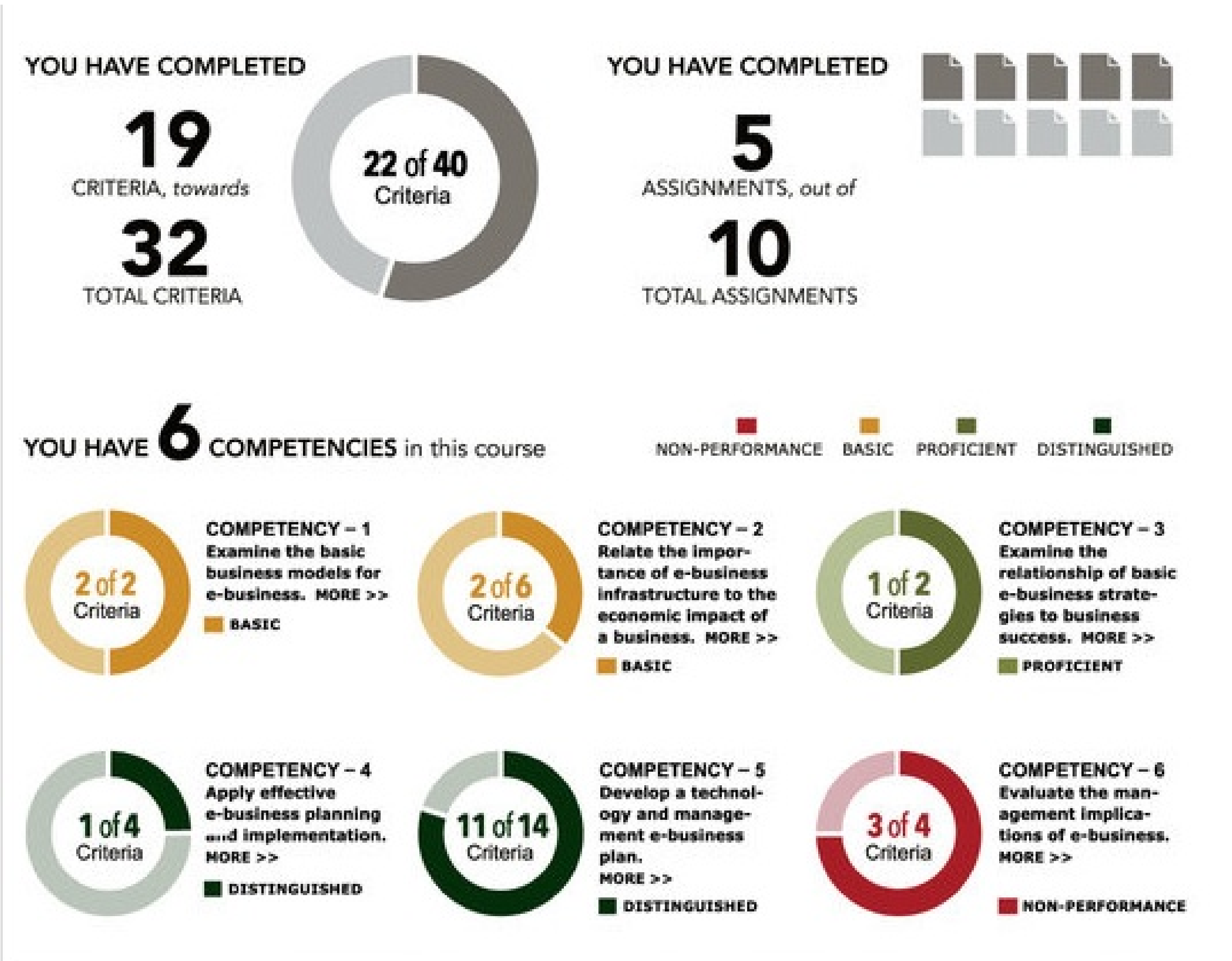


Figure 4.5.1 e-Commerce business course competencies, Capella University

4.5.1 What is competency-based learning?

Competency-based learning begins by identifying specific competencies or skills, and enables learners to develop mastery of each competency or skill at their own pace, usually working with a mentor. Learners can develop just the competencies or skills they feel they need (for which increasingly they may receive a ‘badge’ or some form of validated recognition), or can combine a whole set of competencies into a full qualification, such as a certificate, diploma or increasingly a full degree.

Learners work individually, usually online, rather than in cohorts. If learners can demonstrate that they already have mastery of a particular competency or skill, through a test or some form of prior learning assessment, they may be allowed to move to the next level of competency without having to repeat a prescribed course of study for the prior competency. Competency-based learning attempts to break away from the regularly scheduled classroom model, where students study the same subject matter at the same speed in a cohort of fellow students.

The value of competency-based learning for developing practical or vocational skills or competencies is more obvious, but increasingly competency-based learning is being used for education requiring more abstract or academic skills development, sometimes combined with other cohort-based courses or programs.

4.5.2 Who uses competency-based learning?

The Western Governors University in the USA, with nearly 40,000 students, has pioneered competency-based learning, but, with the more recent support of the Federal Department of Education, competency-based learning is expanding rapidly in the USA. Other institutions making extensive use of competency-based learning are Southern New Hampshire University through its College for America, designed specifically for working adults and their employers, Northern Arizona University, and Capella University.

Competency-based learning is particularly appropriate for adult learners with life experience who may have developed competencies or skills without formal education or training, for those who started school or college and dropped out and wish to return to formal study, but want their learning ‘after school’ to be recognized, or for those learners wanting to develop specific skills but not wanting a full program of studies. Competency-based learning can be delivered through a campus program, but it is increasingly delivered fully online, because many students taking such programs are already working or seeking work, and because technology enables each student a distinct pathway through content based on their prior knowledge.

4.5.3 Designing competency-based learning

There are various approaches, but the Western Governors’ model illustrates many of the key steps.

4.5.3.1 Defining competencies

A feature of most competency-based programs is a partnership between employers and educators in identifying the competencies required, at least at a high level. Some of the skills outlined in Chapter 1, such as problem-solving or critical thinking, may be considered high-level, but competency-based learning tries to break down abstract or vague goals into specific, measurable competencies.

For instance, at Western Governors University (WGU), for each degree, a high-level set of competencies is defined by the University Council, and then a working team of contracted subject matter experts takes the ten or so high level competencies for a particular qualification and breaks them down into about 30 more specific competencies, around which are built online courses to develop mastery of each competency. Competencies are based upon what graduates are supposed to know in the workplace and as professionals in a chosen career. Assessments are designed specifically to assess the mastery of each competency; thus students receive either a pass/no pass following assessment. A degree is awarded when all 30 specified competencies are successfully achieved.

Defining competencies that meet the needs of students and employers in ways that are progressive (in that one competency builds on earlier competencies and leads to more advanced competencies) and coherent (in that the sum of all the competencies produces a graduate with all the knowledge and skills required within a business or profession) is perhaps the most important and most difficult part of competency-based learning.

4.5.3.2 Course and program design

At WGU, courses are created by in-house subject matter experts selecting existing online curriculum from third parties and/or resources such as e-textbooks through contracts with publishers. Increasingly open educational resources are used. WGU does not use a learning management system but a specially designed portal for each course. E-textbooks are offered to students without extra cost to the student, through contracts between WGU and the publishers. Courses are pre-determined for the student with no electives. Students are admitted on a monthly basis and work their way through each competency at their own pace.

Students who already possess competencies may accelerate through their program in two ways: transferring in credits from a previous associate degree in appropriate areas (e.g. general education, writing); or by taking exams when they feel they are ready.

4.5.3.3 Learner support

Again this varies from institution to institution. WGU currently employs approximately 750 faculty who act as mentors. There are two kinds of mentors: ‘student’ mentors and ‘course’ mentors. Student mentors, who have qualifications within the subject domain, usually at a masters level, are in at least bi-weekly telephone contact with their students, depending on the needs of the student in working through their courses, and are the main contact for students. A student mentor is responsible for roughly 85 students. Students start with a mentor from their first day and stay with their mentor until graduation. Student mentors assist students in determining and maintaining an appropriate pace of study, and step in with help when students are struggling.

Course mentors are more highly qualified, usually with a doctorate, and provide extra support for students when needed. Course mentors will be available to between 200-400 students at a time, depending on the subject requirement.

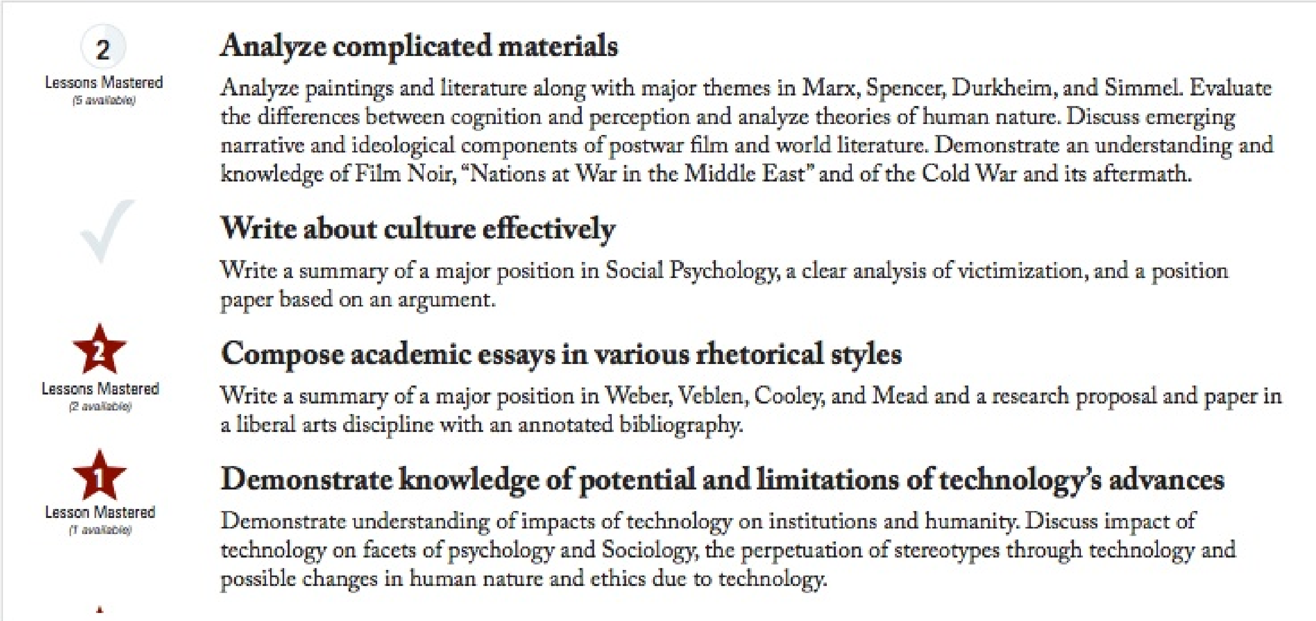
Students may contact either student or course mentors at any time (unlimited access) and mentors are expected to deal with student calls within one business day. Mentors are full-time but work flexible hours, usually from home. Mentors are reasonably well paid, and receive extensive training in mentoring.

4.5.3.4 Assessment

WGU uses written papers, portfolios, projects, observed student performance and computer-marked assignments as appropriate, with detailed rubrics. Assessments are submitted online and if they require human evaluation, qualified graders (subject matter experts trained by WGU in assessment) are randomly assigned to mark work on a pass/fail basis. If students fail, the graders provide feedback on the areas where competency was not demonstrated. Students may resubmit if necessary.

Figure 4.5.2 Remote proctoring of exams at Western Governors' University

Students will take both formative (pre-assessment) and summative (proctored) exams. WGU is increasingly using online proctoring, enabling students to take an exam at home under video supervision, using facial recognition technology to ensure that the registered student is taking the exam. In areas such as teaching and health, student performance or practice is assessed in situ by professionals (teachers, nurses).



2
Lessons Mastered
(5 available)

Analyze complicated materials

Analyze paintings and literature along with major themes in Marx, Spencer, Durkheim, and Simmel. Evaluate the differences between cognition and perception and analyze theories of human nature. Discuss emerging narrative and ideological components of postwar film and world literature. Demonstrate an understanding and knowledge of Film Noir, "Nations at War in the Middle East" and of the Cold War and its aftermath.

Write about culture effectively

Write a summary of a major position in Social Psychology, a clear analysis of victimization, and a position paper based on an argument.

2
Lessons Mastered
(2 available)

Compose academic essays in various rhetorical styles

Write a summary of a major position in Weber, Veblen, Cooley, and Mead and a research proposal and paper in a liberal arts discipline with an annotated bibliography.

1
Lesson Mastered
(1 available)

Demonstrate knowledge of potential and limitations of technology's advances

Demonstrate understanding of impacts of technology on institutions and humanity. Discuss impact of technology on facets of psychology and Sociology, the perpetuation of stereotypes through technology and possible changes in human nature and ethics due to technology.

Figure 4.5.3 Example transcript from Northern Arizona University

4.5.4 Strengths and weaknesses

Proponents have identified a number of strengths in the competency-based learning approach:

- it meets the immediate needs of businesses and professions; students are either already working, and receive advancement within the company, or if unemployed, are more likely to be employed once qualified;
- it enables learners with work or family commitments to study at their own pace;
- for some students, it speeds up time to completion of a qualification by enabling prior learning to be recognized;
- students get individual support and help from their mentors;
- tuition fees are affordable (US$6,000 per annum at WGU) and programs can be self-funding from tuition fees alone, since WGU uses already existing study materials and increasingly open educational resources;
- competency-based education is being recognized as eligible for Federal loans and student aid in the USA.

Consequently, institutions such as WGU, the University of Southern New Hampshire, and Northern Arizona University, using a competency-based approach, at least as part of their operations, have seen annual enrolment growth in the range of 30-40 per cent per annum.

Its main weakness is that it works well with some learning environments and less well with others. In particular:

- it focuses on immediate employer needs and is less focused on preparing learners with the flexibility needed for a more uncertain future;

- it does not suit subject areas where it is difficult to prescribe specific competencies or where new skills and new knowledge need to be rapidly accommodated;
- it takes an objectivist approach to learning; constructivists would argue that skills are not either present or absent (pass or fail), but have a wide range of performance and continue to develop over time;
- it ignores the importance of social learning;
- it will not fit the preferred learning styles of many students.

A 2015 report by EAB, a private educational consultancy, identified three 'myths' about about competency-based education:

- high demand: in fact EAB reported a lack of demand from students or employers
- faster and cheaper for students: in fact it is difficult for students, especially working adults, to complete competencies fast enough for there to be savings over conventional programs
- cheaper for institutions: in fact, because of the need for new systems such as on-demand registration, and different reporting for government financial aid, institutional costs are often higher than anticipated

4.5.5 In conclusion

Competency-based learning is a relatively new approach to learning design which is proving increasingly popular with employers and suits certain kinds of learners such as adults seeking to re-skill or searching for mid-level jobs requiring relatively easily identifiable skills. It does not suit though all kinds of learners and may be limited in developing the higher level, more abstract knowledge and skills requiring creativity, high-level problem-solving and decision-making and critical thinking.

Further reading

At the time of writing, there is comparatively little literature and even less research on competency-based learning compared with most other teaching approaches. It is also an area that has recently evolved from earlier, more training-focused approaches to competency. I have therefore limited myself to more recent publications. The following publications are recommended for those who would like to pursue this area further:

Book, P. (2014) *All Hands on Deck: Ten Lessons from Early Adopters of Competency-based Education* Boulder CO: WCET

Cañado, P. and Luisa, M. (eds.) (2013) *Competency-based Language Teaching in Higher Education* New York: Springer

EAB (2015) *Three Myths About Competency-Based Education* Washington DC: Education Advisory Board

Garrett, R. and Lurie, H. (2016) *Deconstructing CBE: An Assessment of Institutional Activity, Goals and Challenges in Higher Education* Boston MA: Ellucian/Eduventures

Rothwell, W. and Graber, J. (2010) *Competency-Based Training Basics* Alexandria VA: ADST

Weise, M. (2014) Got Skills? Why Online Competency-Based Education Is the Disruptive Innovation for Higher Education *EDUCAUSE Review*, November 10

The Southern Regional Educational Board in the USA has a comprehensive Competency-based Learning Bibliography

Activity 4.5 Thinking about competency-based education?

1. What factors are likely to influence you to adopt a competency-based approach to teaching? Could you describe a scenario where you could use this approach effectively?

2. What are the advantages and disadvantages of students studying individually, rather than in a cohort? What skills are they likely to miss out on through individual study?

3. Is competency-based learning something an individual instructor should contemplate? What institutional support would be necessary to make this approach work?

For my response to these questions, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=130

4.6 Communities of practice

Figure 4.6.1 [Bank of America's Vital Voices](#) program links women executives of small and medium sized enterprises from around the world
Image: © Belfast Telegraph, 2014

4.6.1 The theories behind communities of practice

The design of teaching often integrates different theories of learning. Communities of practice are one of the ways in which experiential learning, social constructivism, and connectivism can be combined, illustrating the limitations of trying to rigidly classify learning theories. Practice tends to be more complex.

4.6.2 What are communities of practice?

4.6.2.1 Definition:

> *Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.*
>
> Wenger, 2014

4.6.2.2 What are communities of practice?

The basic premise behind communities of practice is simple: we all learn in everyday life from the communities in which we find ourselves. Communities of practice are everywhere. Nearly everyone belongs to some community of practice, whether it is through our working colleagues or associates, our profession or trade, or our leisure interests, such as a book club. Wenger (2000) argues that a community of practice is different from a community of interest or a geographical community in that it involves a shared practice: ways of doing things that are shared to some significant extent among members.

4.6.2.3 Characteristics

Wenger argues that there are three crucial characteristics of a community of practice:

- **domain**: a common interest that connects and holds together the community;
- **community**: a community is bound by the shared activities they pursue (for example, meetings, discussions) around their common domain;
- **practice:** members of a community of practice are practitioners; what they do informs their participation in the community; and what they learn from the community affects what they do.

4.6.2.4 Innovation and change

Wenger (2000) has argued that although individuals learn through participation in a community of practice, more important is the generation of newer or deeper levels of knowledge through the sum of the group activity. If the community of practice is centered around business processes, for instance, this can be of considerable benefit to an organization. Smith (2003) notes that:

> *…communities of practice affect performance..[This] is important in part because of their potential to overcome the inherent problems of a slow-moving traditional hierarchy in a fast-moving virtual economy. Communities also appear to be an effective way for organizations to handle unstructured problems and to share knowledge outside of the traditional structural boundaries. In addition, the community concept is acknowledged to be a means of developing and maintaining long-term organizational memory.*

Brown and Duguid (2000) describe a community of practice developed around the Xerox customer service representatives who repaired the machines in the field. The Xerox reps began exchanging tips and tricks over informal meetings at breakfast or lunch and eventually Xerox saw the value of these interactions and created the Eureka project to allow these interactions to be shared across the global network of representatives. The Eureka database has been estimated to have saved the corporation $100 million. Companies such as Google and Apple are encouraging communities of practice through the sharing of knowledge across their many specialist staff.

2.6.2.5 Technologies

Technology provides a wide range of tools that can support communities of practice, as indicated by Wenger (2014) in the diagram below:

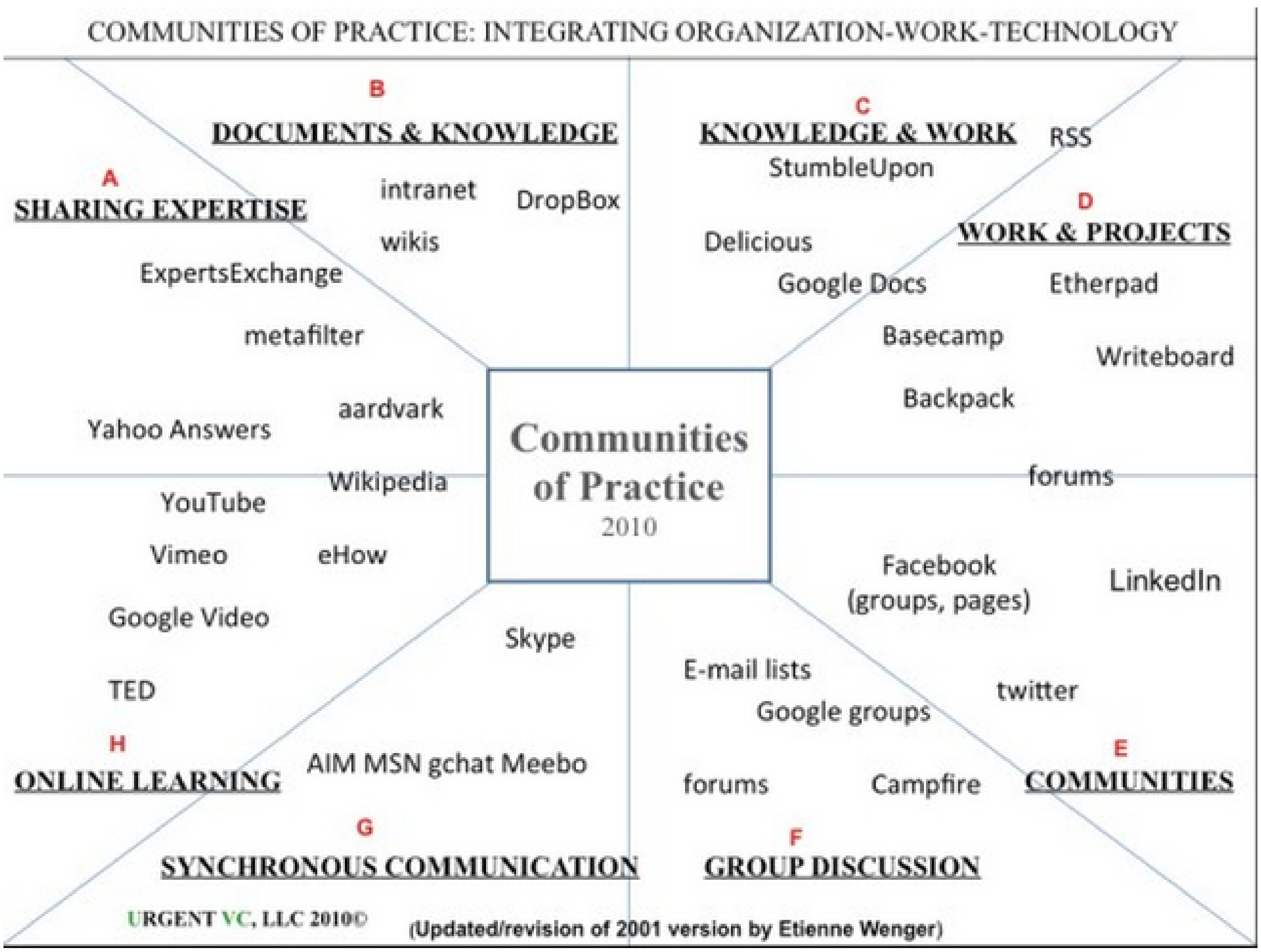


Figure 4.6.2 Tools that support communities of practice
Image: Wenger, 2014

4.6.3 Designing effective communities of practice

Most communities of practice have no formal design and tend to be self-organising systems. They have a natural life cycle, and come to an end when they no longer serve the needs of the community. However, there is now a body of theory and research that has identified actions that can help sustain and improve the effectiveness of communities of practice.

Wenger, McDermott and Snyder (2002) have identified seven key design principles for creating effective and self-sustaining communities of practice, related specifically to the management of the community, although the ultimate success of a community of practice will be determined by the activities of the members of the community themselves. Designers of a community of practice need to:

4.6.3.1 Design for evolution

Ensure that the community can evolve and shift in focus to meet the interests of the participants without moving too far from the common domain of interest.

4.6.3.2 Open a dialogue between inside and outside perspectives

Encourage the introduction and discussion of new perspectives that come or are brought in from outside the community of practice.

4.6.3.3 Encourage and accept different levels of participation

Different levels of participation include:

- the ‘core’ (most active members),
- those who participate regularly but do not take a leading role in active contributions,
- hose (likely the majority) who are on the periphery of the community but may become more active participants if the activities or discussions start to engage them more fully.

4.6.3.4 Develop both public and private community spaces

Communities of practice are strengthened if they encourage individual or group activities that are more personal or private as well as the more public general discussions; for instance, individuals may decide to blog about their activities, or a small group in an online community that live or work close together may also decide to meet informally on a face-to-face basis.

4.6.3.5 Focus on value

Attempts should be made explicitly to identify, through feedback and discussion, the contributions that the community most values.

4.6.3.6 Combine familiarity and excitement

Focus both on shared, common concerns and perspectives, but also on the introduction of radical or challenging perspectives for discussion or action.

4.6.3.7 Create a rhythm for the community

There needs to be a regular schedule of activities or focal points that bring participants together on a regular basis, within the constraints of participants' time and interests.

4.6.4 Critical factors for success

Subsequent research has identified a number of critical factors that influence the effectiveness of participants in communities of practice, These include being:

- **aware of social presence:** individuals need to feel comfortable in engaging socially with other professionals or 'experts' in the domain, and those with greater knowledge must be willing to share in a collegial manner that respects the views and knowledge of other participants (social presence is defined as the awareness of others in an interaction combined with an appreciation of the interpersonal aspects of that interaction.)
- **motivated to share information for the common good of the community**
- **able and willing to collaborate.**

EDUCAUSE has developed a step-by-step guide for designing and cultivating communities of practice in higher education (Cambridge, Kaplan and Suter, 2005).

Lastly, research on other related sectors, such as collaborative learning or MOOCs, can inform the design and development of communities of practice. For instance, communities of practice need to balance between structure and chaos: too much structure and many participants are likely to feel constrained in what they need to discuss; too little structure and participants can quickly lose interest or become overwhelmed.

Many of the other findings about group and online behaviour, such as the need to respect others, observing online etiquette, and preventing certain individuals from dominating the discussion, are all likely to apply. However, because many communities of practice are by definition self-regulating, establishing rules of conduct and even more so enforcing them is really a responsibility of the participants themselves.

4.6.5 Learning through communities of practice in a digital age

Communities of practice are a powerful manifestation of informal learning. They generally evolve naturally to address commonly shared interests and problems. By their nature, they tend to exist outside formal educational organisations. Participants are not usually looking for formal qualifications, but to address issues in their life and to be better at what they do. Furthermore, communities of practice are not dependent on any particular medium; participants may meet face-to-face socially or at work, or they can participate in online or virtual communities of practice.

It should be noted that communities of practice can be very effective in a digital world, where the working context is volatile, complex, uncertain and ambiguous. A large part of the lifelong learning market will become occupied by communities of practice and self-learning, through collaborative learning, sharing of knowledge and experience, and crowd-sourcing new ideas and development. Such informal learning provision will be particularly valuable for non-governmental or charitable organizations, such as the Red Cross, Greenpeace or UNICEF, or local government, looking for ways to engage communities in their areas of operation.

These communities of learners will be open and free, and hence will provide a competitive alternative to the high priced lifelong learning programs being offered by research universities. This will put pressure on universities and colleges to provide more flexible arrangements for recognition of informal learning, in order to hold on to their current monopoly of post-secondary accreditation.

One of the significant developments in recent years has been the use of massive open online courses (MOOCs) for developing online communities of practice. MOOCs are discussed in more detail in Chapter 5, but it is worth discussing here the connection between MOOCs and communities of practice. The more instructionist xMOOCs are not really developed as communities of practice, because they use mainly a transmissive pedagogy, from experts to those considered less expert.

In comparison, connectivist MOOCs are an ideal way to bring together specialists scattered around the world to focus on a common interest or domain. Connectivist MOOCs are much closer to being virtual communities of practice, in that they put much more emphasis on sharing knowledge between more or less equal participants. However, current connectivist MOOCs do not always incorporate what research indicates are best practices for developing communities of practice, and those wanting to establish a virtual community of practice at the moment need some kind of MOOC provider to get them started and give them access to the necessary MOOC software.

Although communities of practice are likely to become more rather than less important in a digital age, it is probably a mistake to think of them as a replacement for traditional forms of education. There is no single, 'right' approach to the design of teaching. Different groups have different needs. Communities of practice are more of an alternative for certain kinds of learners, such as lifelong learners, and are likely to work best when participants already have some domain knowledge and can contribute personally and in a constructive manner – which suggests the need for at least some form of prior general education or training for those participating in effective communities of practice.

In conclusion, it is clear is that in an increasingly volatile, uncertain, complex, and ambiguous world, and given the openness of the Internet, the social media tools now available, and the need for sharing of knowledge on a global scale, virtual communities of practice will become even more common and important. Smart educators and trainers will look to see how they can harness the strength of this design model, particularly for lifelong learning. However, merely lumping together large numbers of people with a common interest is unlikely to lead to effective learning. Attention needs to be paid to those design principles that lead to effective communities of practice.

References

Brown, J. and Duguid, P. (2000) *Balancing act: How to capture knowledge without killing it* *Harvard Business Review*.

Cambridge, D., Kaplan, S. and Suter, V. (2005) *Community of Practice Design Guide* Louisville CO: EDUCAUSE

Smith, M. K. (2003) 'Communities of practice', *the encyclopedia of informal education*, accessed 26 September, 2014, but no longer in press

Wenger, E. (2000)*Communities of Practice: Learning, Meaning and Identity* Cambridge UK: Cambridge University Press

Wenger, E. (2014) Communities of practice: a brief introduction, accessed 5 October, 2019

Wenger, E, McDermott, R., and Snyder, W. (2002). *Cultivating Communities of Practice (Hardcover)*. Harvard Business Press; 1 edition.

Update and further reading

Wenger, E., Trayner, B. and de Laat, M. (2011)*Promoting and assessing value creation in communities and networks: a conceptual framework* Heerlen NL: The Open University of the Netherlands

This document presents a conceptual foundation for promoting and assessing value creation in communities and networks. By value creation we mean the value of the learning enabled by community involvement and networking.

For an interesting critique of this paper, see:

Dingyloudi, F. and Strijbos, J. (2015) Examining value creation in a community of learning practice: Methodological reflections on story-telling and story-reading *Seminar.net*, Vol. 11, No.3

Activity 4.6 Making communities of practice work

1. Can you identify a community of practice to which you belong? Is it successful and does it meet the key design principles outlined above?

2. Could you think of a way to develop a community of practice that would support your work as a teacher?

3. Is there anything special you would need to do to make an online community of practice succeed that would not be necessary in a face-to-face community?

For my (not very deep) thoughts on these questions, click on the podcast below.

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=134

Scenario E: ETEC 522: Ventures in e-Learning

Figure 4 E Image: Harper Adams University

Mike: Hey, George, come and sit down and tell Allison and Rav about that weird course you're taking from UBC.

George: Hi, you two. Yeah, it's a great course, very different from any other I've taken.

Rav.: What's it about?

George: It's how to go about starting up a technology company.

Allison: But I thought you were doing a masters in education.

George: Yeah, I am. This course is looking at how new technologies can be used in education and how to build a business around one of these technologies.

Mike: Really, George? So what about all your socialist principles, the importance of public education, and all that? Are you giving up and going to become a fat capitalist?

George: No, it's not like that. What the course is really making me do is think about how we could be using technology better in school or college.

Mike: And how to make a profit out of it, by the sound of it.

Rav.: Shut up, Mike – I'm curious, George, since I'm doing a real business program. You're going to learn how to set up a business in 13 weeks? Gimme a break.

George: It's more about becoming an entrepreneur – someone who takes risks and tries something different.

Mike.: With someone else's money.

George: Do you really want to know about this course, or are you just wanting to give me a hard time?

Allison: Yes, shut up, Mike. Have you chosen a technology yet, George?

George: Almost. We spend most of the course researching and analysing emerging technologies that could have an application in education. We have to find a technology, research it then come up with a plan of how it could be used in education, and how a business could be built around it. But I think the real aim is to get us to think about how technology could improve or change teaching or learning..

Rav.: So what's the technology you've chosen?

George: You're jumping too far ahead, Rav. We go through two boot camps, one on analysing the edtech marketplace, and one on entrepreneurship: what it takes to be an entrepreneur. Why are you laughing, Mike?

Mike: I just can't see you in combat uniform, crawling through tubes under gun fire, with a book in your hand.

George: Not that kind of bootcamp. This course is totally online. Our instructor points us in the direction of a few technologies to get us started, but because there's more stuff coming out all the time, we're encouraged to make our own choices about what to research. And we all help each other. I must have looked at more than 50 products or services so far, and we all share our analyses. I'm down to possibly three at the moment, but I'm going to have to make my mind up soon, as I have to do a YouTube elevator pitch for my grade.

Rav.: A what?

George: If you look at most of these products, there's a short YouTube video that pitches the business. I've got to make the case for whatever technology I choose in just under eight minutes. That's going to be 25% of my grade.

Allison: Wow, that's tough.

George: Well, we all help each other. We have to do a preliminary recording, then everyone pitches in to critique it. Then we have a few days to send in our final version.

Allison: What else do you get grades for?

George: I got 25% of my marks for an assignment that analysed a particular product called Dybuster which is used to help learners with dyslexia. I looked mainly at its educational strengths and weaknesses, and its likely commercial viability. For my second assignment, also worth 25%, we had to build an application of a particular product or service, in my case a module of teaching using a particular product. There were four of us altogether working as a team to do this. Our team designed a short instructional module that showed a chemical reaction, using an off-the-shelf online simulation tool that is free for people to use. I'll get my last 25% from analysing my own contribution to discussions and activities.

Rav.: What, you give yourself the grade?

George: No, I have to collect my best contributions together in a sort of portfolio, then send them in to the instructor, who then gives the grade based on the quality of the contributions.

Allison: But what I don't understand is: what's the curriculum? What text books do you have to read? What do you have to *know*?

George: Well, there *are* the two boot camps, but really, we the students, set the curriculum. Our instructor asks us for our first week's work to look at a range of emerging technologies that might be relevant for education, then we select eight which form the basis of our work groups. I've already learned a lot, just by searching and analysing different products over the Internet. We have to think about and justify our decisions. What kind of teaching philosophy do they imply? What criteria am I using when I support or reject a particular product? Is this a sustainable tool? (You don't want to have to get rid of good teaching material because the company's gone bust and doesn't support the technology any more). What I'm really learning though is to think about technology differently. Previously I wasn't really thinking about *teaching* differently. I was just trying to find a technology that made my life easier. But this course has woken me up to the real possibilities. I feel I'm in a much better position now to shake up my own school and move them into the digital age.

Allison (sighs): Well, I guess that's the difference between an undergraduate and a graduate course. You couldn't do this unless you already knew a lot about education, could you?

George: I'm not so sure about that, Allison. It doesn't seem to have stopped a lot of entrepreneurs from developing tools for teaching!

Mike: George, I'm sorry. I can't wait for you to become a rich capitalist – it's your turn to buy the drinks.

Scenario based on a UBC graduate course for the Master in Educational Technology. The instructors are David Vogt and David Porter, assisted by Jeff Miller, the instructional designer for the course.

4.7 'Agile' Design: flexible designs for learning

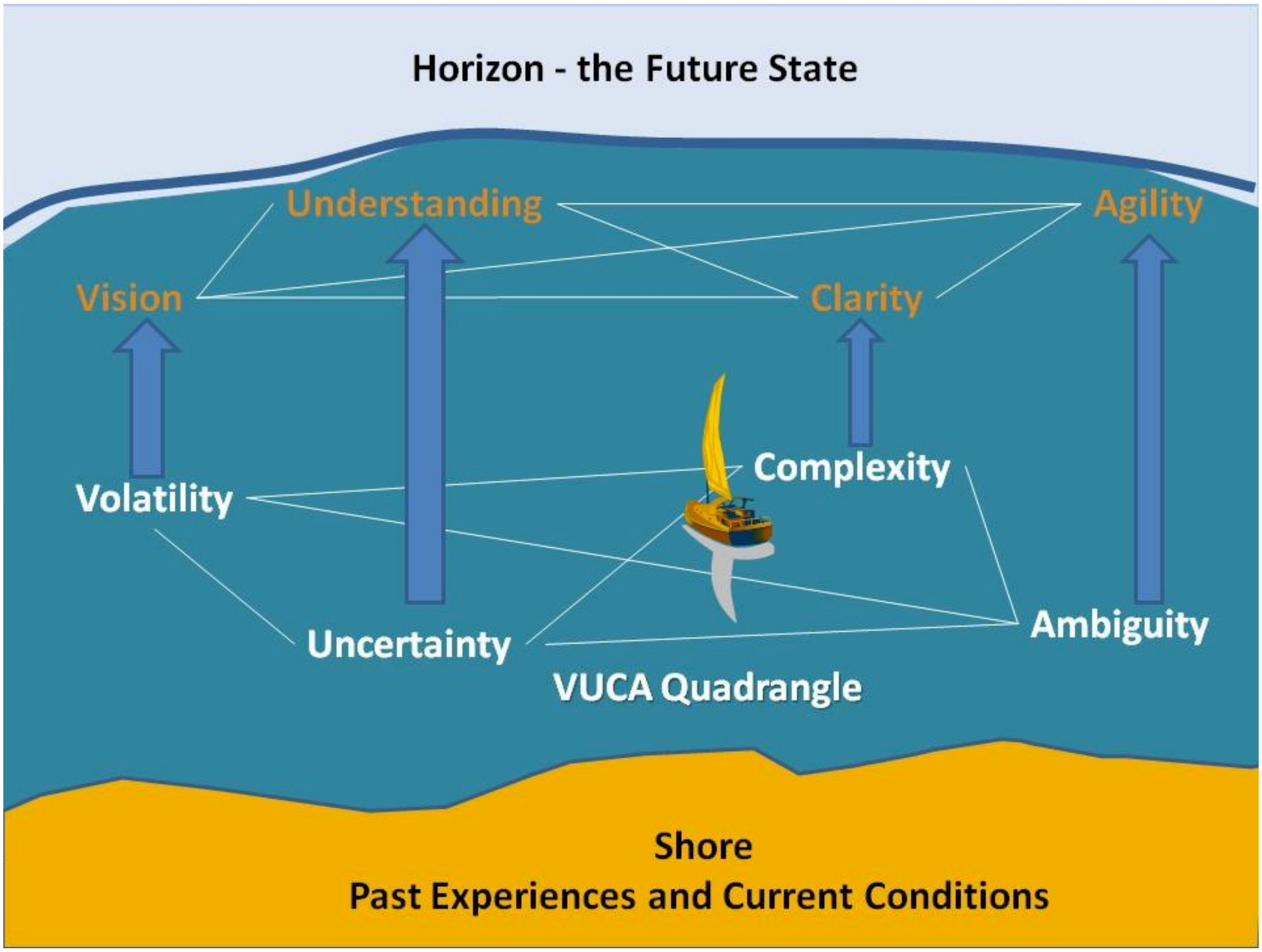


Figure 4.7.1 A volatile, uncertain, complex and ambiguous world
Image: © Carol Mase, Free Management Library, 2011, used with permission

4.7.1 The need for more agile design models

Adamson (2012) states:

The systems under which the world operates and the ways that individual businesses operate are

> *vast and complex – interconnected to the point of confusion and uncertainty. The linear process of cause and effect becomes increasingly irrelevant, and it is necessary for knowledge workers to begin thinking in new ways and exploring new solutions.*

In particular, knowledge workers must deal with situations and contexts that are volatile, uncertain, complex and ambiguous (what Adamson calls a VUCA environment). This certainly applies to teachers working with ever new, emerging technologies, very diverse students, and a rapidly changing external world that puts pressure on institutions to change.

If we look at course design, how does a teacher respond to rapidly developing new content, new technologies or apps being launched on a daily basis, to a constantly changing student base, to pressure to develop the knowledge and skills that are needed in a digital age? For instance, even setting prior learning outcomes is fraught in a VUCA environment, unless you set them at an abstract 'skill' level such as thinking flexibly, networking, and information retrieval and analysis. Students need to develop the key knowledge management skills of knowing where to find relevant information, how to assess, evaluate and appropriately apply such information. This means exposing students to less than certain knowledge and providing them with the skills, practice and feedback to assess and evaluate such knowledge, then apply that to solving real world problems.

In order to do this, learning environments need to be created that are rich and constantly changing, but which at the same time enable students to develop and practice the skills and acquire the knowledge they will need in a volatile, uncertain, complex and ambiguous world.

4.7.2 Core features of agile design models

Describing the design features of this model is a challenge, for two reasons. First, there is no single approach to agile design. The whole point is to be adaptable to the circumstances in which it operates. Second, it is only with the development of light, easy to use technology and media in the last few years that instructors and course designers have started to break away from the standard design models, so agile designs are still emerging. However, this is a challenge that software designers have also been facing (see for instance, Larman and Vodde, 2009; Ries, 2011) and perhaps there are lessons that can be applied to educational design.

First, it is important to distinguish 'agile' design from rapid instructional design (Meier, 2000) or rapid prototyping, which are really both streamlined versions of the ADDIE model. Although rapid instructional design/rapid protyping enable courses or modules to be designed more quickly (especially important for corporate training), they still follow the same kind of sequential or iterative processes as in the ADDIE model, but in a more compressed form. Rapid instructional design and rapid prototyping might be considered particular kinds of agile design, but they lack some of the most important characteristics outlined below:

4.7.2.1 Light and nimble

If ADDIE is a 100-piece orchestra, with a complex score and long rehearsals, then agile design is a jazz trio who get together for a single performance then break up until the next time. Although there may be a short preparation time before the course starts, most of the decisions about what will go into the course, what tools will be used, what activities learners will do, and sometimes even how students will be assessed, are decided as the course progresses.

On the teaching side, there are usually only a few people involved in the actual design, one or sometimes two instructors and possibly an instructional designer, who nevertheless meet frequently during the offering of the course to make decisions based on feedback from learners and how learners are progressing through the course. However, many more content contributors may be invited – or spontaneously offer – to participate on a single occasion as the course progresses.

4.7.2.2 Content, learner activities, tools used and assessment vary, according to the changing environment

The content to be covered in a course is likely to be highly flexible, based more on emerging knowledge and the interests or prior experience of the learners, although the core skills that the course aims to develop are more likely to remain constant. For instance, for ETEC 522 in Scenario F, the overall objective is to develop the skills needed to be a pioneer or innovator in education, and this remains constant over each iteration of the course. However, because the technology is rapidly developing with new products, apps and services every year, the content of the course is quite different from year to year.

Also learner activities and methods of assessment are also likely to change, because students can use new tools or technology themselves for learning as they become available. Very often learners themselves seek out and organise much of the core content of the course and are free to choose what tools they use.

4.7.2.3 The design attempts to exploit the affordances of either existing or emerging technologies

Agile design aims to exploit fully the educational potential of new tools or software, which means sometimes changing at least sub-goals. This may mean developing different skills in learners from year to year, as the technology changes and allows new things to be done. The emphasis here is not so much on doing the same thing better with new technology, but striving for new and different outcomes that are more relevant in a digital world.

ETEC 522 for instance did not start with a learning management system. Instead, a web site, built in WordPress, was used as the starting point for student activities, because students as well as instructors were posting content, but in another year the content focus of the course was mainly on mobile learning, so apps and other mobile tools were strong components of the course.

4.7.2.4 Sound, pedagogical principles guide the overall design of a course – to a point

Just as most successful jazz trios work within a shared framework of melody, rhythm, and musical composition, so is agile design shaped by overarching principles of best practice. Most successful agile designs have been guided by core design principles associated with 'good' teaching, such as clear learning outcomes or goals, assessment linked to these goals, strong learner support, including timely and individualised feedback, active learning, collaborative learning, and regular course maintenance based on learner feedback, all within a rich learning environment (see Appendix 1). Sometimes though deliberate attempts are made to move away from an established best practice for experimental reasons, but usually on a small scale, to see if the experiment works without risking the whole course.

4.7.2.5 Experiential, open and applied learning

Usually agile course design is strongly embedded in the real, external world. Much or all the course may be open to other than registered students. For instance, much of ETEC 522, such as the final YouTube business pitches, is openly available to those interested in the topics. Sometimes this results in entrepreneurs contacting the course with suggestions for new tools or services, or just to share experience.

Another example is a course on Latin American studies from a Canadian university. This particular course had an open, student-managed wiki, where they could discuss contemporary events as they arose. This course was active at the same time that the Argentine government nationalised the Spanish oil company, Repsol. Several students posted comments critical of the government action, but after a week, a professor from a university in Argentina, who had come across the wiki by accident while searching the Internet, responded, laying out a detailed defence of the government's policy. This was then made a formal topic for discussion within the course.

Such courses may though be only partially open. Discussion of sensitive subjects for instance may still take place behind a password controlled discussion forum, while other parts of the course may be open to all. As experience grows in this kind of design, other and perhaps clearer design principles are likely to emerge.

4.7.3 Strengths and weaknesses of flexible design models

The main advantage of agile design is that it focuses directly on preparing students for a volatile, uncertain, complex and ambiguous world. It aims explicitly at helping students develop many of the specific skills they will need in a digital age, such as knowledge management, multimedia communication skills, critical thinking, innovation, and digital literacy embedded within a subject domain. Where agile design has been successfully used, students have found the design approach highly stimulating and great fun, and instructors have been invigorated and enthusiastic about teaching. Agile design enables courses to be developed and offered quickly and at much lower initial cost than ADDIE-based approaches.

However, agile design approaches are very new and have not really been much written about, never mind evaluated. There is no 'school' or set of agreed principles to follow, although there are similarities between the agile approach to design for learning with 'agile' design for computer software. Indeed it could be argued that most of the things in agile design are covered in other teaching models, such as online collaborative learning or experiential learning. Despite this, innovative instructors are beginning to develop courses in a similar way to ETEC 522 and there is a consistency in the basic design principles that give them a certain coherence and shape, even though each course or program appears on the surface to be very different (another example of agile design, but campus-based, with quite a different overall program from ETEC 522, is the Integrated Science program at McMaster University.)

Certainly agile design approaches require confident instructors willing to take a risk, and success is heavily dependent on instructors having a good background in best teaching practices and/or strong instructional design support from innovative and creative instructional designers. Because of the relative lack of experience in such design approaches the limitations are not well identified yet. For instance, this approach can work well with relatively small class sizes but how well will it scale? Successful use probably also depends on learners already having a good foundational knowledge base in the subject domain. Nevertheless I expect more agile designs for learning to grow over the coming years, because they are more likely to meet the needs of a VUCA world.

References

Adamson, C. (2012) Learning in a VUCA world, OEB Insights, November 13,
Bertram, J. (2013) *Agile Learning Design for Beginners* New Palestine IN: Bottom Line Performance

Larman, C. and Vodde, B. (2009) *Scaling Lean and Agile Development* New York: Addison-Wesley
Meier, D. (2000). *The Accelerated Learning Handbook*. New York: McGraw-Hill
Rawsthorne, P. (2012) *Agile Instructional Design* St. John's NF: Memorial University of Newfoundland
Ries, E. (2011) *The Lean Start-Up* New York: Crown Business/Random House

Activity 4.7 Taking risks with 'agile' design

1. Do you think a 'agile'/flexible design approach will increase or undermine academic excellence? What are your reasons?

2. Would you like to try something like this in your own teaching (or are you already doing something like this)? What would be the risks and benefits in your subject area of doing this?

For my comments on this activity, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=139

4.8 Making decisions about teaching methods

Figure 4.8.1 Making decisions about which design model to choose

4.8.1 Choosing a method

Chapters 3 and 4 cover a range of different teaching methods and design models. There are many more that could have been included. I will be discussing open pedagogy in Chapter 11, Section 4. MOOCs are also a notable omission. However, the design models behind MOOCs require a full chapter of their own (Chapter 5.)

Your choice of teaching method and the design of the teaching within that method will depend very much on the context in which you are teaching. However, a key criterion should be the suitability of the method and/or design model for developing the knowledge and skills that learners will need in a digital age. Other critical factors will be the demands of the subject domain, characteristics of the learners you will likely be teaching, the resources available, especially in terms of supporting learners, and probably most important of all, your own views and beliefs about what constitutes ‘good teaching.’

Furthermore, the teaching methods covered in Chapters 3 and 4 by and large are not mutually exclusive. They can probably be mixed and matched to a certain degree, but there are limitations in doing this. Moreover, a consistent approach will be less confusing not only to learners, but also to you as a teacher or instructor.

So: how would you go about choosing an appropriate teaching method? I set out below in Figure 4.8.2 one way of doing this. I have chosen five criteria as headings along the top of the table:

4.8.1.1 Epistemological basis

What epistemology does this method suggest? Does the method suggest a view of knowledge as content that must be learned, does the method suggest a rigid (‘correct’) way of designing learning (objectivist)? Or does the method suggest that learning is a dynamic process and knowledge needs to be discovered and is constantly changing (constructivist)? Does the method suggest that knowledge lies in the connections and interpretations of different nodes or people on networks and that connections matter more in terms of creating and communicating knowledge than the individual nodes or people on the network (connectivist)? Or is the method epistemologically neutral, in that one could use the same method to teach from different epistemological positions?

4.8.1.2 Industrial (20th century) or digital (21st century)

Does this method lead to the kind of learning that would prepare people for an industrial society, with standardised learning outcomes, will it help identify and select a relatively small elite for higher education or senior positions in society, does it enable learning to be easily organised into similarly performing groups of learners?

Alternatively**,** does the method encourage the development of the soft skills and the effective management of knowledge needed in a digital world? Does the method enable and support the appropriate educational use of the affordances of new technologies? Does it provide the kind of educational support that learners need to succeed in a volatile, uncertain, complex and ambiguous world? Does it enable and encourage learners to become global citizens?

4.8.1.3 Academic quality

Does the method lead to deep understanding and transformative learning? Does it enable students to become experts in their chosen subject domain?

4.8.1.4 Flexibility

Does the method meet the needs of the diversity of learners today? Does it encourage open and flexible access to learning? Does it help teachers and instructors to adapt their teaching to ever changing circumstances?

Now these are my criteria, and you may well want to use different criteria (cost or your time is another important factor), but I have drawn up the table this way because it has helped me consider better where I stand on the different methods or design models. Where I think a method or design model is strong on a particular criterion, I have given it three stars, where weak, one star, and n/a for not applicable. Again, you may – no, should – rank the models differently. (See, that's why I'm a constructivist – if I was an objectivist, I'd tell you what damned criteria to use!)

Design model	*Epistemology*	*20th century learning*	*21st century learning*	*Academic quality*	*Flexibility*
Transmissive lectures	Objectivist	**	*	**	*
Interactive lectures/seminars	Constructivist	***	**	***	*
Classroom-type online learning	Objectivist	n/a	*	*	***
Online collaborative learning	Constructivist	n/a	***	***	***
ADDIE	Mainly objectivist	***	**	***	**
Experiential learning	Constructivist	**	***	**	***
Competency-based learning	Objectivist	n/a	**	**	***
Communities of practice	Connectivist	**	**	*	***
x MOOCs	Objectivist	n/a	*	**	***
cMOOCs	Connectivist	n/a	**	*	***
Agile design	Constructivist	n/a	***	**	***

Figure 4.8.2 Choosing design models

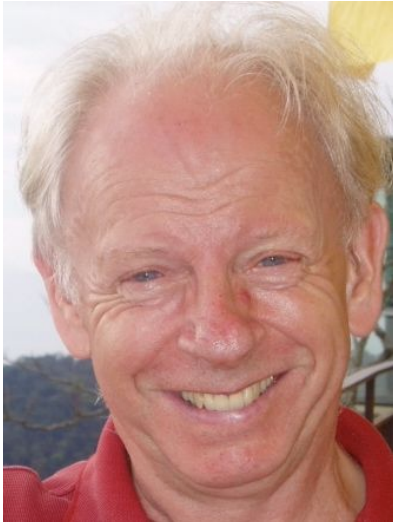
It can be seen that the only method that ranks highly on all three criteria of 21st century learning, academic quality and flexibility is online collaborative learning. Experiential learning and agile design also score highly. Transmissive lectures come out worst. This is a pretty fair reflection of my preferences. However, if you are teaching first year civil engineering to over 500 students, your criteria and rankings will almost certainly be different from mine. So please see Figure 4.8.2 as a heuristic device and not as a general recommendation.

4.8.2 Design models and the quality of teaching and learning

Lastly, the review of different methods indicate some of the key issues around quality:

- first, what students learn is more likely to be influenced by choosing an appropriate teaching method for the context in which you are teaching, than by focusing on a particular technology or delivery method (face-to-face or online). Technology and delivery method are more about access and flexibility and hence learner characteristics than they are about learning. Learning is affected more by pedagogy and the design of instruction;
- second, different teaching methods are likely to lead to different kinds of learning outcomes. This is why there is so much emphasis in this book on being clear about what knowledge and skills are needed in a digital age. These are bound to vary somewhat across different subject domains, but only to a limited degree. Understanding of content is always going to be important, but the skills of independent learning, critical thinking, innovation and creativity are even more important. Which teaching method is most likely to help develop these skills in your students?
- third, quality depends not only on the choice of an appropriate teaching method, but also on how that approach to teaching is implemented. Online collaborative learning can be done well, or it can be done badly. The same applies to other methods. Following core design principles is critical for the successful use of any particular teaching method. Also there is considerable research on what the conditions are for success in using some of the newer methods or design models. The findings from such research need to be applied when implementing a particular method (this is discussed further throughout the book, but specifically in Chapter 12);
- lastly students *and* teachers get better with practice. If you are moving to a new method of teaching or design model, give yourself (and your students) time to get comfortable with it. It will probably take two or three courses where the new method or design is applied before you begin to feel comfortable that it is producing the results you were hoping for. However, it is better to make some mistakes along the way than to continue to teach comfortably, but not produce the graduates that are needed in the future.

There are still two major teaching methods to be discussed, Open Pedagogy in Chapter 11, Section 4, and MOOCs, which needs their own chapter (next).



For my personal comments on some of the issues raised in this chapter, please click on the podcast below.

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=143

Activity 4.8 Making choices

Describe your main subject area and level. Then try to answer each of the following questions:

1. What are the main learning outcomes (at a high level) that I need to achieve in this course or program, if the students are to be properly prepared for the future?

2. What teaching method is most likely to enable me to help learners achieve these outcomes?

3. How much would I have to change what I'm doing now, and what would the course or program look like in the future? Could I write a scenario to describe how I would be teaching in the future? Or how students will be learning in my course or program?

4. What support am I likely to get from my institution, in terms of supporting my ideas, supporting change, providing resources such as training in new methods, or professional help such as instructional designers?

5. How will my students react to the changes I'm contemplating? How could I 'sell' it to them?

No feedback is provided on this activity; it is for your personal reflection.

Key Takeaways (Chapters 3 and 4)

1. Traditional classroom teaching, and especially transmissive lectures, were designed for another age. Although lectures have served us well, we are now in a different age that requires different methods.

2. The key shift is towards greater emphasis on skills, particularly knowledge management, and less on memorising content. We need teaching methods for teaching and learning that lead to the development of the skills needed in a digital age.

3. There is no one teaching method or 'best' design model for all circumstances. The choice of teaching method needs to take account of the context in which it will be applied, but nevertheless, some methods are better than others for developing the knowledge and skills needed in a digital age. For the contexts with which I'm most associated, online collaborative learning, experiential learning and agile design best meet my criteria.

4. Teaching methods in general are not dependent on a particular mode of delivery; they can operate in most cases as well online as in class.

5. In an increasingly volatile, uncertain, complex and ambiguous world, we need methods of teaching that are light and nimble.

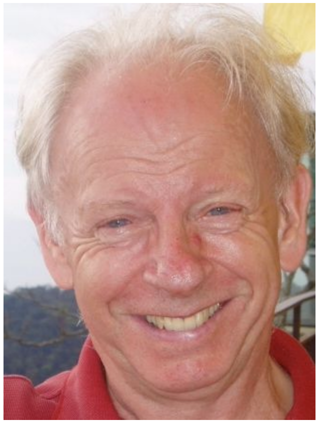
Chapter 5: MOOCs

Purpose of the chapter

It has been claimed that MOOCs (Massive, Open, Online Courses) are the most disruptive of all technologically-based innovations in higher education, and as a result are the most controversial.

When you have finished this chapter you should be able to:

- understand the differences between various kinds of MOOCs, and between MOOCs and other forms of online and open learning;
- decide on whether or not to develop your own MOOC and what kind of MOOC;
- advise your administration on whether or not to invest in MOOCs.



For a my personal introduction to this chapter, please click on the podcast below.

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=145

What is covered in this chapter

This chapter covers the following topics:

Also in this chapter you will find the following activities:

Key Takeaways

1. MOOCs are forcing every higher education institution to think carefully both about its strategy for online teaching and its approach to open education.

2. MOOCs are not the only form of online learning nor of open educational resources. It is important to look at the strengths and weaknesses of MOOCs within the overall context of online learning and open-ness.

3. There are considerable differences in the design of MOOCs, reflecting different purposes and philosophies.

4. There are currently major structural limitations in MOOCs for developing deep or transformative learning, or for developing the high level knowledge and skills needed in a digital age.

5. MOOCs are at still a relatively early stage of maturity. As their strengths and weaknesses become clearer, and as experience in improving their design grows, they are likely to occupy a significant niche within the higher education learning environment

6. MOOCs could well replace some forms of traditional teaching (such as large lecture classes). However, MOOCs are more likely to remain an important supplement or alternative to other conventional education methods. They are not on their own a solution to the high cost of higher education, although MOOCs are and will continue to be an important factor in forcing change.

7. Perhaps the greatest value of MOOCs in the future will be for providing a means for tackling large global problems through community action.

5.1 Brief history

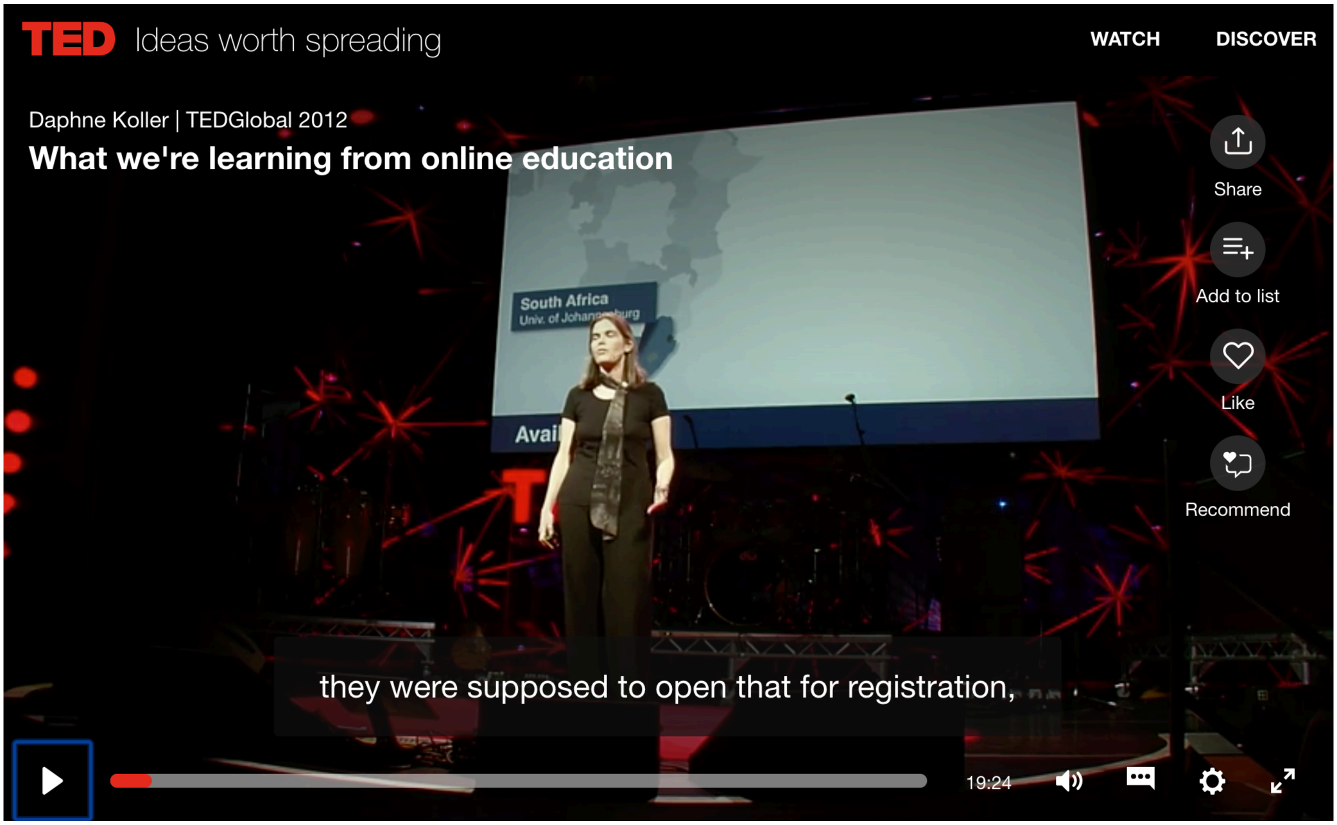


Figure 5.1.1 Daphne Koller's TED Talk, 2012
To see this YouTube video, click on the graphic. For a response to this video, see: '[What's right and what's wrong with Coursera-style MOOCs](#)'.

The term MOOC was used for the first time in 2008 for a course offered by the Extension Division of the University of Manitoba in Canada. This non-credit course, *Connectivism and Connective Knowledge* (*CK08*) was designed by George Siemens, Stephen Downes and Dave Cormier. It enrolled 27 on-campus students who paid a tuition fee but was also offered online for free. Much to the surprise of the instructors, 2,200 students enrolled in the free online version. Downes classified this course and others like it that followed as connectivist or cMOOCs, because of their design (Downes, 2012).

In the fall of 2011, two computer science professors from Stanford University, Sebastian Thrun and Peter Norvig, launched a MOOC on *The Introduction to AI* (artificial intelligence) that attracted over 160,000 enrollments, followed quickly by two other MOOCs, also in computer sciences, from Stanford instructors Andrew Ng and Daphne Koller. Thrun went on to found Udacity, and Ng and Koller established Coursera. These are for-profit companies using their own specially developed software that enable massive numbers of registrations and a platform for the teaching. Udacity and Coursera formed partnerships with other leading universities where the universities pay a fee to offer their own MOOCs through these platforms. Udacity in 2013 changed direction to focus on the vocational and corporate training market.

The Massachusetts Institute of Technology (MIT) and Harvard University in March 2012 developed an open source platform for MOOCs called edX, which also acts as a platform for online registration and teaching. edX has also developed partnerships with leading universities to offer MOOCs without direct charge for hosting their courses, although some may pay to become partners in edX. Other platforms for MOOCs, such as the U.K. Open University's FutureLearn, have also been developed. Because the majority of MOOCs offered through these various platforms are based mainly on video lectures and computer-marked tests, Downes has classified these as xMOOCs, to distinguish them from the more connectivist cMOOCs.

In March, 2019 there were more than 11,000 MOOC courses from 900 universities globally, with just over 100 million registrations (Shah and Pickard, 2019). The big change in 2017-2018 was a move to MOOC-based degrees, with seven universities announcing 15 degrees in 2017, and in 2018, 30 more universities joined in, and launched more than 45 degrees (Johnson, 2019).

In addition to full degrees, EdX and Coursera both offer multiple micro-credentials, each with their own branding. Overall, 630 micro-credentials existed at the end of 2018, but most of the new credentials came from just two credentials, Coursera specialization, and edX professional certificate (Johnson, 2019).

References

Downes, S. (2012) Massively Open Online Courses are here to stay, Stephen's Web, July 20

Johnson, S. (2019) Much ado about MOOCs: Where are we in the evolution of MOOCs? *Edsurge On Air*, 26 February

Shah, D. and Pickard. L. (2019) Massive list of MOOC providers around the world *Class Central*, 30 July

5.2 What is a MOOC?

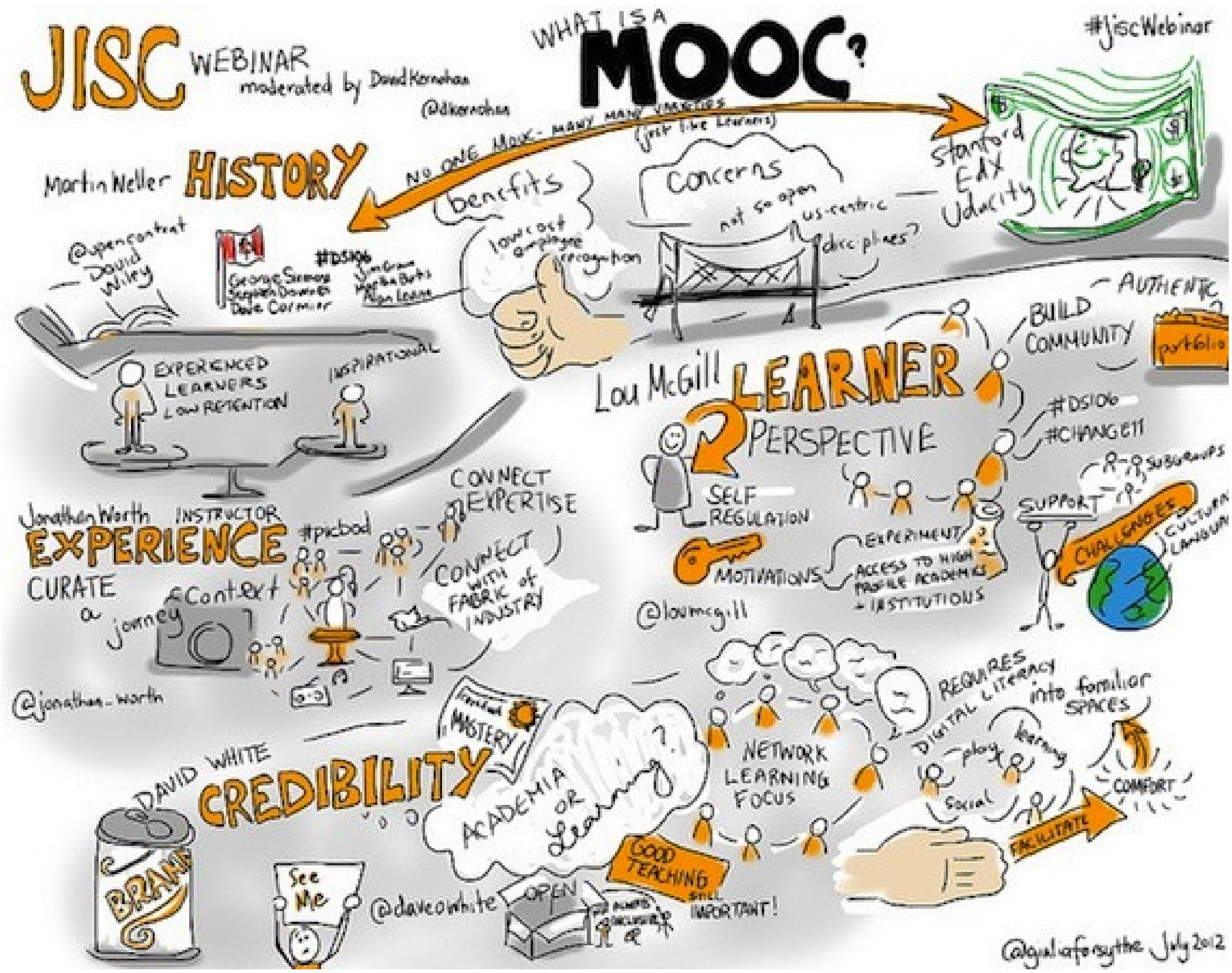


Figure 5.2.1 Making sense of MOOCs © Giulia Forsythe, 2012 and JISC, 2012

5.2.1 MOOCS: a massive disruption?

Probably no development in teaching in recent years has been as controversial as the development of Massive Open Online Courses (MOOCs). In 2013, the writer Thomas Friedman wrote in the New York Times:

> *...nothing has more potential to enable us to reimagine higher education than the massive open online course ….For relatively little money, the U.S. could rent space in an Egyptian village, install two dozen computers and high-speed satellite Internet access, hire a local teacher as a facilitator, and invite in any Egyptian who wanted to take online courses with the best professors in the world, subtitled in Arabic…I can see a day soon where you'll create your own college degree by taking the best online courses from the best professors from around the world ….paying only the nominal fee for the certificates of completion. It will change teaching, learning and the pathway to employment.*

Many others have referred to MOOCs as a prime example of the kind of disruptive technology that Clayton Christensen (2010) has argued will change the world of education. Others have argued that MOOCs are not a big deal, just a more modern version of educational broadcasting, and do not really affect the basic fundamentals of education, and in particular do not address the type of learning needed in a digital age.

MOOCs can be seen then as either a major revolution in education or just another example of the overblown hyperbole often surrounding technology, particularly in the USA. I shall be arguing that MOOCs are a significant development, but they have severe limitations for developing the knowledge and skills needed in a digital age.

5.2.2 Key characteristics

All MOOCs have some common features, although we shall see that the term MOOC covers an increasingly wide range of designs.

5.2.2.1 Massive

By 2019, Coursera claimed over 35 million sign-ups with its largest course claiming 240,000 participants. The huge numbers (in the hundred of thousands) enrolling in the earliest MOOCs are not always replicated in later MOOCs, but the numbers are still substantial. For instance, in 2013, the University of British Columbia offered several MOOCs through Coursera, with the numbers initially signing up ranging from 25,000 to 190,000 per course (Engle, 2014).

However, even more important than the actual numbers is that *in principle* MOOCs have infinite *scalability.* There is technically no limit to their final size, because the marginal cost of adding each extra participant is nil for the institutions offering MOOCs. (In *practice* this is not quite true, as central technology, backup and bandwidth costs increase, and as we shall see, there can be some knock-on costs for an institution offering MOOCs as numbers increase. However, the cost of each additional participant is so small, given the very large numbers, that it can be more or less ignored). The scalability of MOOCs is probably the characteristic that has attracted the most attention, especially from governments, but it should be noted that this is also a characteristic of broadcast television and radio, so it is not unique to MOOCs.

5.2.2.2 Open

At least for the initial MOOCs, access was free for participants, although an increasing number of MOOCs are charging a fee for assessment leading to a badge or certificate or other fees. For instance, in 2019 Coursera was charging between US$29-$99 per course.

There are no pre-requisites for participants other than access to a computer/mobile device and the

Internet. However, broadband access is essential for MOOCs that use video streaming, which severely limits their potential for widening access to higher education in the least developed countries.

There is another significant way in which MOOCs through Coursera and some other MOOC platforms are not fully open (see Chapter 11 for more on what constitutes 'open' in education). Coursera owns the rights to the materials, so they cannot be repurposed or reused without permission, and the material may be removed from the Coursera site when the course ends. Also, Coursera decides which institutions can host MOOCs on its platform – this is not an open access for institutions. On the other hand, edX is an open source platform, so any institution that joins edX can develop their own MOOCs with their own rules regarding rights to the material. cMOOCs are generally completely open, but since individual participants of cMOOCs create a lot if not all of the material it is not always clear whether they own the rights and how long the MOOC materials will remain available.

Indeed, there are many other kinds of online material that are also open and free over the Internet, such as open textbooks and open educational resources, often in ways that are more accessible for reuse than MOOC material (see Chapter 11).

5.2.2.3 Online

MOOCs are offered at least initially wholly online, but increasingly institutions are negotiating with the rights holders to use MOOC materials in a blended format for use on campus. In other words, the institution provides learner support for the MOOC materials through the use of campus-based instructors. For instance at San Jose State University, on-campus students used MOOC materials from Udacity courses, including lectures, readings and quizzes, and then instructors spent classroom time on small-group activities, projects and quizzes to check progress (Collins, 2013). More variations in the design of MOOCs will be discussed in more detail in Section 5.3.

Again though it should be noted that MOOCs are not unique in offering courses online. In 2017, there were 6.3 million students in the USA alone taking online courses *for credit*, as part of regular degree programs (Seaman et. al, 2018).

5.2.2.4 Courses

One characteristic that distinguishes MOOCs from most other open educational resources is that they are organized into a whole course. However, what this actually means for participants is not exactly clear. Although many MOOCs offer certificates or badges for successful completion of a course, to date these have not in most cases been accepted for admission to universities or for advanced standing or credit, even (or especially) by the institutions offering the MOOCs.

5.2.3 Summary

It can be seen that all the key characteristics of MOOCs exist in some form or other outside MOOCs. What makes MOOCs unique though is the combination of the four key characteristics, and in particular the fact that they scale massively and are open for participants (although not always free).

References

Christensen, C. (2010) *Disrupting Class, Expanded Edition: How Disruptive Innovation Will Change the Way the World Learns* New York: McGraw-Hill

Collins, E. (2013) *SJSU Plus Augmented Online Learning Environment Pilot Project Report* San Jose CA: San Jose State University

Engle, W. (2104) *UBC MOOC Pilot: Design and Delivery* Vancouver BC: University of British Columbia

Friedman, T. (2013) Revolution Hits the Universities *New York Times,* January 26

Seaman, J.E., Allen, I.E., and Seaman, J. (2018) *Grade Increase: Tracking Distance Education in the United States* Wellesley MA: The Babson Survey Research Group

Activity 5.2

1. When is a MOOC not a MOOC? What are the essential characteristics for a course to be a MOOC?
2. Can you find examples of MOOCs from providers within your own state or province? Do they differ in any way from the main MOOC platforms such as Coursera or edX? In what ways?
3. Are they an inferior or low quality form of education? If so, why? What criteria would you use for judging the quality of a MOOC? Write down your answers then check these when you have read the rest of this chapter and see if you have changed your mind.

For my feedback on these questions click the podcast below

An audio element has been excluded from this version of the text. You can listen to it online here: *https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=150*

5.3 A Taxonomy of MOOCs

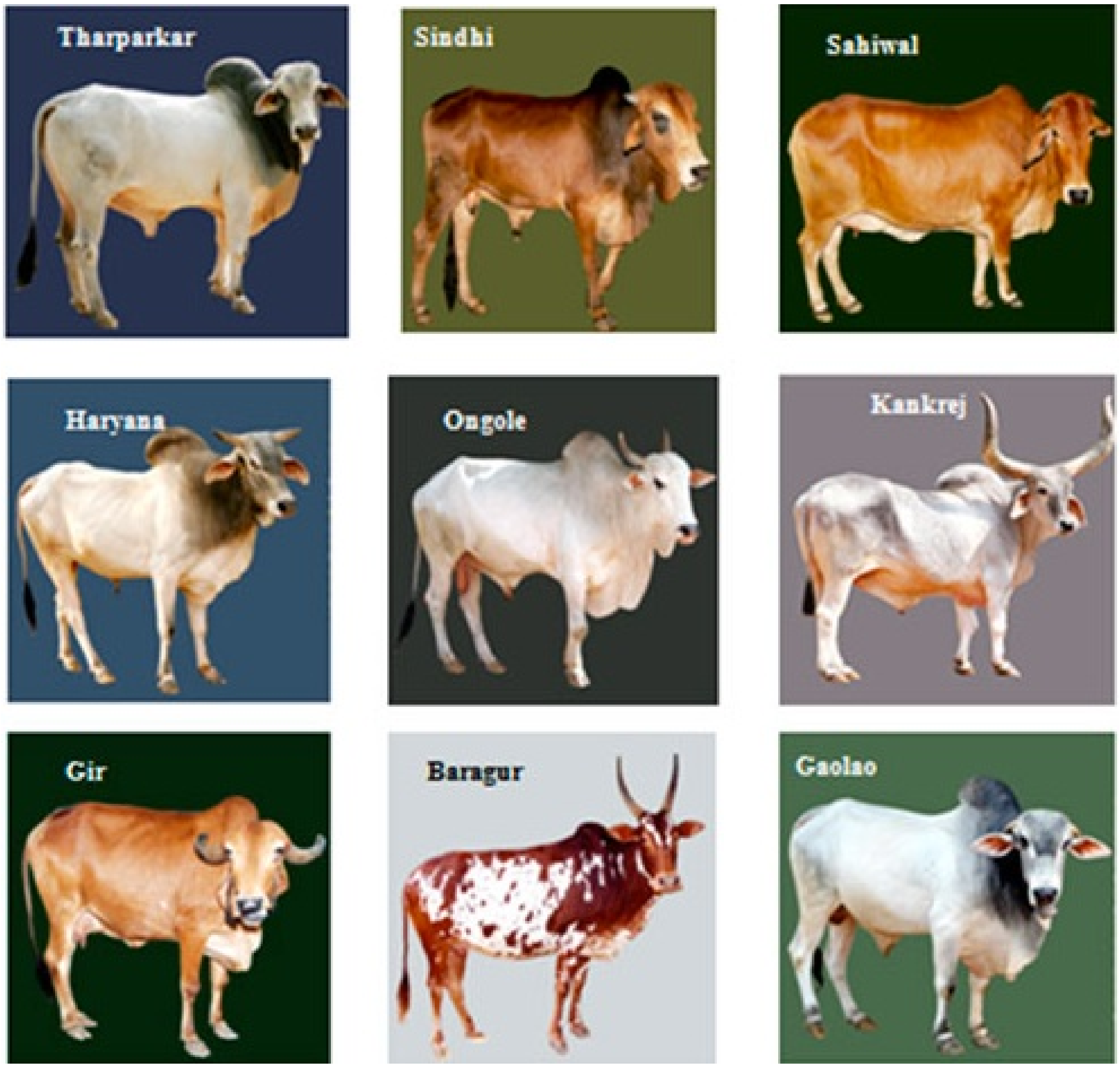


Figure 5.3 There are many variations of the basic MOOC design
Image: © Dairy Cattle, India, 2014© Dairy Cattle, India, 2014

In this section the main MOOC designs will be analysed. However, MOOCs are still a relatively new phenomenon, and design models are still evolving.

5.3.1 xMOOCs

MOOCs developed initially by Stanford University professors and a little later by MIT and Harvard instructors are based primarily on a strongly behaviourist, information transmission model, the core teaching being through online recorded videos of short lectures, combined with computer automated testing, and sometimes also through the use of peer assessment. These MOOCs are offered through special cloud-based software platforms such as Coursera, edX and FutureLearn.

xMOOCs is a term coined by Stephen Downes (2012) for courses developed by Coursera, Udacity and edX. At the time of writing (2019) xMOOCs are by far the most common MOOC. Instructors have considerable flexibility in the design of the course, so there is considerable variation in the details, but in general xMOOCs have the following common design features:

5.3.1.1 Specially designed platform software

Most very large xMOOCs use specially designed platform software such as Coursera, edX or FutureLearn that allows for the registration of very large numbers of participants, provides facilities for the storing and streaming on demand of digital materials, and automates assessment procedures and student performance tracking. The software platform also allows the companies that provide the software to collect and analyse student data.

However, more and more smaller institutions are offering their own xMOOCs through using or adapting their continuing education online registration process, their own video servers, and 'off-the-shelf' automated feedback, testing and marking tools.

5.3.1.2 Video lectures

xMOOCs use the standard lecture mode, delivered online by participants downloading on demand recorded video lectures. These video lectures are normally available on a weekly basis over a period of 10-13 weeks. Initially these were often 50 minute lectures, but as a result of experience some xMOOCs now are using shorter recordings (sometimes down to 15 minutes in length) and thus there may be more video segments. As well, xMOOC *courses* are becoming shorter in length, some now lasting only five weeks. Various video production methods have been used, including lecture capture (recording face-to-face on-campus lectures, then storing them and streaming them on demand), full studio production, or desk-top recording by the instructor.

5.3.1.3 Computer-marked assignments

Students complete an online test and receive immediate computerised feedback. These tests are usually offered throughout the course, and may be used just for participant feedback. Alternatively the tests may be used for determining the award of a certificate. Another option is for an end of course grade or certificate based solely on an end-of-course online test. Most xMOOC assignments are based on multiple-choice, computer-marked questions, but some MOOCs have also used text or formula boxes for participants to enter answers, such as coding in a computer science course, or mathematical formulae, and in one or two cases, short text answers, but in most cases these will be computer-marked.

5.3.1.4 Peer assessment

Some xMOOCs have experimented with assigning students randomly to small groups for peer assessment, especially for more open-ended or more evaluative assignment questions. This has often proved problematic though because of wide variations in expertise between the different members of a group, and because of the different levels of involvement in the course of different participants.

5.3.1.5 Supporting materials

Sometimes copies of slides, supplementary audio files, urls to other resources, and online articles may be included for downloading by participants.

5.3.1.6 A shared comment/discussion space

These are places where participants can post questions, ask for help, or comment on the content of the course.

5.3.1.7 No, or very light, discussion moderation

The extent to which the discussion or comments are moderated varies probably more than any other feature in xMOOCs, but at its most, moderation is directed at all participants rather than to individuals. Because of the very large numbers participating and commenting, moderation of individual comments by the instructor(s) offering the MOOC is rarely possible. Some instructors offer no moderation whatsoever, so participants rely on other participants to respond to questions or comments. Some instructors 'sample' comments and questions, and post comments in response to these. Some instructors use volunteers or paid teaching assistants to comb comments to identify common areas of concern shared by a number of participants then the instructor and/or the teaching assistants will respond. However, in most cases, participants moderate each other's comments or questions.

5.3.1.8 Badges or certificates

Most xMOOCs award some kind of recognition for successful completion of a course, based on a final computer-marked assessment. However, at the time of writing, MOOC badges or certificates have in most cases not been recognised for credit or admission purposes even by the institutions offering a MOOC – even when the lectures are the same as for on-campus students. Little evidence exists to date about employer acceptance of MOOC qualifications (see for instance, Banks and Meinart, 2016 or Gatuguta-Gitau, 2017). However, with the increasing development of partnerships between major employers and MOOC providers to develop microcredentials, this may change (see for example, Gordon, 2018).

5.3.1.9 Learning analytics

Although to date there has not been a great deal of published information about the use of learning analytics in xMOOCs, the xMOOC platforms have the capacity to collect and analyse 'big data' about participants and their performance, enabling, at least in theory, for immediate feedback to instructors about areas where the content or design needs improving and possibly directing automated cues or hints for individuals. For examples of the use of learning analytics in MOOCs, see Laveti et al., 2017 or Eradze and Tammets, 2017.

5.3.1.10 xMOOCs Summary

xMOOCs therefore primarily use a teaching model focused on the transmission of information, with high quality content delivery, computer-marked assessment (mainly for student feedback purposes), and automation of all key transactions between participants and the learning platform. There is rarely any direct interaction between an individual participant and the instructor responsible for the course, although instructors may post general comments in response to a range of participants' comments. Thus there is a highly behaviouristic/objectivist epistemology underlying xMOOCs.

5.3.2 cMOOCs

cMOOCs, the first of which was developed by three instructors for a course at the University of Manitoba in 2008, are based on network learning, where learning develops through the connections and discussions between participants over social media. There is no standard technology platform for cMOOCs, which use a combination of webcasts, participant blogs, tweets, software that connects blogs and tweets on the same topic via hashtags, and online discussion forums. Although usually there are some experts who initiate and participate in cMOOCs, they are by and large driven by the interests and contributions of the participants. Usually there is no attempt at formal assessment.

5.3.2.1 Key design principles for cMOOCs

Downes (2014) has identified four key design principles for cMOOCs:

- **autonomy of the learner:** although whoever organises the MOOC will usually choose a main topic and invite participants, there is no formal curriculum; participants decide what to discuss, what to read, and what they wish to contribute towards the topic;
- **diversity:** in the tools used, the range of participants, their knowledge levels, and the varied content;
- **interactivity:** in terms of co-operative learning, communication between participants, resulting in 'emergent' knowledge
- **open-ness**: in terms of access, content, activities and assessment.

Thus for the proponents of cMOOCs, learning results not from the transmission of information from an expert to novices, as in xMOOCs, but from the sharing and flow of knowledge between participants.

5.3.2.2 From principles to practice

Identifying how these key design features for cMOOCs are turned into practice is somewhat more difficult to pinpoint, because cMOOCs depend on an evolving set of practices. Most cMOOCs to date have in fact made some use of 'experts', both in the organization and promotion of the MOOC, and in providing 'nodes' of content around which discussion tends to revolve. In other words, the design practices of cMOOCs are still more a work in progress than those of xMOOCs.

Nevertheless, at the moment the following are key design practices in cMOOCs:

- **use of social media** Partly because most cMOOCs are not institutionally based or supported, they do not at present use a shared platform or platforms but are more loosely supported by a range of openly accessible 'connected' tools and media. These may include a simple online registration system, and the use of web conferencing tools such as Blackboard Collaborate or Adobe Connect, streamed video or audio files, blogs, wikis, 'open' learning management systems such as Moodle or Canvas, Twitter, LinkedIn or Facebook, all enabling participants to share their contributions. Indeed, as new apps and social media tools develop, they too are likely to be incorporated into cMOOCs. All these tools are connected through web-based hashtags or other web-based linking mechanisms, enabling participants to identify social media contributions from other participants. Thus the use of loosely linked or connected social media is a key design component of cMOOCs;
- **participant-driven content** In principle, other than a common topic that may be decided by someone wanting to organise a cMOOC, content is decided upon and contributed by the participants themselves. Indeed, there may be no formally identified instructor. In practice though cMOOC organisers (who themselves tend to have some expertise in the topic of the MOOC) are likely to invite potential participants who have expertise or are known already to have a well articulated approach to a topic, to make contributions which form the basis of discussion and debate. Participants choose their own ways to contribute or communicate, the most common being through blog posts, tweets, or comments on other participants' blog posts, although some cMOOCs use wikis or open source online discussion forums. The key design practice with regard to content is that all participants contribute to and share content;
- **distributed communication** This is probably the most difficult design practice to understand for those not familiar with cMOOCs – and even for those who have participated. With participants numbering in the hundreds or even thousands, each contributing individually through a variety of social media, there are a myriad different inter-connections between participants that are impossible to track (in total) by any single participant. This results in many sub-conversations, more commonly at a binary level of two people communicating with each other than an integrated group discussion, although all conversations are 'open' and all other participants are able to contribute to a conversation if they know it exists. The key design practice then with regard to communication is a self-organising network with many sub-components;
- **assessment** There is no formal assessment, although participants may seek feedback from other, more knowledgeable participants, on an informal basis. Basically participants decide for themselves whether what they have learned is appropriate to them.

5.3.2.3 cMOOCs summary

cMOOCs therefore primarily use a networked approach to learning based on autonomous learners connecting with each other across open and connected social media and sharing knowledge through their own personal contributions. There is no pre-set curriculum and no formal teacher-student relationship, either for delivery of content or for learner support. Participants learn from the contributions of others, from the meta-level knowledge generated through the community, and from self-reflection on their own contributions, thus reflecting many of the features of communities of interest or practice.

cMOOCs have a very different educational philosophy from xMOOCs. Downes and Siemens have argued that cMOOCs reflect a new theory of learning, 'connectivism', based on exploiting online social networks (see Chapter 2.6). cMOOCs certainly reflect a constructivist epistemology.

5.3.3 Other variations of MOOCs

I have deliberately focused on the differences in design between xMOOCs and cMOOCs, and Mackness (2103) and Yousef et al. (2014) also emphasise similar differences in philosophy/theory between cMOOCs and xMOOCs, as well as Downes himself (2012), one of the original designers of cMOOCs.

However, it should be noted that the design of MOOCs continues to evolve, with all kinds of variations. Pilli and Admiraal (2016) have identified 27 types of MOOC, including:

- *cMOOCs;*
- *xMOOCs;*
- *BOOCs* (a big open online course) – a cross between an xMOOC and a cMOOC;
- *COOCs* (community open online courses) – small-scale, non-profit courses that corporations open online to provide courses for customers and/or employees
- *DOCCs* (distributed open collaborative course): this involves 17 universities sharing and adapting the same basic MOOC;
- *LOOC* s(little open online course): as well as 15-20 tuition-paying campus-based students, such courses also allow a limited number of non-registered students to also take the course, but also paying a fee;
- *MOORs* (massive open online research): a mix of video-based lecturers and student research projects guided by the instructors;
- *SPOCs* (small, private, online courses): the example given is from Harvard Law School, which pre-selected 500 students from over 4,000 applicants, who take the same video-delivered lectures as on-campus students enrolled at Harvard;

The MOOCs developed by the University of British Columbia and a number of other institutions use volunteers, paid academic assistants or even the instructor to moderate the online discussions and participant comments, making such MOOCs closer in design to regular for-credit online courses – except that they are open to anyone.

5.3.4 What's going on here?

It is not surprising that over time, the design of MOOCs is evolving. There seem to be three distinct kinds of development:

- some of the newer MOOCs, especially those from institutions with a history of credit-based online learning prior to the introduction of MOOCs, are beginning to apply some of the best practices, such as organised and moderated discussion groups, from online credit courses to MOOCs (see Chapter 4, Section 4);
- others are trying to open up their regular campus classes also, simultaneously, to non-registered students (which in fact is how the first MOOC, from Cormier, Downes and Siemens, originated);
- yet others are trying to blend online MOOC materials or content with their on-campus teaching.

It is likely that innovation in MOOC design and the way MOOCs are used will continue. In particular, different kinds of MOOC come and go. Finding extant examples of some of the types of MOOC listed in Section 5.3.3 has been difficult in revising this chapter.

However, some of these developments also indicate a good deal of confusion around the definition and goals of MOOCs, especially regarding massiveness and open-ness. If participants from outside a university have to pay a hefty fee to participate in an otherwise 'closed', on-campus course, or if off-campus participants have to be selected on certain criteria before they can participate, is it really open? Is the term MOOC now being used to describe any unconventional online offering or any online continuing education course? It's difficult to see how a SPOC for instance differs from a typical online continuing education course, except perhaps in that it uses a recorded lecture rather than a learning management system. There is a danger of having any online course ending up being described as a MOOC, when in fact there are major differences in design and philosophy.

Although each of these individual innovations, often the result of the initiative of an individual instructor, are to be welcomed in principle, the consequences need to be carefully considered in fairness to potential participants. Individual instructors designing MOOCs really need to make sure that the design is consistent in terms of educational philosophy, and be clear as to why they are opting for a MOOC rather than a conventional online course. This is particularly important if there is to be any form of formal assessment. The status of such an assessment for participants who are not formally admitted to or registered as a student in an institution needs to be clear and consistent.

There is even more confusion about mixing MOOCs with on-campus teaching. At the moment the strategy appears to be to first develop a MOOC then see how it can be adapted for on-campus teaching. However, a better strategy might be to develop a conventional, for-credit online course, in terms of design, then see how it could be scaled for open access to other participants. Another strategy might be to use open social media, such as a course wiki and student blogs, to widen access to the teaching of a formal course, rather than develop a full-blown MOOC.

Thinking through the policy implications of incorporating MOOCs or MOOC materials with on-campus teaching does not appear to be happening at the moment in most institutions experimenting with 'blended' MOOCs. If MOOC participants are taking exactly the same course and assessment as registered on-campus for-credit students, will the institution award the external MOOC participants who successfully complete the assessment credit for it and/or admit them to the institution? If not, why not?

For an excellent discussion of these issues framed for an institution's Board of Governors, see Green, 2013.

Thus some of these MOOC developments seem to be operating in a policy vacuum regarding open learning in general. At some point, institutions will need to develop a clearer, more consistent strategy for open learning, in terms of how it can best be provided, how it calibrates with formal learning, and how open learning can be accommodated within the fiscal constraints of the institution, and then where MOOCs, other OERs and conventional for-credit online courses might fit with the strategy. For more on this topic, see Chapter 11.

References

Banks, C. and Meinert, E. (2016) The acceptability of MOOC certificates in the workplace International Conference eLearning 2016

Downes, S. (2012) Massively Open Online Courses are here to stay, *Stephen's Web*, July 20

Downes, S. (2014) *The MOOC of One*, Valencia, Spain, March 10

Eradze M., Tammets K. (2017) Learning Analytics in MOOCs: EMMA Case. In: Lauro N., Amaturo E., Grassia M., Aragona B., Marino M. (eds) *Data Science and Social Research: Studies in Classification, Data Analysis, and Knowledge Organization* Springer: Cham

Gatuguta-Gitau, S. (2017) MOOCs: Employers View, a brief snapshot *QS*, London, UK

Gordon, A. (2018) 'Micromasters surge as MOOCs go from education to qualification', *Forbes*, 13 February

Green, K. (2013) Mission, money and MOOCs *Association of Governing Boards Trusteeship*, No. 1, Volume 21

Laveti, R. et al. (2017) Implementation of learning analytics framework for MOOCs using state-of-the-art in-memory computing, *IEEE Xplore*, 19 October

Mackness, J. (2013) *cMOOCs and xMOOCs – key differences*, Jenny Mackness, October 22

Pilli, O. amd Admiraal, W. (2016) A Taxonomy of Massive Open Online Courses *Contemporary Educational Technology*, Vol. 7, No. 3, pp. 223-240

Yousef, A. et al. (2014) *MOOCs: A Review of the State-of-the-Art* Proceedings of 6th International Conference on Computer Supported Education – CSEDU 2014, Barcelona, Spain, pp. 9-20

Activity 5.3: Thinking about MOOC design

1. When is a MOOC a MOOC and when is it not a MOOC? Can you identify the common features? Is MOOC still a useful term?

2. If you were to design a MOOC, who would be the target audience? What kind of MOOC would it be? What form of assessment could you use? What would make you think your MOOC was a success, after it was delivered? What criteria would you use?

3. Could you think of other ways to make one or more of your courses more open, other than creating a MOOC from scratch? What would be the advantages and disadvantages of these other methods, compared to a MOOC?

For my comments on these questions click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=154

5.4 Strengths and weaknesses of MOOCs

Figure 5.4.1 MOOC users tend to be male, well-educated, with about 40-60% from other countries. Image: Depositphotos, 2019

In-depth analysis by standard academic criteria shows that MOOCs have more academic rigor and are a far more effective teaching methodology than in-house teaching

Benton R. Groves, Ph.D. student

My big concern with xMOOCs is their limitation, as currently designed, for developing the higher order intellectual skills needed in a digital world.

Tony Bates

5.4.1 The research on MOOCs

At the time of writing (2019), MOOCs are still less than ten years old, whereas online courses for credit have been around for more than 20 years. The latter have been subject to much more independent research, although this prior research was largely ignored in the design of the early MOOCs. A lot of the research to date on MOOCs comes from the institutions offering MOOCs, mainly in the form of reports on enrolments, or self-evaluation by instructors. The commercial platform providers such as Coursera and Udacity have provided limited research information overall, which is a pity, because they have access to really big data sets. However, MIT and Harvard, the founding partners in edX, are conducting some research, mainly on their own courses.

In this chapter, I have drawn on available evidence-based research that provides insight into the strengths and weaknesses of MOOCs. At the same time, we should be clear that we are discussing a phenomenon that to date has been marked largely by political, emotional and often irrational discourse, rather than something based on evidence-based research.

Lastly, it should be remembered in this evaluation I am applying the criteria of whether MOOCs are likely to lead to the kinds of learning needed in a digital age: in other words, do they help develop the knowledge and skills defined in Chapter 1?

5.4.2 Open and free education

5.4.2.1 The 'open-ness' of MOOCs

MOOCs, particularly xMOOCs, deliver high quality content from some of the world's best universities to anyone with a computer and an Internet connection. This in itself is an amazing value proposition. In this sense, MOOCs are an incredibly valuable addition to education. Who could argue against this?

However, MOOCs are not the only form of open and free education. Libraries, open textbooks and educational broadcasting are also open and free and have been for some time. There are also lessons we can learn from these earlier forms of open and free education that also apply to MOOCs.

Furthermore, MOOCs are not always open as in the sense of open educational resources. Coursera and Udacity for instance offer limited access to their material for re-use without permission. On other more open platforms, such as edX, individual faculty or institutions may restrict re-use of material. Lastly, many MOOCs exist for only one or two years then disappear, which limits their use as open educational resources for re-use in other courses or programs.

5.4.2.2 A replacement for conventional education?

It is worth noting that these earlier forms of open and free education did not replace the need for formal, credit-based education, but were used to supplement or strengthen it. In other words, MOOCs are a tool for continuing and informal education, which has high value in its own right. As we shall see, though, MOOCs work best when people are already reasonably well educated. There is no reason to believe then that because MOOCs are open and free to end-users, they will inevitably force down the cost of conventional higher education, or eliminate the need for it altogether.

5.4.2.3 The answer for education in developing countries?

There have been many attempts to use educational broadcasting and satellite broadcasting in developing countries to open up education for the masses (see Bates, 1984), and they all substantially failed to increase access or reduce cost for a variety of reasons, the most important being:

- the high cost of ground equipment (including security from theft or damage);
- the need for local face-to-face support for learners without high levels of education;

- the need to adapt content to the culture and needs of the receiving countries;
- the difficulty of covering the operational costs of management and administration, especially for assessment, qualifications and local accreditation.

Also the priority in most developing countries is not for university courses from high-level Stanford University professors, but for low cost, good quality high school education.

Although mobile phones and to a lesser extent tablets are widespread in Africa, they are relatively expensive to use. For instance, it costs US$2 to download a typical YouTube video – equivalent to a day's salary for many Africans. Streamed 50 minute video lectures then have limited applicability.

Lastly, it is frankly immoral to allow people in developing countries to believe that successful completion of MOOCs will lead to a recognised degree or to university entrance in the USA or in any other economically advanced country, at least under present circumstances.

This is not to say that MOOCs could not be valuable in developing countries, but this will mean:

- being realistic as to what they can actually deliver;
- working in partnership with educational institutions and systems and other partners in developing countries;
- ensuring that the necessary local support – which costs real money – is put in place;
- adapting the design, content and delivery of MOOCs to the cultural and economic requirements of those countries.

Finally, although MOOCs are in the main free for participants, they are not without substantial cost to MOOC providers, an issue that will be discussed in more detail in Section 5.4.8.

5.4.3 The audience that MOOCs mainly serve

In a research report from Ho et al. (2014), researchers at Harvard University and MIT found that on the first 17 MOOCs offered through edX,

- 66 per cent of all participants, and 74 per cent of all who obtained a certificate, have a bachelor's degree or above,
- 71 per cent were male, and the average age was 26.
- this and other studies also found that a high proportion of participants came from outside the USA, ranging from 40-60 per cent of all participants, indicating strong interest internationally in open access to high quality university teaching.

In a study based on over 80 interviews in 62 institutions 'active in the MOOC space', Hollands and Tirthali (2014), researchers at Columbia University Teachers' College, found that:

> *Data from MOOC platforms indicate that MOOCs are providing educational opportunities to millions of individuals across the world. However, most MOOC participants are already well-educated and employed, and only a small fraction of them fully engages with the courses. Overall, the evidence suggests that MOOCs are currently falling far short of "democratizing" education and may, for now, be doing more to increase gaps in access to education than to diminish them.*

Thus MOOCs, as is common with most forms of university continuing education, cater to the better educated, older and employed sectors of society.

5.4.4 Persistence and commitment: the onion hypothesis

The edX researchers (Ho et al., 2014) identified different levels of commitment as follows across 17 edX MOOCs:

- **only registered**: registrants who never access the courseware (35 per cent);
- **only viewed**: non-certified registrants who access the courseware, accessing less than half of the available chapters (56 per cent);
- **only explored**: non-certified registrants who access more than half of the available chapters in the courseware, but did not get a certificate (4 per cent);
- **certified**: registrants who earn a certificate in the course (5 per cent).

Hill (2013) has identified five types of participants in Coursera courses:

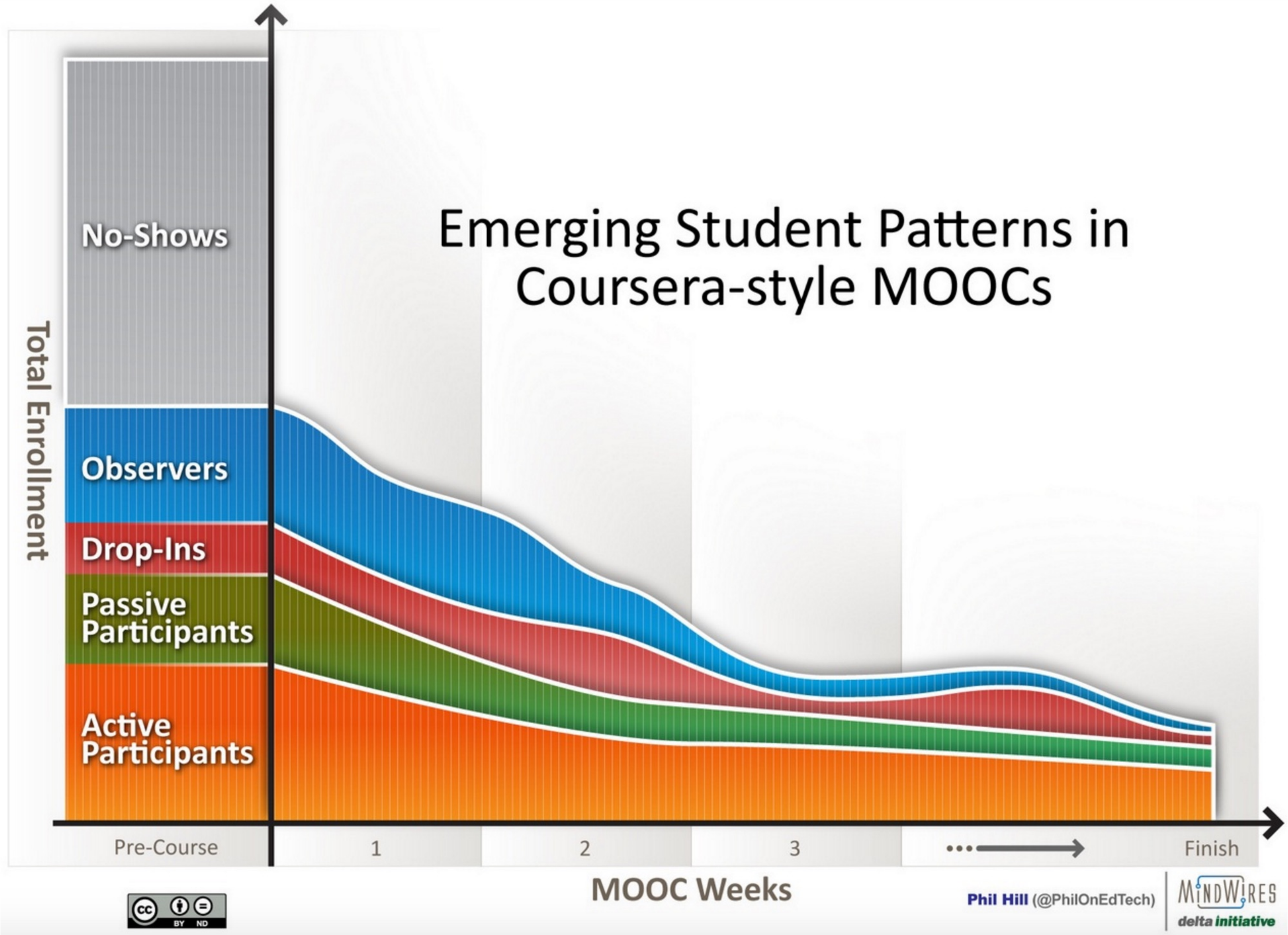


Figure 5.4.2 Image: Phil Hill, 2013

Engle (2014) found similar patterns (also replicated in other studies) for the University of British Columbia MOOCs on Coursera :

- of those that initially sign up, between one third and a half do not participate in any other active way;
- of those that participate in at least one activity, between 5-10 per cent go on to successfully complete a certificate.

Those going on to achieve certificates usually are within the 5-10 per cent range of those that sign up and in the 10-20 per cent range for those who actively engaged with the MOOC at least once. Nevertheless, the numbers obtaining certificates are still large in absolute terms: over 43,000 across 17 courses on edX and 8,000 across four courses at UBC (between 2,000-2,500 certificates per course).

Milligan et al. (2013) found a similar pattern of commitment in cMOOCs, from interviewing a small sample of participants (29 out of 2,300 registrants) about halfway through a cMOOC:

- passive participants: in Milligan's study these were those that felt lost in the MOOC and rarely but occasionally logged in;

- lurkers: they were actively following the course but did not engage in any of the activities (just under half those interviewed);
- active participants (again, just under half those interviewed) who were fully engaged in the course activities.

MOOCs need to be judged for what they are, a somewhat unique – and valuable – form of non-formal education. These results are very similar to research into non-formal educational broadcasts (e.g. the History Channel). One would not expect a viewer to watch every episode of a History Channel series then take an exam at the end. Ho et al. (p.13) produced the following diagram to show the different levels of commitment to xMOOCs:

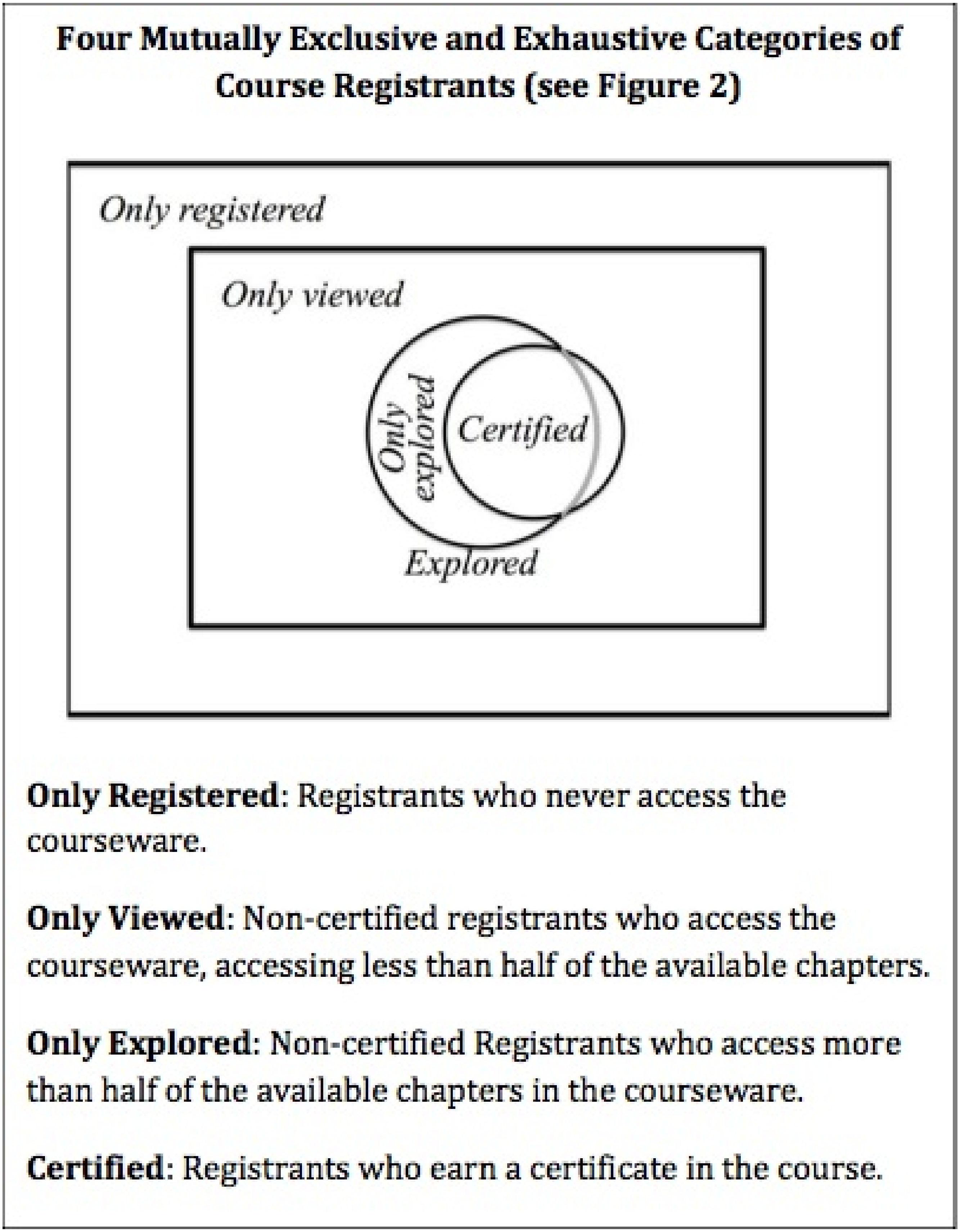


Figure 5.4.3 Level of participation in MOOCs © Ho et al., 2014

This is remarkably similar to what I wrote in 1984 about the onion hypothesis of educational broadcasting in Britain (Bates, 1984):

> (p.99): *At the centre of the onion is a small core of fully committed students who work through the whole course, and, where available, take an end-of-course assessment or examination. Around the small core will be a rather larger layer of students who do not take any examination but do enrol with a local class or correspondence school. There may be an even larger layer of students who, as well as watching and listening, also buy the accompanying textbook, but who do not enrol in any courses. Then, by far the largest group, are those that just watch or listen to the programmes. Even within this last group, there will be considerable variations, from those who watch or listen fairly regularly, to those, again a much larger number, who watch or listen to just one programme.*

I also wrote (p.100):

> *A sceptic may say that the only ones who can be said to have learned effectively are the tiny minority that worked right through the course and successfully took the final assessment…A counter argument would be that broadcasting can be considered successful if it merely attracts viewers or listeners who might otherwise have shown no interest in the topic; it is the numbers exposed to the material that matter…the key issue then is whether broadcasting does attract to education those who would not otherwise have been interested, or merely provides yet another opportunity for those who are already well educated…There is a good deal of evidence that it is still the better educated in Britain and Europe that make the most use of non-formal educational broadcasting.*

Exactly the same could be said about MOOCs. In a digital age where easy and open access to new knowledge is critical for those working in knowledge-based industries, MOOCs will be one valuable source or means of accessing that knowledge. The issue is though whether there are more effective ways to do this. Thus MOOCs can be considered a useful – but not really revolutionary – contribution to non-formal continuing education.

5.4.5 What do students learn in MOOCs?

This is a much more difficult question to answer, because so little of the research to date (2019) has tried to answer this question. (One reason, as we shall see in the next section, is that assessment of learning in MOOCs remains a major challenge). There are at least two kinds of study: quantitative studies that seek to quantify learning gains; and qualitative studies that describe the experience of learners within MOOCs, which indirectly provide some insight into what they have learned.

5.4.5.1 Conceptual learning

At the time of writing, the most quantitative study of learning in MOOCs has been by Colvin et al.(2014), who investigated ‘conceptual learning’ in an MIT Introductory Physics MOOC. Colvin and colleagues compared learner performance not only between different sub-categories of learners within the MOOC, such as those with no physics or math background with those such as physic teachers who had considerable prior knowledge, but also with on-campus students taking the same curriculum in a traditional campus teaching format. In essence, the study found no significant differences in learning gains between or within the two types of teaching, but it should be noted that the on-campus students were students who had failed an earlier version of the course and were retaking it.

This research is a classic example of the no significant difference in comparative studies in educational technology; other variables, such as differences in the types of students, were as important as the mode of delivery (for more on the 'no significant difference' phenomenon in media comparisons, see Chapter 10, Section 2.2). Also, this MOOC design represents a behaviourist-cognitivist approach to learning that places heavy emphasis on correct answers to conceptual questions. It doesn't attempt to develop the skills needed in a digital age as identified in Chapter 1.

5.4.5.2 The student experience

There have been far more studies of the *experience* of learners within MOOCs, particularly focusing on the discussions within MOOCs (see for instance, Kop, 2011). In general (although there are exceptions), discussions are unmonitored, and it is left to participants to make connections and respond to other students comments.

However, there are some strong criticisms of the effectiveness of the discussion element of MOOCs for developing the high-level conceptual analysis required for academic learning. There is evidence from studies of credit-based online learning that to develop deep, conceptual learning, there is a need in most cases for intervention by a subject expert to clarify misunderstandings or misconceptions, to provide accurate feedback, to ensure that the criteria for academic learning, such as use of evidence, clarity of argument, and so on, are being met, and to ensure the necessary input and guidance to seek deeper understanding (see in particular Harasim, 2017).

Furthermore, the more massive the course, the more likely participants are to feel 'overload, anxiety and a sense of loss', if there is not some instructor intervention or structure imposed (Knox, 2014). Firmin et al. (2014) have shown that when there is some form of instructor 'encouragement and support of student effort and engagement', results improve for all participants in MOOCs. Without a structured role for subject experts, participants are faced with a wide variety of quality in terms of comments and feedback from other participants. There is again a great deal of research on the conditions necessary for the successful conduct of collaborative and co-operative group learning (see for instance, Lave and Wenger, 1991, or Barkley, Major and Cross, 2014), and these findings certainly have not been generally applied to the management of MOOC discussions.

5.4.5.3 Networked and collaborative learning

One counter argument is that cMOOCs in particular develop a new form of learning based on networking and collaboration that is essentially different from academic learning, and cMOOCs are thus more appropriate to the needs of learners in a digital age. Adult participants in particular, it is claimed by Downes and Siemens, have the ability to self-manage the development of high level conceptual learning. cMOOCs are 'demand' driven, meeting the interests of individual students who seek out others with similar interests and the necessary expertise to support them in their learning, and for many this interest may well not include the need for deep, conceptual learning but more likely the appropriate applications of prior knowledge in new or specific contexts. All MOOCs do appear to work best for those who already have a high level of education and therefore bring many of the conceptual skills developed in formal education with them when they join a MOOC, and therefore contribute to helping those who come without such prior knowledge or skills.

5.4.5.4 The need for learner support

Over time, as more experience is gained, MOOCs are likely to incorporate and adapt some of the findings from research on smaller group work to the much larger numbers in MOOCs. For instance, some MOOCs are using 'volunteer' or community tutors. The US State Department organized MOOC camps through US missions and consulates abroad to mentor MOOC participants. The camps included Fulbright scholars and embassy staff who lead discussions on content and topics for MOOC participants in countries abroad (Haynie, 2014).

Some MOOC providers, such as the University of British Columbia, paid a small cohort of academic assistants to monitor and contribute to the MOOC discussion forums (Engle, 2014). Engle reported that the use of academic assistants, as well as limited but effective interventions from the instructors themselves, made the UBC MOOCs more interactive and engaging.

However, paying for people to monitor and support MOOCs will of course increase the cost to providers. Consequently, MOOCs are likely to develop new automated ways to manage discussion effectively in very large groups. For instance, the University of Edinburgh experimented with an automated 'teacherbot' that crawled through student and instructor Twitter posts associated with a MOOC and directed predetermined comments to students to prompt discussion and reflection (Bayne, 2015). These results and approaches are consistent with prior research on the importance of instructor presence for successful online learning in credit-based courses (see Chapter 4.4.3).

In the meantime, though, there is much work still to be done if MOOCs are to provide the support and structure needed to ensure deep, conceptual learning where this does not already exist in students. The development of the skills needed in a digital age is likely to be an even greater challenge when dealing with massive numbers. However, we need much more research into what participants actually learn in MOOCs and under what conditions before any firm conclusions can be drawn.

5.4.6 Assessment

Assessment of the massive numbers of participants in MOOCs has proved to be a major challenge. It is a complex topic that can be dealt with only briefly here. However, Chapter 6, Section 8 provides a general analysis of different types of assessment, and Suen (2014) provides a comprehensive and balanced overview of the way assessment has been used in MOOCs to date. This section draws heavily on Suen's paper.

5.4.6.1 Computer marked assignments

Assessment to date in MOOCs has been primarily of two kinds. The first is based on quantitative multiple-choice tests, or response boxes where formulae or 'correct code' can be entered and automatically checked. Usually participants are given immediate automated feedback on their answers, ranging from simple right or wrong answers to more complex responses depending on the type of response checked, but in all cases, the process is usually fully automated.

For straight testing of facts, principles, formulae, equations and other forms of conceptual learning where there are clear, correct answers, this works well. In fact, multiple choice computer marked assignments were used by the UK Open University as long ago as the 1970s, although the means to give immediate online feedback were not available then. However, this method of assessment is limited for testing deep or 'transformative' learning, and particularly weak for assessing the intellectual skills needed in a digital age, such as creative or original thinking.

5.4.6.2 Peer assessment

Another type of assessment that has been tried in MOOCs has been peer assessment, where participants assess each other's work. Peer assessment is not new. It has been successfully used for formative assessment in traditional classrooms and in some online teaching for credit (Falchikov and Goldfinch, 2000; van Zundert et al., 2010). More importantly, peer assessment is seen as a powerful way to improve deep understanding and knowledge through the process of students evaluating the work of others, and at the same time, it can be useful for developing some of the skills needed in a digital age, such as critical thinking, for those participants assessing other participants.

However, a key feature of the successful use of peer assessment has been the close involvement of an instructor or teacher, in providing benchmarks, rubrics or criteria for assessment, and for monitoring and adjusting peer assessments to ensure consistency and a match with the benchmarks set by the instructor. Although an instructor can provide the benchmarks and rubrics in MOOCs, close monitoring of the multiple peer assessments is difficult if not impossible with the very large numbers of participants. As a result, MOOC participants often become incensed at being randomly assessed by other participants who may not and often do not have the knowledge or ability to give a 'fair' or accurate assessment of another participant's work.

Various attempts to get round the limitations of peer assessment in MOOCs have been tried such as calibrated peer reviews, based on averaging all the peer ratings, and Bayesian post hoc stabilization (Piech at al. 2013), but although these statistical techniques reduce the error (or spread) of peer review somewhat they still do not remove the problems of systematic errors of judgement in raters due to misconceptions. This is particularly a problem where a majority of participants fail to understand key concepts in a MOOC, in which case peer assessment becomes the blind leading the blind.

5.4.6.3 Automated essay scoring

This is another area where there have been attempts to automate scoring (Balfour, 2013). Although such methods are increasingly sophisticated they are currently limited in terms of accurate assessment to measuring primarily technical writing skills, such as grammar, spelling and sentence construction. Once again they do not measure accurately longer essays where higher level intellectual skills are demanded.

5.4.6.4 Badges, certificates and microcredentials

Particularly in xMOOCs, participants may be awarded a certificate or a 'badge' for successful completion of the MOOC, based on a final test (usually computer-marked) which measures the level of learning in a course. However, most of the institutions offering MOOCs will not accept their own certificates for admission or credit within their own, campus-based programs. Probably nothing says more about the confidence in the quality of the assessment than this failure of MOOC providers to recognize their own teaching.

MOOC-based microcredentials are a more recent development.A microcredential is any one of a number of new certifications that covers more than a single course but is less than a full degree. Pickard (2018) provides an analysis of more than 450 MOOC-based microcredentials. Pickard states:

> *Microcredentials can be seen as part of a trend toward modularity and stackability in higher education, the idea being that each little piece of an education can be consumed on its own or can be aggregated with other pieces up to something larger. Each course is made of units, each unit is made of lessons; courses can stack up to Specializations or XSeries; these can stack up to partial*

degrees such as MicroMasters, or all the way up to full degrees (though only some microcredentials are structured as pieces of degrees).

However, in her analysis, Pickard found that in the micro-credentials offered through the main MOOC platforms, such as Coursera, edX, Udacity and FutureLearn.;

- *student fees range from US$250 to US$17,000;*
- *some microcredentials, though not all, offer some opportunity to earn credit towards a degree program. Typically, university credit is awarded if and only if a student goes on to enroll in the particular degree program connected with the microcredential;*
- *they are not accredited, recognized, or evaluated by third party organizations (except insofar as they pertain to university degree programs). This variability and lack of standardization poses a problem for both learners and employers, as it makes it difficult to compare the various microcredentials;*
- *with so much variability, how would a prospective learner choose among the various options? Furthermore, without a detailed understanding of these options, how would an employer interpret or compare these microcredentials when they come up on a resume?*

Nevertheless, in a digital age, both workers and employers will increasingly look for ways to 'accredit' smaller units of learning than a degree, but in ways that they can be stacked towards eventually a full degree. The issue is whether tying this to the MOOC movement is the best way to go.

Surely a better way would be to develop microcredentials as part of or in parallel with a regular online masters program. For instance as early as 2003, the University of British Columbia in its online Master of Educational Technology was allowing students to take single courses at a time, or the five foundation courses for a post-graduate certificate, or add four more courses and a project to the certificate for a full Master's degree. Such microcredentials would not be MOOCs, unless (a) they are open to anyone and (b) they are free or at such a low cost anyone can take them. Then the issue becomes whether the institution will accept such MOOC-like credentials as part of a full degree. If not, employers are unlikely to recognise such microcredentials, because they will not know what they are worth.

5.4.6.5 The intent behind assessment

To evaluate assessment in MOOCs requires an examination of the intent behind assessment. There are many different purposes behind assessment (see Chapter 6, Section 8). Peer assessment and immediate feedback on computer-marked tests can be extremely valuable for *formative* assessment or feedback, enabling participants to see what they have understood and to help develop further their understanding of key concepts. In cMOOCs, as Suen points out, learning is measured as the communication that takes place between MOOC participants, resulting in crowdsourced validation of knowledge – it's what the sum of all the participants come to believe to be true as a result of participating in the MOOC, so formal assessment is unnecessary. However, what is learned in this way is not necessarily *academically* validated knowledge, which to be fair, is not the concern of cMOOC proponents.

Academic assessment is a form of currency, related not only to measuring student achievement but also affecting student mobility (for example, entrance to graduate school) and perhaps more importantly employment opportunities and promotion. From a learner's perspective, the validity of the currency – the recognition and transferability of the qualification – is essential. To date, MOOCs have been unable to demonstrate that they are able to assess accurately the learning achievements of participants beyond comprehension and knowledge of ideas, principles and processes (recognizing that there is some value in this alone). What MOOCs have not been able to demonstrate is that they can either develop or assess deep understanding or the intellectual skills required in a digital age. Indeed, this may not be possible within the constraints of massiveness, which is their major distinguishing feature from other forms of online learning.

5.4.7 Branding

Hollands and Tirthali (2014) in their survey on institutional expectations for MOOCs, found that building and maintaining brand was the second most important reason for institutions launching MOOCs (the most important was extending reach, which can also be seen as partly a branding exercise). Institutional branding through the use of MOOCs has been helped by elite Ivy League universities such as Stanford, MIT and Harvard leading the charge, and by Coursera limiting access to its platform to only 'top tier' universities. This of course has led to a bandwagon effect, especially since many of the universities launching MOOCs had previously disdained to move into credit-based online learning. MOOCs provided a way for these elite institutions to jump to the head of the queue in terms of status as 'innovators' of online learning, even though they arrived late to the party.

It obviously makes sense for institutions to use MOOCs to bring their areas of specialist expertise to a much wider public, such as the University of Alberta offering a MOOC on dinosaurs, MIT on electronics, and Harvard on Ancient Greek Heroes. MOOCs certainly help to widen knowledge of the quality of an individual professor (who is usually delighted to reach more students in one MOOC than in a lifetime of on-campus teaching). MOOCs are also a good way to give a glimpse of the quality of courses and programs offered by an institution.

However, it is difficult to measure the real impact of MOOCs on branding. As Hollands and Tirthali put it:

> *While many institutions have received significant media attention as a result of their MOOC activities, isolating and measuring impact of any new initiative on brand is a difficult exercise. Most institutions are only just beginning to think about how to capture and quantify branding-related benefits.*

In particular, these elite institutions do not need MOOCs to boost the number of applicants for their campus-based programs (none to date is willing to accept successful completion of a MOOC for admission to credit programs), since elite institutions have no difficulty in attracting already highly qualified students.

Furthermore, once every other institution starts offering MOOCs, the branding effect gets lost to some extent. Indeed, exposing poor quality teaching or course planning to many thousands can have a negative impact on an institution's brand, as Georgia Institute of Technology found when one of its MOOCs crashed and burned (Jaschik, 2013). However, by and large, most MOOCs succeed in the sense of bringing an institution's reputation in terms of knowledge and expertise to many more people than it would through any other form of teaching or publicity.

5.4.8 Costs and economies of scale

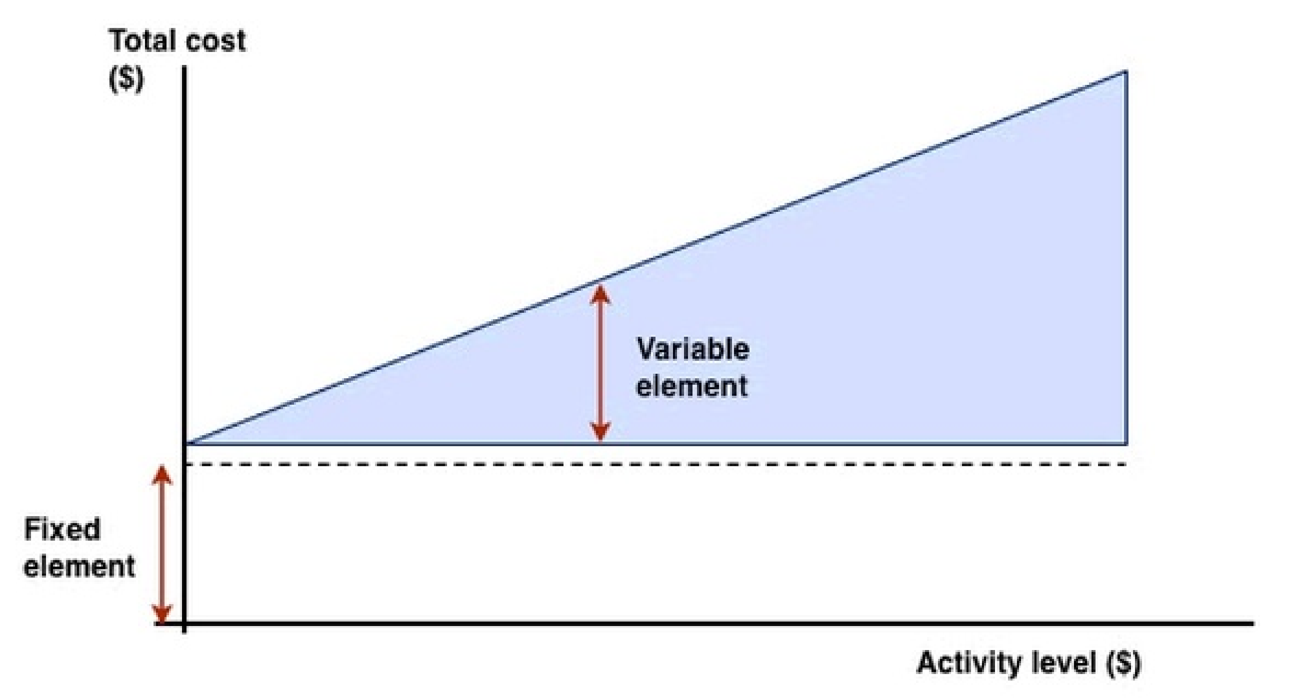


Figure 5.4.8 The MOOC value proposition is that MOOCs can eliminate the variable costs of course delivery. Image: © OpenTuition.com, 2014

One main strength claimed for MOOCs is that they are free to participants. Once again this is more true in principle than in practice, because MOOC providers may charge a range of fees, especially for assessment. Furthermore, although MOOCs may be free for participants, they are not without substantial cost to the provider institutions. Also, there are large differences in the costs of xMOOCs and cMOOCs, the latter being generally much cheaper to develop, although there are still some opportunity or actual costs even for cMOOCs.

5.4.8.1 The cost of MOOC production and delivery

There is still very little information to date on the actual costs of designing and delivering a MOOC as there are not enough published studies to draw firm conclusions about the costs of MOOCs. However we do have some data. The University of Ottawa (2013) estimated the cost of developing an xMOOC, based on figures provided to the university by Coursera, and on their own knowledge of the cost of developing online courses for credit, at around $100,000.

Engle (2014) has reported on the actual cost of five MOOCs from the University of British Columbia. There are two important features concerning the UBC MOOCs that do not necessarily apply to other MOOCs. First, the UBC MOOCs used a wide variety of video production methods, from full studio production to desktop recording, so development costs varied considerably, depending on the sophistication of the video production technique. Second, the UBC MOOCs made extensive use of paid academic assistants, who monitored discussions and adapted or changed course materials as a result of student feedback, so there were substantial delivery costs as well.

Appendix B of the UBC report gives a pilot total of $217,657, but this excludes academic assistance or, perhaps the most significant cost, instructor time. Academic assistance came to 25 per cent of the overall cost in the first year (*excluding* the cost of faculty). Working from the video production costs ($95,350) and the proportion of costs (44 per cent) devoted to video production in Figure 1 in the report, I estimate the direct cost at $216,700, or approximately $54,000 per MOOC, *excluding* faculty time and co-ordination support (that is, excluding program administration and overheads), but including academic assistance. However, the range of cost is almost as important. The video production costs for the MOOC which used intensive studio production were more than six times the video production costs of one of the other MOOCs.

5.4.8.2 The comparative costs of credit-based online courses

The main cost factors or variables in *credit-based* online and distance learning are relatively well understood, from previous research by Rumble (2001) and Hülsmann (2003). Using a similar costing methodology, I tracked and analysed the cost of an online master's program at the University of British Columbia over a seven year period (Bates and Sangrà, 2011). This program used mainly a learning management system as the core technology, with instructors both developing the course and providing online learner support and assessment, assisted where necessary by extra adjunct faculty for handling larger class enrolments.

I found in my analysis of the costs of the UBC program that in 2003, development costs were approximately $20,000 to $25,000 per course. However, over a seven year period, course development constituted less than 15 per cent of the total cost, and occurred mainly in the first year or so of the program. Delivery costs, which included providing online learner support and student assessment, constituted more than a third of the total cost, and of course continued each year the course was offered. Thus in credit-based online learning, delivery costs tend to be more than double the development costs over the life of a program.

The main difference then between MOOCs, credit-based online teaching, and campus-based teaching is that in principle MOOCs eliminate all delivery costs, because MOOCs do not provide learner support or instructor-delivered assessment, although again in practice this is not always true.

5.4.8.3 Opportunity costs

There is also clearly a large opportunity cost involved in offering xMOOCs. By definition, the most highly valued faculty are involved in offering MOOCs. In a large research university, such faculty are likely to have, at a maximum, a teaching load of four to six courses a year. Although most instructors volunteer to do MOOCs, their time is limited. Either it means dropping one credit course for at least one semester, equivalent to 25 per cent or more of their teaching load, or xMOOC development and delivery replaces time spent doing research. Furthermore, unlike credit-based courses, which run from anywhere between five to seven years, MOOCs are often offered only once or twice.

5.4.8.4 Comparing the cost of MOOCs with online credit courses

However one looks at it, the cost of xMOOC development, *without* including the time of the MOOC instructor, tends to be almost double the cost of developing an online credit course using a learning management system, because of the use of video in MOOCs. If the cost of the instructor is included, xMOOC production costs come closer to three times that of a similar length online credit course, especially given the extra time faculty tend put in for such a public demonstration of their teaching in a MOOC. xMOOCs could (and some do) use cheaper production methods, such as an LMS instead of video, for content delivery, or using and re-editing video recordings of classroom lectures via lecture capture.

Without learner support or academic assistance, though, delivery costs for MOOCs are zero, and this is where the huge potential for savings exist. If the cost per participant is calculated the MOOC unit costs are very low, combining both production and delivery costs. Even if the cost per student successfully obtaining an end of course certificate is calculated it will be many times lower than the cost of an online or campus-based successful student. If we take a MOOC costing roughly $100,000 to develop, and 5,000 participants complete the end of course certificate, the average cost per successful participant is $20. However, this assumes that the same type of knowledge and skills is being assessed for both a MOOC and for a graduate masters program; usually this not the case.

5.4.8.5 Costs versus outputs

The issue then is whether MOOCs can succeed without the cost of learner support and human assessment, or more likely, whether MOOCs can substantially reduce delivery costs through automation without loss of quality in learner performance. There is no evidence to date though that they can do this in terms of higher order learning skills and ‘deep’ knowledge. To assess this kind of learning requires setting assignments that test such knowledge, and such assessments usually need human marking, which then adds to cost. We also know from prior research from successful online credit programs that active instructor online presence is a critical factor for successful online learning. Thus adequate learner support and assessment remains a major challenge for MOOCs. MOOCs then are a good way to teach certain levels of knowledge but will have major structural problems in teaching other types of knowledge. Unfortunately, it is the type of knowledge most needed in a digital world that MOOCs struggle to teach.

5.4.8.6 MOOC business models and cost-benefits

In terms of sustainable business models, Baker and Passmore (2016) examined several different possible business models to support MOOCs (but do not offer any actual costing). The elite universities have been able to move into xMOOCs because of generous donations from private foundations and use of endowment funds, but these forms of funding are limited for most institutions. Coursera and Udacity have the opportunity to develop successful business models through various means, such as charging MOOC provider institutions for use of their platform, by collecting fees for badges or certificates, through the sale of participant data, through corporate sponsorship, or through direct advertising.

However, particularly for publicly funded universities or colleges, most of these sources of income are not available or permitted, so it is hard to see how they can begin to recover the cost of a substantial investment in MOOCs, even with ‘cannibalising’ MOOC material for or from on-campus use. Every time a MOOC is offered, this takes away resources that could be used for online credit programs. Thus institutions are faced with some hard decisions about where to invest their resources for online learning. The case for putting scarce resources into MOOCs is far from clear, unless some way can be found to give credit for successful MOOC completion.

5.4.9 Summary of strengths and weaknesses

The main points of this analysis of the strengths and weaknesses of MOOCs can be summarised as follows:

5.4.9.1 Strengths

- MOOCs, particularly xMOOCs, deliver high quality content from some of the world's best universities for free or at little cost to anyone with a computer and an Internet connection;
- MOOCs can be useful for opening access to high quality content, particularly in developing countries, but to do so successfully will require a good deal of adaptation, and substantial investment in local support and partnerships;
- MOOCs are valuable for developing basic conceptual learning, and for creating large online communities of interest or practice;
- MOOCs are an extremely valuable form of lifelong learning and continuing education;
- MOOCs have forced conventional and especially elite institutions to reappraise their strategies towards online and open learning;
- institutions have been able to extend their brand and status by making public their expertise and excellence in certain academic areas;
- MOOCs main value proposition is to eliminate through computer automation and/or peer-to-peer communication the very large variable costs in higher education associated with providing learner support and quality assessment.

5.4.9.2 Weaknesses

- the high registration numbers for MOOCs are misleading; less than half of registrants actively participate, and of these, only a small proportion successfully complete the course; nevertheless, absolute numbers completing are still higher than for conventional courses;
- MOOCs are expensive to develop, and although commercial organisations offering MOOC platforms have opportunities for sustainable business models, it is difficult to see how publicly funded higher education institutions can develop sustainable business models for MOOCs;
- MOOCs tend to attract those with already a high level of education, rather than widen access;
- MOOCs so far have been limited in the ability to develop high level academic learning, or the high level intellectual skills needed in a digital society;
- assessment of the higher levels of learning remains a challenge for MOOCs, to the extent that most MOOC providers will not recognise their own MOOCs for credit;
- MOOC materials may be limited by copyright or time restrictions for re-use as open educational resources.

References

Baker, R. and Passmore, D. (2016) Value and Pricing of MOOCs *Education Sciences*, 27 May

Balfour, S. P. (2013) Assessing writing in MOOCs: Automated essay scoring and calibrated peer review *Research & Practice in Assessment*, Vol. 8

Barkley, E, Major, C.H. and Cross, K.P. (2014) *Collaborative Learning Techniques* San Francisco: Jossey-Bass/Wiley

Bates, A. (1984) *Broadcasting in Education: An Evaluation* London: Constables (out of print)

Bates, A. and Sangrà, A. (2011) *Managing Technology in Higher Education* San Francisco: Jossey-Bass/John Wiley and Co

Bayne, S. (2015) *Teacherbot: interventions in automated teaching*, Teaching in Higher Education, Vol. 20, No.4, pp. 455-467

Colvin, K. et al. (2014) *Learning an Introductory Physics MOOC: All Cohorts Learn Equally, Including On-Campus Class*, IRRODL, Vol. 15, No. 4

Engle, W. (2104) *UBC MOOC Pilot: Design and Delivery* Vancouver BC: University of British Columbia

Falchikov, N. and Goldfinch, J. (2000) *Student Peer Assessment in Higher Education: A Meta-Analysis Comparing Peer and Teacher Marks* Review of Educational Research, Vol. 70, No. 3

Firmin, R. et al. (2014) Case study: using MOOCs for conventional college coursework *Distance Education*, Vol. 35, No. 2

Harasim, L. (2017) *Learning Theory and Online Technologies 2nd edition* New York/London: Routledge

Haynie, D. (2014). State Department hosts 'MOOC Camp' for online learners. *US News*, January 20

Hill, P. (2013) Some validation of MOOC student patterns graphic, *e-Literate*, August 30

Ho, A. et al. (2014) HarvardX and MITx: The First Year of Open Online Courses Fall 2012-Summer 2013 (HarvardX and MITx Working Paper No. 1), January 21

Hollands, F. and Tirthali, D. (2014) *MOOCs: Expectations and Reality* New York: Columbia University Teachers' College, Center for Benefit-Cost Studies of Education

Hülsmann, T. (2003) Costs without camouflage: a cost analysis of Oldenburg University's two graduate certificate programs offered as part of the online Master of Distance Education (MDE): a case study, in Bernath, U. and Rubin, E., (eds.) *Reflections on Teaching in an Online Program: A Case Study* Oldenburg, Germany: Bibliothecks-und Informationssystem der Carl von Ossietsky Universität Oldenburg

Jaschik, S. (2013) MOOC Mess, *Inside Higher Education*, February 4

Knox, J. (2014) Digital culture clash: 'massive' education in the e-Learning and Digital Cultures *Distance Education*, Vol. 35, No. 2

Kop, R. (2011) The Challenges to Connectivist Learning on Open Online Networks: Learning Experiences during a Massive Open Online Course *International Review of Research into Open and Distance Learning*, Vol. 12, No. 3

Lave, J. and Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press

Milligan, C., Littlejohn, A. and Margaryan, A. (2013) Patterns of engagement in connectivist MOOCs, *Merlot Journal of Online Learning and Teaching*, Vol. 9, No. 2

Pickard, L. (2018) Analysis of 450 MOOC-Based Microcredentials Reveals Many Options But Little Consistency, *Class Central*, July 18

Piech, C., Huang, J., Chen, Z., Do, C., Ng, A., & Koller, D. (2013) *Tuned models of peer assessment in MOOCs*. Palo Alto, CA: Stanford University

Rumble, G. (2001) The costs and costing of networked learning, *Journal of Asynchronous Learning Networks*, Vol. 5, No. 2

Suen, H. (2104) Peer assessment for massive open online courses (MOOCs) *International Review of Research into Open and Distance Learning*, Vol. 15, No. 3

University of Ottawa (2013) *Report of the e-Learning Working Group* Ottawa ON: The University of Ottawa

van Zundert, M., Sluijsmans, D., van Merriënboer, J. (2010). Effective peer assessment processes: Research findings and future directions *Learning and Instruction*, *20*, 270-279

Activity 5.4 Assessing the strengths and weaknesses of MOOCs

1. Do you agree that MOOCs are just another form of educational broadcasting? What are your reasons?

2. Is it reasonable to compare the costs of xMOOCs to the costs of online credit courses? Are they competing for the same funds, or are they categorically different in their funding source and goals? If so, how?

3. Could you make the case that cMOOCs are a better value proposition than xMOOCs – or are they again too different to compare?

4. MOOCs are clearly cheaper than either face-to-face or online credit courses if judged on the cost per participant successfully completing a course. Is this a fair comparison, and if not, why not?

5. Do you think institutions should give credit for students successfully completing MOOCs? If so, why, and what are the implications?

I give my own personal views on these questions in the podcast below, but I'd like you to come to your own conclusions before listening to my response, because there are no right or wrong answers here:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=159

5.5 Political, social and economic drivers of MOOCs

Figure 5.5 MOOC mania
Image: © Park Ridge Underground, 2010

5.5.1 Why the fuss about MOOCs?

It can be seen from the previous section that the pros and cons of MOOCs are finely balanced. Given though the obvious questions about the value of MOOCs, and the fact that before MOOCs arrived, there had been substantial but quiet progress for over ten years in the use of online learning for undergraduate and graduate programs, you might be wondering why MOOCs have commanded so much media interest, and especially why a large number of government policy makers, economists, and computer scientists have become so ardently supportive of MOOCs, and why there has been such a strong, negative reaction, not only from many university and college instructors, who understandably feel threatened by the implications of MOOCs, but also from many professionals in online learning (see for instance, Hill, 2012; Bates, 2012; Daniel, 2012; Watters, 2012), who might be expected to be more supportive of MOOCs.

It needs to be recognised that the discourse around MOOCs is not usually based on a cool, rational, evidence-based analysis of the pros and cons of MOOCs, but is more likely to be driven by emotion, self-interest, fear, or ignorance of what education is actually about. Thus it is important to explore the political, social and economic factors that have driven MOOC mania.

5.5.2 Massive, free and Made in America!

This is what I will call the intrinsic reason for MOOC mania. It is not surprising that, since the first MOOC from Stanford professors Sebastian Thrun, Andrew Ng and Daphne Koller each attracted over 200,000 sign-ups from around the world, since the courses were free, and since it came from professors at one of the most prestigious private universities in the USA, the American media were all over it. It was big news in its own right, however you look at it.

5.5.3 It's the Ivy Leagues!

Until MOOCs came along, the major Ivy League universities in the USA, such as Stanford, MIT, Harvard and UC Berkeley, as well as many of the most prestigious universities in Canada, such as the University of Toronto and McGill, and elsewhere, had largely ignored online learning in any form (the exception was MIT, which made much of its teaching material available for free via the OpenCourseWare project.).

However, by 2011, online learning, in the form of for credit undergraduate and graduate courses, was making big inroads at many other, very respectable universities, such as Carnegie Mellon, Penn State, and the University of Maryland in the USA, and also in many of the top tier public universities in Canada and elsewhere, to the extent that one in three students in the USA were were taking online courses (Allen and Seaman, 2014). Furthermore, at least in Canada, the online courses were often getting good completion rates and matching on-campus courses for quality (Ontario, 2011).

The Ivy League and other highly prestigious universities that had ignored online learning were beginning to look increasingly out of touch by 2011. By launching into MOOCs, these prestigious universities could jump to the head of the queue in terms of technology innovation, while at the same time protecting their selective and highly personal and high cost campus programs from direct contact with online learning. In other words, MOOCs gave these prestigious universities a safe sandbox in which to explore online learning. At the same time, the involvement of the Ivy League universities in online learning for the first time gave credibility to MOOCs, and, inadvertently, online learning as a whole.

5.5.4 It's disruptive!

For years before 2011, various economists, philosophers and industrial gurus had been predicting that education was the next big area for disruptive change due to the march of new technologies (see for instance Lyotard, 1979; Tapscott (undated); Christensen, 2016).

However, although online learning in credit courses had been quietly absorbed into the mainstream of university teaching, without any signs of major disruption, MOOCs were a potentially massive change, evidence at long last for the theory of disruption in the education sector.

5.5.5 It's Silicon Valley!

It is no coincidence that the first MOOCs were all developed by entrepreneurial computer scientists. Ng and Koller very quickly went on to create Coursera as a private, commercial company, followed shortly by Thrun, who created Udacity. Anant Agarwal, a computer scientist at MIT, went on to head up edX.

The first MOOCs were very typical of Silicon Valley start-ups: a bright idea (massive, open online courses with cloud-based, relatively simple software to handle the numbers), thrown out into the market to see how it might work, supported by more technology and ideas (in this case, learning analytics, automated marking, peer assessment) to deal with any snags or problems. Building a sustainable business model would come later, when some of the dust had settled.

As a result it is not surprising that almost all the early MOOCs completely ignored any pedagogical theory about best practices in teaching online, or any prior research on factors associated with success or failure in online learning. It is also not surprising as a result that a very low percentage of participants actually successfully completed MOOCs.

5.5.6 It's the economy, stupid!

Of all the reasons for MOOC mania, Bill Clinton's famous election slogan resonates the most. It should be remembered that by 2011, the consequences of the disastrous financial collapse of 2008 were working their way through the economy, and particularly were impacting on the finances of state governments in the USA.

The recession meant that states were suddenly desperately short of tax revenues, and were unable to meet the financial demands of state higher education systems. For instance, California's community college system, the nation's largest, suffered about $809 million in state funding cuts between 2008-2012, resulting in a shortfall of 500,000 places in its campus-based colleges (Rivera, 2012). Free MOOCs were seen as manna from heaven by the state governor, Jerry Brown (see for instance, To, 2014).

One consequence of rapid cuts to government funding was a sharp spike in tuition fees, bringing the real cost of higher education sharply into focus. Tuition fees in the USA have increased by 7 per cent per annum over the last 10 years, compared with an inflation rate of 4 per cent per annum. Here at last was a possible way to rein in the high cost of higher education. By 2015 though the economy in the USA had picked up and revenues were flowing back into state coffers, and so the immediate pressure for more radical solutions to the cost of higher education began to ease.

5.5.7 The future of MOOCs

It will be interesting to see if MOOC mania continues as the economy grows. Class Central provides ongoing monitoring of developments in MOOCs around the world. The overall numbers up to 2019 are impressive but the number of learners added in 2018 was just 20 million, which was less than 23 million for the previous two years (Shah, 2019). So the rate at which new users are coming into the MOOC space is decreasing.

However, MOOCs continue to evolve. For a start, there has been a slow growth in complete degrees that can be offered through MOOCs. In 2018 there were 45 degrees on offer. While this is a significant development, though, the numbers are still quite small, given the number of conventional degrees available worldwide. The other main market is corporate training. Business models are also evolving with revenues continuing to increase into 2018, with Coursera alone recording $140 million in revenues.

However, although the number of MOOC courses offered continues to increase, the average number of students is decreasing as more choices become available.

The rate of adoption also varies considerably by country. For instance in 2017, only 18% of Canadian post-secondary institutions were offering MOOCs, compared with 82% that were offering fully online courses for credit (Donovan et al., 2018). However, the growth of MOOCs in China, India and Europe continues apace. What is not clear is whether the institutions providing MOOCs are getting any direct financial returns for their investments as distinct from the platform providers.

5.5.8 Don't panic!

These are all very powerful drivers of MOOC mania, which makes it all the more important to try to be clear and cool headed about the strengths and weaknesses of MOOCs. The real test is whether MOOCs can help develop the knowledge and skills that learners need in a knowledge-based society. The answer of course is yes and no.

As a low-cost supplement to formal education, they can be quite valuable, but not as a complete replacement. They can at present teach basic conceptual learning, comprehension and in a narrow range of activities, application of knowledge. They can be useful for building communities of practice, where already well educated people or people with a deep, shared passion for a topic can learn from one another, another form of continuing education.

However, certainly to date, MOOCs have not been able to demonstrate that they can lead to transformative learning, deep intellectual understanding, evaluation of complex alternatives, and evidence-based decision-making, and without greater emphasis on expert-based learner support and more qualitative forms of assessment, they probably never will, at least without substantial increases in their costs.

At the end of the day, there is a choice for institutions between throwing more resources into MOOCs and hoping that some of their fundamental flaws can be overcome without too dramatic an increase in costs, or investing in other forms of online learning and educational technology that could lead to more cost-effective learning outcomes in terms of the needs of learners in a digital age.

References

Allen, I. and Seaman, J. (2014) *Grade Change: Tracking Online learning in the United States* Babson Survey Research Group/Pearson/Sloan

Bates, T. (2012) What's right and what's wrong with Coursera-style MOOCs Online Learning and Distance Education Resources, August 5

Christensen, C. (2016) *Disrupting Class, Expanded Edition: How Disruptive Innovation Will Change the Way the World Learns: Expanded Edition* New York: McGraw-Hill

Daniel, J. (2012) *Making sense of MOOCs: Musings in a maze of myth, paradox and possibility* *Journal of Interactive Media*, No. 18

Donovan, T. et al. (2018) *Tracking Online and Distance Education in Canadian Universities and Colleges: 2018* Halifax NS: Canadian Digital Learning Research Association

Hill, P. (2012) Four Barriers that MOOCs Must Overcome to Build a Sustainable Model *e-Literate*, July 24

Lyotard, J-J. (1979) *La Condition postmoderne: rapport sur le savoir:* Paris: Minuit

Ontario (2011) *Fact Sheet: Summary of Ontario eLearning Surveys of Publicly Assisted PSE Institutions*, Toronto: Government of Ontario

Rivera, C. (2012) Survey offers dire picture of California's two-year colleges *Los Angeles Times*, 29 August

Tapscott, D. (undated) The transformation of education *dontapscott.com*

To, K. (2014) *UC Regents announce online course expansion*, The Guardian, UC San Diego, undated, but probably February 5

Shah, D. (2019) Year of MOOC-based degrees: A Review of MOOC Stats and Trends in 2018 *Class Central*, 6 January

Watters, A. (2012) Top 10 Ed-Tech Trends of 2012: MOOCs *Inside Higher Education*, 18 December

For a more light-hearted look at MOOC mania see:

North Korea Launches Two MOOCs

"What should we do about MOOCs?" – the Board of Governors discusses

NOTE: Both the two blog posts above are satirical: they are fictional!

Activity 5.5 Assessing the importance of MOOCs

1. Do you think MOOCs have improved or weakened public acceptance of online learning? Why?
2. On a scale of 1 to 10, where 1 is no importance and 10 is extremely important, where would you rank MOOCs in terms of their importance for the future of higher education? Why?
3. Do you think MOOCs will improve to the point where they are a serious alternative to other forms of higher education, or do you think they will never be a real challenge to conventional university teaching? What are your reasons?

Once again, my views should carry no more weight than yours on these questions, as they are value rather than fact based, but here are my thoughts, for what they are worth:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=162

5.6 Why MOOCs are only part of the answer

Image: Your Training Edge, 2015

5.6.1 The importance of context and design

I am frequently labelled as a major critic of MOOCs, which is somewhat surprising since I have been a longtime advocate of online learning. In fact I do believe MOOCs are an important development, and under certain circumstances they can be of tremendous value in education.

But as always, context is important. There is not one but many different markets and needs for education. A student leaving high school at eighteen has very different needs and will want to learn in a very different context from a 35 year old employed engineer with a family who needs some management education. Similarly a 65 year old man struggling to cope with his wife's early onset of Alzheimer's and desperate for help is in a totally different situation to either the high school student or the engineer. When designing educational programs, it has to be horses for courses. There is no single silver bullet or solution for every one of these various contexts.

Secondly, as with all forms of education, how MOOCs are designed matters a great deal. If they are designed inappropriately, in the sense of not developing the knowledge and skills needed by a particular learner in a particular context, then they have little or no value for that learner. However, designed differently and a MOOC may well meet that learner's needs.

5.6.2 The limitations of xMOOCs

The real threat of xMOOCs is to the very large face-to-face lecture classes found in many universities at the undergraduate level. MOOCs are a more effective way of replacing such lectures. They are more interactive and permanent so students can go over the materials many times. I have heard MOOC instructors argue that their MOOCs are better than their classroom lectures. They put more care and effort into them.

However, we should question why we are teaching in this way on campus. Content is now freely available anywhere on the Internet – including MOOCs. What is needed is information management: how to identify the knowledge you need, how to evaluate it, how to apply it. xMOOCs do not do that. They pre-select and package the information. My big concern with xMOOCs is their limitation, as currently designed, for developing the higher order intellectual skills needed in a digital world. Unfortunately, xMOOCs are taking the least appropriate design model for developing 21st century skills from on-campus teaching, and moving this inappropriate design model online. Just because the lectures come from elite universities does not necessarily mean that learners will develop high level intellectual skills, even though the content is of the highest quality. More importantly, with MOOCs, relatively few students succeed, in terms of assessment, and those that do are tested mainly on comprehension and limited application of knowledge.

We can and have done much better in terms of skills for a digital age with other pedagogical approaches, both on campus, such as problem- or inquiry-based learning, and online using more constructivist approaches in credit courses, such as online collaborative learning. However these alternative methods to lectures do not scale so easily. The interaction between an expert and a novice still remains critical for developing deep understanding, transformative learning resulting in the learner seeing the world differently, and for developing high levels of evidence-based critical thinking, evaluation of complex alternatives, and high level decision-making. Computer technology to date is extremely poor at enabling this kind of learning to develop. This is why credit-based classroom and online learning still aim to have a relatively low instructor:student ratio and still need to focus a great deal on interaction between instructor and students.

However xMOOCs are valuable as a form of continuing education, or as a source of open educational materials that can be part of a broader educational offering. They can be a valuable supplement to campus-based education. They are not a replacement though for either conventional education or the current design of online credit programs. As a form of continuing education, low completion rates and the lack of formal credit is not of great significance. However, completion rates and quality assessment DO matter if MOOCs are being seen as a substitute or a replacement for formal education, even classroom lectures.

5.6.3 Undermining the public higher education system?

The real danger is that xMOOCs may be used to undermine what is admittedly an expensive public higher education system. If elite universities can deliver MOOCs for free, why do we need low quality and high cost state universities? The risk is a sharply divided two tier system, with a relatively small number of campus-based elite universities catering to the rich and privileged, and developing the knowledge and skills that will provide rich rewards, and the masses being fed xMOOC-delivered courses, with state universities providing minimal and low cost learner support for such courses. This would be both a social and economic disaster, because it would fail to produce enough learners with the high-level skills that are going to be needed for good jobs in the the coming years – unless you believe that automation will remove all decently paid jobs except for a tiny elite (bring on the Hunger Games).

Content accounts for less than 15 per cent of the total cost over five years for credit-based online programs; the main costs required to ensure high quality outcomes and high rates of completion are spent on learner support, providing the learning that matters most. The kind of MOOCs being promoted by politicians and the media fail spectacularly to do this. We do need to be careful that the open education movement in general, and MOOCs in particular, are not used as a stick by those in the United States and elsewhere who are deliberately trying to undermine public education for ideological and commercial reasons. On their own, open content, OERs and MOOCs do not automatically lead to open access to high quality credentials for everyone. In the end, a well-funded public higher education system remains the best way to assure access to higher education for all.

5.6.3 The potential of cMOOCs

cMOOCs have the most potential, because lifelong learning will become increasingly important, and the power of bringing a mix of already well educated and knowledgeable people from around the world to work with other committed and enthusiastic learners on common problems or areas of interest could truly revolutionise not just education, but the world in general.

However, cMOOCs at present are unable to do this, because they lack organisation and do not apply what is already known about how online groups work best. Once we learn these lessons and apply them, though, cMOOCs can be a tremendous tool for tackling some of the great challenges we face in the areas of global health, climate change, civil rights, and other 'good civil ventures'. The beauty of cMOOCs is that they every participant has the power to define and solve the problems being tackled.

Scenario F that ends this chapter is an example of how cMOOCs could be used for such 'good civil ventures.' In Scenario F, the MOOC is not a replacement for formal education, but a rocket that needs formal education as its launch pad. Behind this MOOC are the resources of a very powerful institution, that provides the initial impetus, simple to use software, overall structure, organization and co-ordination within the MOOC, and some essential human resources for supporting the MOOC when running. At the same time, it does not have to be an educational institution. It could be a public health authority, or a broadcasting organization, or an international charity, or a consortium of organisations with a common interest. Also, of course, there is the danger that even cMOOCs could be manipulated by corporate or government interests.

5.6.5 In conclusion

Having said that, there is enormous scope for improvements within the public higher education system. MOOCs, open education and new media offer promising ways to bring about some much needed improvements. Scenario F (next) is one possible way in which MOOCs could bring about much needed social change.

However, MOOCs must build on what we already know from the use of credit based online learning, from prior experience in open and distance learning, and designing courses and programs in a variety of ways appropriate to the wide range of learning needs. MOOCs can be one important part of that environment, but not a replacement for other forms of educational provision that meet different needs.

Activity 5.6: Strategising about MOOCs

You are the Vice President Academic of a middle sized research university, which is under financial pressure. The President has been asked by the Board to come forward with a strategy for innovation in teaching and learning, with the university facing a cut of approximately 5 per cent in next year's operating budget.

One powerful Board member is pushing really hard for the university to develop MOOCs as a solution to the economic pressure..

The President has asked for a briefing paper from you for the Board on what the university's strategy should be regarding MOOCs, and how they would fit into the overall strategy for teaching and learning. How would you respond?

Since there are many pros and cons regarding MOOCs, I am not going to give direct feedback on this activity, because the 'best' briefing will take account of local contexts, such as existing online provision for credit courses, learning technology support and enrolment goals, for instance.

Chapter 5: Key Takeaways

1. MOOCs are forcing every higher education institution to think carefully both about its strategy for online teaching and its approach to open education.

2. MOOCs are not the only form of online learning nor of open educational resources. It is important to look at the strengths and weaknesses of MOOCs within the overall context of online learning and open-ness.

3. There are considerable differences in the design of MOOCs, reflecting different purposes and philosophies.

4. There are currently major structural limitations in MOOCs for developing deep or transformative learning, or for developing the high level knowledge and skills needed in a digital age.

5. MOOCs are at still a relatively early stage of maturity. As their strengths and weaknesses become clearer, and as experience in improving their design grows, they are likely to occupy a significant niche within the higher education learning environment

6. MOOCs could well replace some forms of traditional teaching (such as large lecture classes). However, MOOCs are more likely to remain an important supplement or alternative to other conventional education methods. They are not on their own a solution to the high cost of higher education, although MOOCs are and will continue to be an important factor in forcing change.

7. Perhaps the greatest value of MOOCs in the future will be for providing a means for tackling large global problems through community action.

5.6.6 Next

This completes the discussion about different design models for teaching and learning. The next chapter looks at the importance of building an effective learning environment in which these different design models can best operate.

But first, Scenario F, which envisions what MOOCs could look like in the future.

Scenario F: How to cope with being old

Figure F 1. Image: WhatSheSaidradio.com

Beth Carter Good evening, everyone. This is Beth Carter, for BBC Radio. The Open University yesterday announced that it had signed up half a million participants in what they claim is now the world's largest online course. The OU's MOOC is about something many of you will be familiar with – getting old, and the many challenges and opportunities that come with that.

In the studio with me is Jane Dyson, who is the course co-ordinator. Jane: at 55, and coming from a social services background, you seem to be the least likely person to be running such a massive, technology-based program. How did that happen?

Jane Dyson: (laughing). Well, it's all my own fault! I've been an OU graduate for many years, and they have an online alumni forum, where they ask former students for ideas about what are the most pressing issues we see in the world, and what the OU could do to address some of these issues. I do a lot of work advising elderly people, their families and even employers these days about the many different kinds of issues that arise with aging.

The OU has many courses and online materials that deal with lots of these issues, but you have to sign up for a degree or diploma or you can just get the materials online but without any support. Also, there are just too many different issues for even the OU to cover in its formal courses. So I suggested that they should do a MOOC where all the different people involved – health care workers, social workers, care givers, family, and most important of all, old people themselves – could talk about their problems and challenges, and what services are available, what people can do for themselves and so on.

Beth Carter. So what happened then?

Jane Dyson. The OU asked me to come in to my local OU regional office, and I met with several people from the OU, and after that meeting, they asked me if I would be willing to co-ordinate such a course.

Beth Carter. Now tell me more about MOOCs. I remember they were big about 10 years ago, then they went all quiet, and we haven't heard much about them since. So what's made this MOOC so popular?

Jane Dyson. The problem with the earlier MOOCs was that participants just got lost in them. Many of the MOOCs were just lectures and then it was up to the participants to help each other out. There was no organization.

What the OU did was to ask those who signed up for the 'Aging' MOOC to fill in a very simple online questionnaire that asked for just a few details such as where they lived, whether they were professionals in aging, or family, or elderly people themselves, and then used that data to automatically allocate participants into groups, so that there was a mix of participants in each group.

Beth Carter. Why was that important?

Jane Dyson. Well, at the OU, the Institute of Educational Technology had done some research on the early MOOCs, and had identified this problem of how to get groups to work in large online classes. They worked with another research group in the OU called the KMI, who developed the software we are using that allocates participants into groups so that there is enough expertise and support in each group to help with the issues raised in the group discussions.

Beth Carter. And how does that work?

Jane Dyson. You wouldn't believe the range of issues or problems that come up. For instance, we have family members desperate because their father or mother is suffering from dementia, but don't know what to do to help them. We have some seniors who feel that their family are trying to force them out of their homes, while they feel they are quite capable of looking after themselves. We have social workers who feel that they are liable to get fired or even prosecuted because they can't handle their case load. And we have some participants who are just old and lonely, and want someone to talk to.

When we put all these participants into an online discussion forum, the results are amazing. What's really critical is getting the right mix of people in the same group, with enough expertise to provide help, and having someone in that group who knows how to moderate the discussions. We have a huge list of services available not just in Britain but in many of the other countries from which we have students. So the course is a kind of self-help, support service within a broader community of practice.

Beth Carter. Let's talk about the international students. As I understand it, almost half the participants are from outside the U.K..

Jane Dyson. That's right. The problems of an aging population aren't just British. The OU is part of a very powerful network of open universities around the world. When we were talking about starting this course, the OU went to several other open universities and asked them if they were interested in participating. So we have participants from the Netherlands, Germany, France, Spain, Japan, Canada, the USA, and many other countries, who participate in the English language version.

In Spain, though, we have a 'mirror' site, with materials in Spanish, Basque and Catalan, and the discussion forums are managed by the Open University of Catalonia. That brings in not only participants from Spain, but also from Latin America. We are about to develop a similar agreement with the Open University of China, which we expect will bring in another half million participants. What's really neat is that because we have so many participants, there are always enough dual language participants to move stuff from one language discussion forum to another.

Beth Carter. So what's next?

Jane Dyson. One of the big issues that keeps coming up in the Aging course is the issue of mental health. This of course is not just about elderly people. The Aging course has already resulted in petitions to parliament about better services for isolated elderly people, and I think we will see some positive developments on this front over the next couple of years. So I think the OU is thinking about a similar MOOC on mental health, and I'd really like to be part of that initiative.

Beth Carter. Well, thank you, Jane. Next week we will be discussing online gambling, with an addiction counsellor.

[This was developed as a 'what if?' scenario for the U.K. Open University as part of its planning for teaching and learning in 2014.]

Chapter 6: Building an effective learning environment

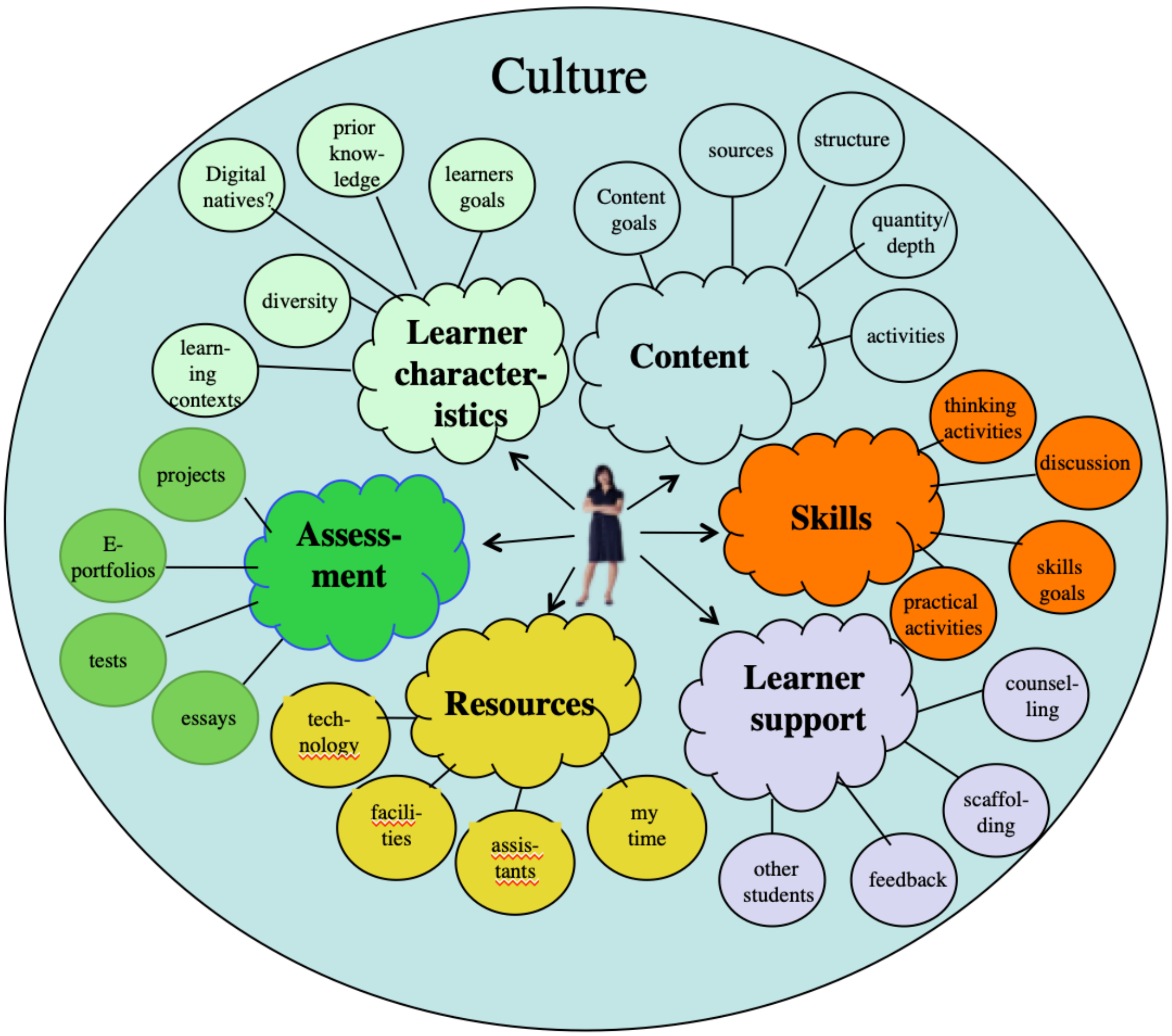


Figure 6.1 An example of a learning environment

Purpose of this appendix

When you have completed this chapter you should be able to:

- design and implement a learning environment that best meets the needs of your course and students

Building a comprehensive and effective learning environment is an important condition for implementing teaching and learning for the digital age. This appendix discusses the key components of a learning environment and how these are affected by developments in a digital age. The chapter covers the following topics:

- 6.1 Integrating design principles within a rich learning environment
- 6.2 What is a learning environment?
- 6.3 Learner characteristics
- 6.4 Managing content
- 6.5 Developing skills
- 6.6 Learner support
- 6.7 Resources
- 6.8 Assessment of learning
- 6.9 Culture and learning environments
- 6.10 Conclusions

Also in this chapter you will find the following activities:

- Activity 6.1 Your students' learning environment
- Activity 6.2 Influencing a learning environment
- Activity 6.3 Who are your students?
- Activity 6.4 Managing content
- Activity 6.5 Developing skills
- Activity 6.6 Building learner support
- Activity 6.7 What resources matter?
- Activity 6.8 What assessments work in a digital age?
- Activity 6.9 Considering culture in a learning environment
- Activity 6.10 Designing your own learning environment

Key Takeaways

1. Context – the learning environment – will influence or determine teaching strategies, as well as epistemology and pedagogy
2. Thus to be able to design effective teaching, it is necessary to create an effective learning environment.
3. Effective learning environments will have a number of different components, and these components will vary, depending on context and the epistemology that drives teaching
4. The aim of building an effective learning environment is to enable more flexible models of learning design to be created and applied.

6.1 Integrating design principles within a rich learning environment

Nature as a learning environment

6.1.1 The importance of creating an effective learning environment

Chapters 1 to 5 provide a set of methods for teaching in a digital age. These methods though will not operate in a vacuum. Both teachers and learners are faced with a rapidly changing world, with new technology, new teaching approaches and external pressures from government, employers, parents, and the media. It is easy to be tossed around in such a stormy environment. Learning always takes place within a context that can influence how and what we learn. Good teachers and instructors try to shape the environment in which they are teaching to create the right conditions for learning. This becomes even more important in a volatile, uncertain, complex and ambiguous world.

6.1.2 Learning environments and epistemology

First though we need to examine two very different approaches to teaching and learning. One approach starts with an objectivist view of the world. Knowledge is like coal. It is there to be mined by the teacher and transported to the learner. The learner's job is to acquire that coal or knowledge and then use it as necessary, either with or without the help of the teacher. This seems to me to be the approach of most xMOOCs and most classroom lectures. There is little attention if any paid to the conditions in which such learning will best take place.

Another approach starts from the assumption that learning is a fundamental human activity. Humans have become the dominant species because they have a need and above all an inherited ability to learn. If we had not been reasonably good at learning, we would have been killed off early in the earth's history by faster, bigger and more ferocious animals. The ability not only to learn, but to learn in abstract and conscious ways, is therefore part of human nature.

If that is the case, a teacher's job is not to do the learning for the student, but to build a rich environment that facilitates the kind of learning that will benefit the learner. It is not a question of pouring knowledge into a student's head, but enabling the learner to develop concepts, think critically, and apply and evaluate what they have learned, by providing opportunities and experiences that are relevant to such goals.

The analogy here is gardening. Humans are like plants: all we need to do is to provide the right conditions for them to grow: the right soil, sufficient sunshine and water, and help eliminating pests and weeds. In terms of humans, this means providing security, and the best conditions for learning. This is a very constructivist view of the world. This seems to me to be the approach of most cMOOCs and most early childhood education. However, there is little attention paid to priorities or to efficiency in learning.

A second premise is that knowledge is not fixed or static, but is continually developing. Our concept of heat changes and becomes richer as we grow older and become more educated, from understanding heat through touch, to providing a quantitative way of measuring it, to understanding its physical properties, to being able to apply that knowledge to solving problems, such as designing refrigerators. In a knowledge-based society, knowledge is constantly developing and growing, and our understanding is always developing.

6.1.3 What learning environments do we want?

Why thinking about effective learning environments is important is because most teachers currently inherit a teaching environment, usually based on a campus, physical classrooms, regularly scheduled lessons, with the expectation of the teacher in control at the front of the class. However, new technologies provide us with the opportunity to design other kinds of learning environments. What do we want to be: coal miners – or gardeners? Or something else? My own view is that the ideal learning environment is somewhere in between coal mining and gardening. Most learners require structure and guidance, but within an environment that enables freedom and exploration.

In developing an effective learning environment, there are another two issues that need to be addressed:

- First, it is the learner who has to do the learning.
- Second, any learning environment is much more than the technology used to support it.

With regard to the first, teachers cannot do the learning for the learner. All teachers or instructors can do is to create and manage an environment that enables and encourages learning. My focus then in terms of building an effective learning environment is on what the teacher or instructor can do, because in the end that is all they can control. However, the focus of what the teacher does should be on the learner, and what the learner needs. That of course will require good communication between the learners and the teacher.

For this reason, I want to examine some of the fundamental components of most effective teaching environments. Not only will this provide some general guidance for the design of teaching, it will also allow consideration of technology-based learning environments that can fundamentally differ from traditional campus-based environments, while at the same time ensuring conditions for successful learning. I set out these components or conditions in the following sections.

Activity 6.1 Your current students' learning environment

1. If you are currently teaching, describe briefly the student learning environment within which they are learning. What are the restrictions, if any, on their learning as a result of this environment?
2. What do you think are the most important components for effective learning within this environment (as well as your teaching)?
3. Are you more of a coal miner or a gardener in your approach to teaching?

There is no feedback from me on this activity. It is for your own reflection.

6.2 What is a learning environment?

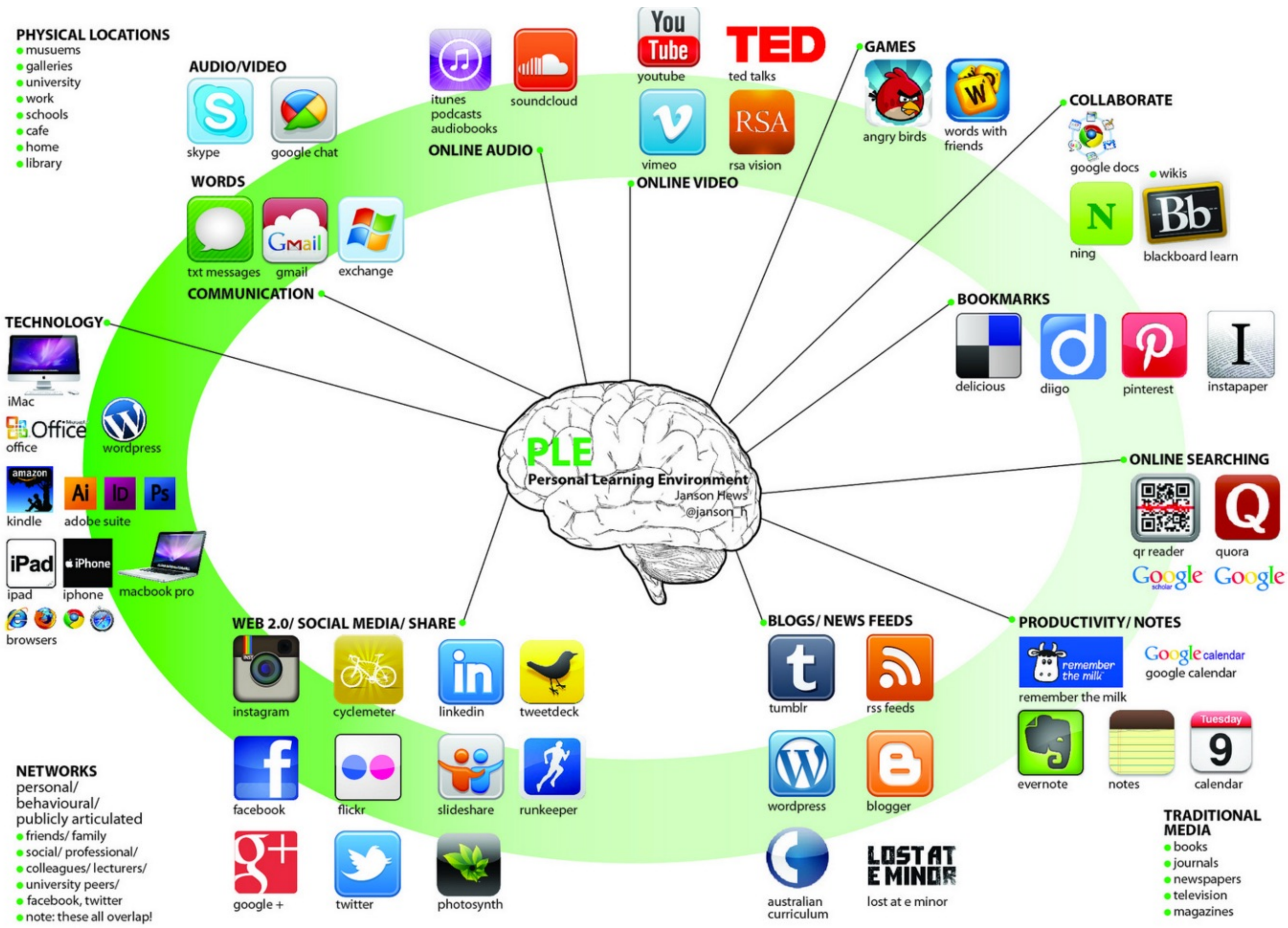


Figure 6.2.1 A technology-based personal learning environment
Image: Jason Hews, Flikr

6.2.1 Definition

> *‘**Learning environment** refers to the diverse physical locations, contexts, and cultures in which students learn. Since students may learn in a wide variety of settings, such as outside-of-school locations and outdoor environments, the term is often used as a more accurate or preferred alternative to classroom, which has more limited and traditional connotations—a room with rows of desks and a chalkboard, for example.*
>
> *The term also encompasses the culture of a school or class—its presiding ethos and characteristics,*

> *including how individuals interact with and treat one another—as well as the ways in which teachers may organize an educational setting to facilitate learning…..'*

The Glossary of Educational Reform, 29 August, 2014

This definition recognises that students learn in many different ways in very different contexts. Since learners must do the learning, the aim is to create a total environment for learning that optimises the ability of students to learn. There is of course no single optimum learning environment. There is an infinite number of possible learning environments, which is what makes teaching so interesting.

6.2.2 Types of learning environments

Here are some examples of different learning environments:

- a school or college campus
- an online course
- military training
- friends, family and work
- nature
- personal, technology-based, learning environments

Nevertheless I will argue that despite the differences in context, there are certain elements or components that will be found in most effective learning environments.

6.2.3 Components of an effective learning environment

Developing a total learning environment for students in a particular course or program is probably the most creative part of teaching. Although there is a tendency to focus on either physical institutional learning environments (such as classrooms, lecture theatres and labs), or on the technologies used to to create online learning environments such as learning management systems, learning environments are broader than just these physical components. They will also include:

- the characteristics of the learners and their means of inter-communication;
- the goals for teaching and learning;
- the activities that support learning;
- the resources that are available, such as textbooks, technology, or learning spaces;
- the assessment strategies that will best measure and drive learning;
- the culture that infuses the learning environment.

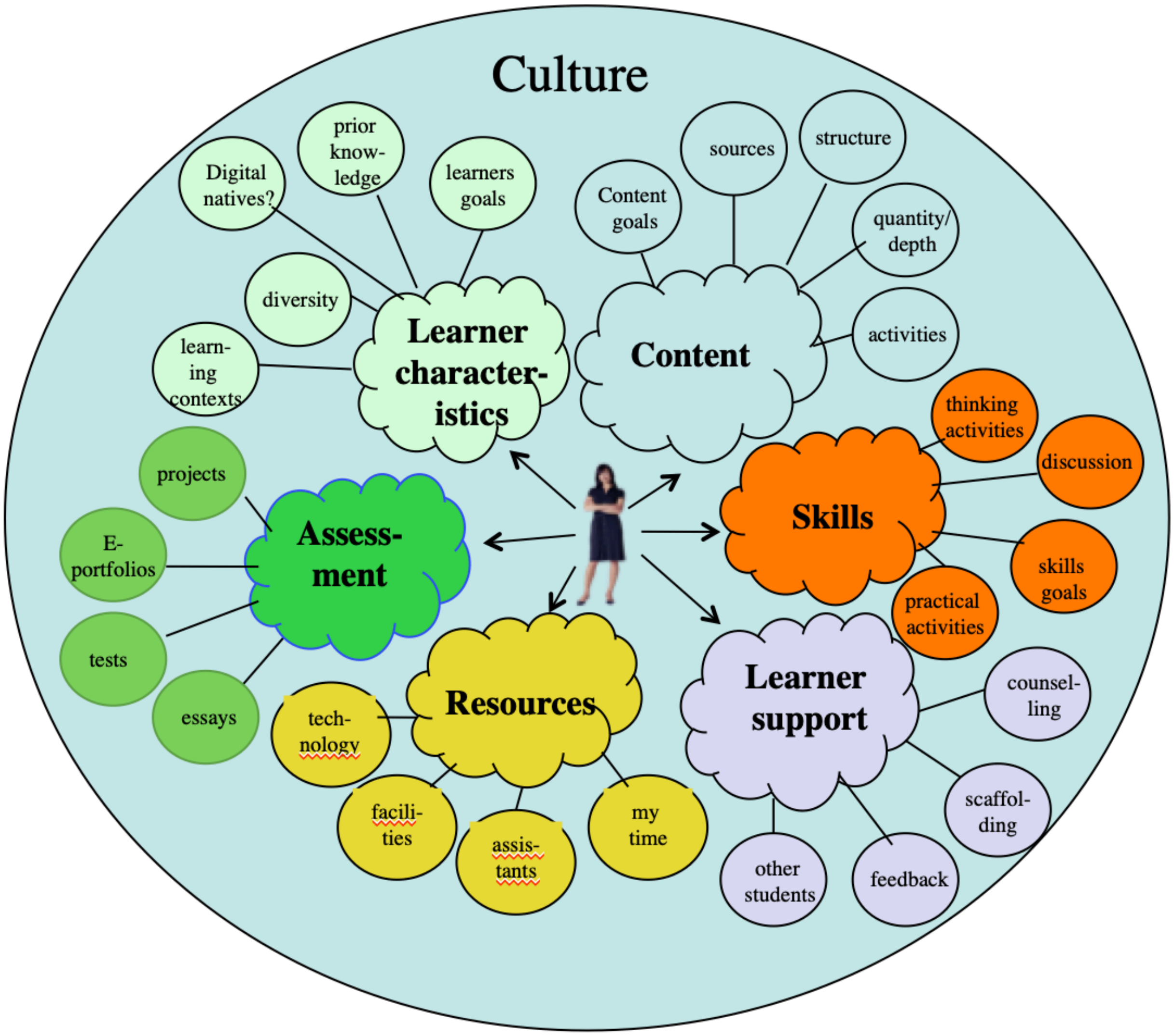


Figure 6.2.2 An example of a learning environment

Figure 6.2.2 illustrates one possible learning environment from the perspective of a teacher or instructor. A teacher may have little or no control over some components, such as learner characteristics or resources, but may have full control over other components such as choice of content and how learners will be supported. Within each of the main components there are a set of sub-components that will need to be considered. In fact, it is in the sub-components (content structure, practical activities, feedback, use of technology, assessment methods, and so on) where the real decisions need to be made.

I have listed just a few components in Figure 6.2.2 and the set is not meant to be comprehensive. For instance it could have included other components, such as developing ethical behaviour, institutional factors, or external accreditation, each of which might also affect the learning environment in which a teacher or instructor has to work. Creating a model of a learning environment then is a heuristic device that aims to provide a comprehensive view of the whole teaching context for a particular course or program, by a particular instructor or teacher with a particular view of learning. Once again, the choice of components and their perceived importance will be driven to some extent by personal epistemologies and beliefs about knowledge, learning and teaching methods.

Lastly, I have deliberately suggested a learning environment from the perspective of a teacher, as the teacher has the main responsibility for creating an appropriate learning environment, but it is also important to consider learning environments from the learners' perspectives. Indeed, adult or mature learners are often capable of creating their own, personal, relatively autonomous learning environments.

The significant point is that it is important to identify those components that need to be considered in teaching a course or program. In particular that there are other components besides content or curriculum. Each of the key components of the learning environment I have chosen as an example are discussed briefly in the following sections, with a focus on the components of a learning environment that are particularly relevant for a digital age.

Activity 6.2 Influencing a learning environment

1. Why do you think I focused on learning environments from a teacher's perspective rather than a learner's perspective? Could you design a similar model of a learning environment from the perspective of a learner? What would be the main differences?
2. In order to create the learning environment for HIST 305 in Scenario D, Ralph Goodyear carefully considered the learning environment he wanted to create and ones he had little or no control over. What components do you think he had little or no control over?
3. What would you add (or remove) from the learning environment in Figure 6.2.2?
4. What is missing in Figure 6.2.1 – the technology-based personal learning environment? For what kind of purpose would it work really well?
5. Does thinking about the whole learning environment overly complicate the teaching endeavour? Why not just get on with it?

For my feedback on this activity, click on the podcast below.

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=360

6.3 Learner characteristics

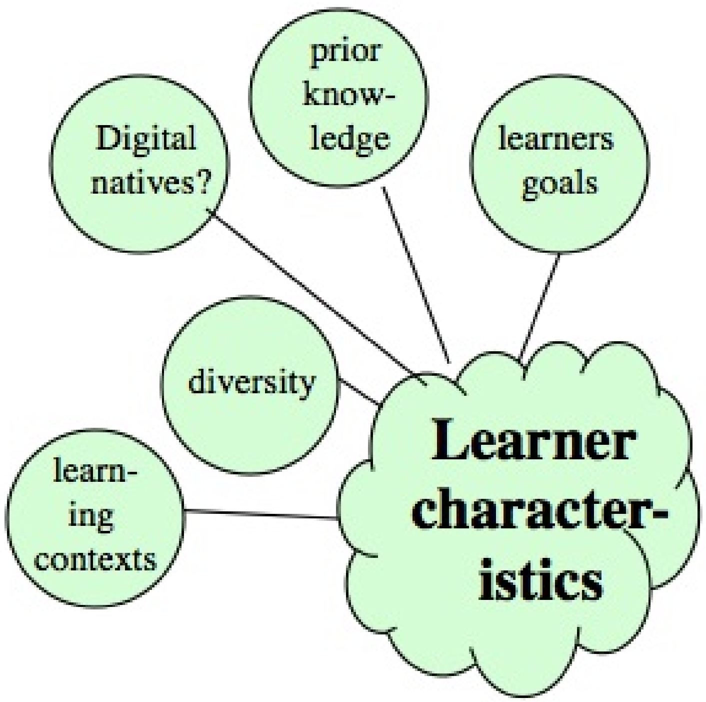


Figure 6.3 Learner characteristics

Probably nothing more reflects teaching in a digital age than the change in learner characteristics from the industrial age.

6.3.1 Increased diversity

I noted in Chapter 1 (Section 6) that in developed countries such as Canada:

> *public post-secondary institutions are expected to represent the same kind of socio-economic and cultural diversity as in society at large, rather than being institutions reserved for an elite minority*.

In an age where economic development is tightly associated with higher levels of education, the goal now is to bring as many students as possible to the standards required, rather than focus on just the needs of the most able students. This means finding ways of helping a very wide range of students with very different levels of ability and/or prior knowledge to succeed. One size clearly does not fit all today. Dealing with an increasingly diverse student population is perhaps the greatest of all challenges then that teachers and instructors face in a digital age, particularly but not exclusively at a post-secondary level. This is not something for which instructors primarily qualified in subject matter expertise are well prepared.

A combination of good design and an appropriate use of technology will greatly facilitate the personalization of learning, allowing for instance for different students to work at different speeds, and to focus learning on students' specific interests and needs, thus ensuring engagement and motivation for a diverse range of students. However, the first and perhaps most important step is for instructors to know their students, and in particular, to identify from the vast range of information regarding students and their differences, which are the most important for the design of teaching and learning in a digital age. I list some of the characteristics that I think are important from the perspective of designing teaching.

6.3.2 The work and home context

Two factors make the work and home context an important consideration in the design of teaching and learning: students are increasingly working while studying (about half of all Canadian post-secondary students also work, and those that do work average 16 hours a week – Marshall, 2010); and the age range of students continues to spread, with the average age of students slowly increasing (in 2016, at the University of British Columbia Vancouver, the average age of undergraduates was 21, and the mean age for graduate students was 31 – UBC, 2017.)

There are several reasons for the average age of students increasing, at least in North America:

- students are taking longer to graduate (partly because they tend to take a smaller study load when working);
- increasing numbers of students are going on to graduate school;
- more students are coming back for additional courses and programs after graduating (lifelong learners), mainly for economic reasons.

Partly or fully employed students, or students with families, increasingly need more flexibility in their studying, and especially avoiding long commutes between home, work and college. These students increasingly want hybrid or fully online courses, and smaller modules, certificates or programs that they can fit around their work and family life.

6.3.3 Learners' goals

Understanding the motivation of students and what they expect to get out of a course or program should also influence the design of a course or program. For academic learning, it is often necessary to find ways to move students whose approach to learning is initially driven by extrinsic rewards such as grades or qualifications to an approach that engages and motivates students in the subject matter itself. Potential students already with a post-secondary qualification and a good job may not want to work through a pre-determined set of courses but may want just specific areas of content from existing courses, tailored to meet their needs (for instance, on demand and delivered online). Thus it is important to have some kind of knowledge or understanding of why learners are likely to take your course or program, and what they are hoping to get out of it.

6.3.4 Prior knowledge or skills

Future learning often depends on students having prior knowledge or an ability to do things at a certain level. Teachers aim to bridge the difference between what a learner can do without help and what he or she can do with help, what Vygotsky (1978) termed the zone of proximal development. If the difficulty level of the teaching is aimed too far beyond the capability or prior knowledge and skills of a learner, then learning fails to occur.

However, the more diverse the students in a program, the more diverse the knowledge and skill levels they are likely to bring with them. Indeed, lifelong learners, or new immigrants repeating a subject because their foreign qualifications are not recognised, may bring specialist or advanced knowledge that can be drawn on to enrich the learning experience for everyone. At the same time, some students may not have the same basic knowledge as others in a course and will need more help. In such a context it is important to design the learning experience so that it is flexible enough to accommodate students with a wide range of prior knowledge and skills.

6.3.5 Digital natives

Most students today have grown up with digital technologies such as mobile phones, tablets and social media, including Facebook, Twitter, blogs and wikis. Prensky (2010) and others (e.g. Tapscott, 2008) argue that not only are such students more proficient in using such technologies than previous generations, but that they also think differently (Tapscott, 2008).

However, it is particularly important to understand that students themselves vary a great deal in their use of social media and new technologies, that their use is largely driven by social and personal demands, and their use of digital technologies does not naturally flow across into educational use. They will use new technologies and social media for learning though where instructors make a good case for it and when students can see that the use of digital media will directly help them in their studies. For this to happen though deliberate design choices are required on the part of the instructor. (For more on the issue of digital natives, see Chapter 9, Section 2.3)

6.3.6 In conclusion

The work and home context, learners' goals, and students' prior knowledge and skills (including their competence with digital media) are some of the critical factors that should influence the design of teaching. For some instructors, other characteristics of learners, such as learning styles, gender differences or cultural background, may be more important, depending on the context. Whatever the context, good design in teaching requires good information about the learners we are going to teach, and in particular good design needs to address the increasing diversity of our students.

References

Marshall, K. (2011) Employment patterns of post-secondary students, *Ottawa: Statistics Canada*

Prensky, M. (2001) '*Digital natives, Digital Immigrants*' On the Horizon Vol. 9, No. 5

Tapscott, D. (2008) *Grown Up Digital* New York: McGraw Hill

University of British Columbia (2017) *2016/2017 Annual Report on Enrolment* Vancouver BC: University of British Columbia

Vygotsky, L. (1978) *Mind in Society: Development of Higher Psychological Processes* Cambridge MA: Harvard University Press

Activity 6.3 Who are your students?

1. How would you characterise the students you are teaching: full-time students from high school; students who are working part-time; or students working full-time? How would a typical class of yours break down between these three groups? Do you have the information necessary to do this analysis?

2. Do you think students think or study differently these days because of social media? How does that affect their studying? Do you feel you need to respond in some way to this?

3. How much variance is there between your students in prior knowledge and/or language ability? How does this affect the way you teach?

You may want to read Chapter 9, Section 2 and Chapter 10, Section 3 before you answer these questions.

This exercise is mainly for your reflection, but I do have a few comments on these issues in the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=363

6.4 Managing content

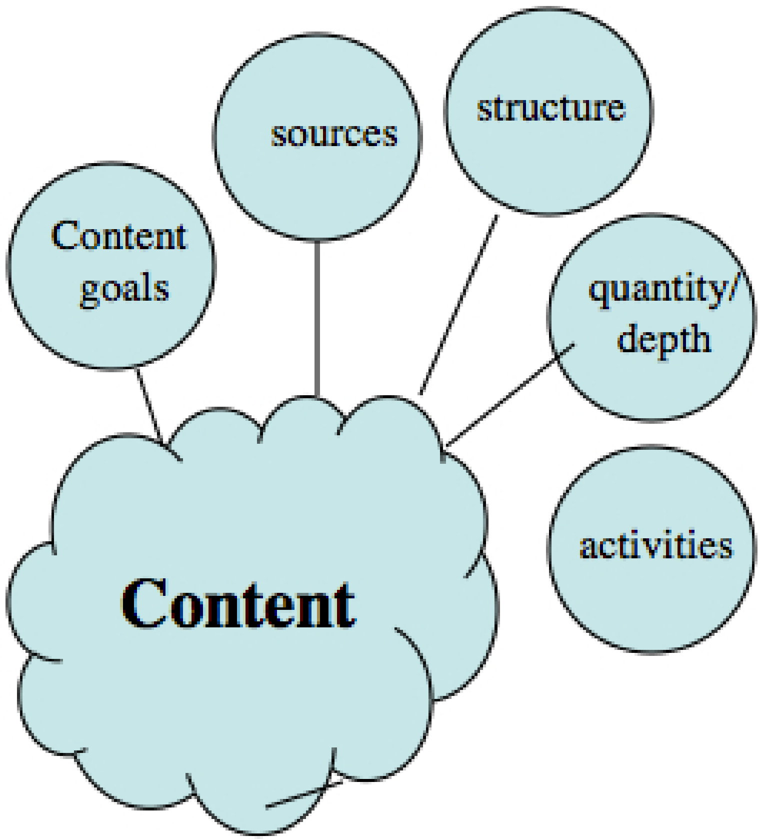


Figure 6.4.1 Managing content

6.4.1 The importance of content

For most teachers and instructors, content is often the key focus when designing courses. Content includes facts, ideas, principles, evidence, and descriptions of processes or procedures. A great deal of time is spent on discussing what content should be included in the curriculum, what needs to be covered in a course or a program, what content sources such as text-books students should access, and so on. Teachers and instructors often feel pressured to cover the whole curriculum in the time available. In particular, lecturing or face-to-face classes remain a prime means for organising and delivering content.

The case for balancing content with skills development is made several times through this book, but issues around content remain critically important in teaching. In particular, instructors need to ask themselves these two questions:

- ‘What specific content will add value to the overall goals of this course or program?’
- ‘What content is essential for meeting the learning outcomes for this course, and what desirable but not necessarily obligatory?’

6.4.2 Goals for content

Especially in post-secondary education, instructors tend to take content for granted – this is what we teach. However, it is important, when designing teaching for a digital age, to be clear in our goals for teaching content. *Why* do we require students to know facts, ideas, principles, evidence, and descriptions of processes or procedures? Is learning specific content a goal in itself, or is it a means to an end? For instance, is there an intrinsic value in knowing the periodic table, or the dates of battles, or are they means to an end, such as designing experiments, or understanding why French is an official language in Canada?

The question is important, because in a digital age, some would argue that learning or memorising content becomes less important or even irrelevant when it is easy just to look up facts or definitions or equations. Cognitivists will argue that content needs to be framed or put in context for it to have meaning. As content is now so easy to access, do we need only to draw on content as and when needed, such as to solve problems, or make decisions? In many cases, of course, skills depend essentially on prior knowledge, so it is not an either/or question.

Probably more important than the teacher or instructor being clear on why content is being taught is for the students to understand this. One way of stating this is to ask: what value is added to the overall goals of this course or program by teaching this specific content? Do students need to memorise this content, or know where to find it, and when it is important to use it? This depends of course on having very clear goals for the course or program as a whole.

6.4.3 Quantity and depth

Figure A.4.2 Is there too much content in your course?
Image: © handyguyspodcast.com

In many contexts, instructors have little choice over content. External bodies, such as accreditation agencies, state or provincial governments, or professional licensing boards, may well dictate what content a particular course or program needs to cover. However, the rapid growth of scientific and technological knowledge increasingly challenges the idea of a fixed body of content that students must learn. Engineering and medical programs struggle to cover even in six or eight years of formal education all the knowledge that professionals need to know to practice effectively. Professionals will need to go on learning well past graduation if they are to keep up with new developments in the field.

In particular, covering content quickly or overloading students with content are not effective teaching strategies, because even working harder all waking hours will not enable students in these subject domains to master all the information they need in their professions. Specialization has been a traditional way of handling the growth of knowledge, but that does not help in dealing with complex problems or issues in the real world, which often require inter-disciplinary and broader based approaches. Thus instructors need to develop strategies that enable students to cope with the massive and growing amounts of knowledge in their field.

One way to handle the problem of knowledge explosion is to focus on the development of skills, such as knowledge management, problem-solving and decision-making. However, these skills are not content-free. In order to solve problems or make decisions, you need access to facts, principles, ideas, concepts and data. To manage knowledge, you need to know what content is important and why, where to find it, and how to evaluate it. In particular there may be core or basic knowledge or content that needs to be mastered for many if not most of their professional activities. One teaching skill then will be the ability to differentiate between essential and desirable areas of content, and to ensure that whatever is done to develop skills, in the process core content is covered.

6.4.4 Sources

Another critical decision for teachers in a digital age is where students should source or find content. In medieval times, books were scarce, and the library was an essential source of content not only for students but also for professors. Professors had to select, mediate and filter content because the sources of content were extremely scarce. We are not in that situation today. Content is literally everywhere: on the Internet, in social media, on mass media, in libraries and books, as well as in the lecture theatre.

Often, a great deal of time is spent in departmental or program meetings on discussing what textbooks or articles students should be required to read. Part of the reason for selecting or limiting content is to limit the cost to students, as well as the need to focus on a limited range of material within a course or program. But today, content is increasingly open, free and available on demand over the Internet. Most students will need to continue learning after graduation. They will increasingly resort to digital media for their sources of knowledge. Therefore when deciding on content we should be considering:

(a) to what extent does the instructor need to choose the content for a program (other than a broad set of curriculum topics) and to what extent should students be free to choose both content and the source of that content?

(b) to what extent does the instructor need to deliver content themselves, such as through a lecture or Powerpoint slides, when content is so freely available elsewhere? What is the added value you are providing by delivering the content yourself? Could your time be better used in other ways?

(c) to what extent do we need to provide criteria or guidelines to students for choosing and using openly accessible content, and what is the best way to do that?

When answering such questions, we should also be asking whether our decisions will help students manage content better themselves after graduating.

6.4.5 Structure

One of the most critical supports that teachers and instructors provide is to structure the sequence and inter-relationship of different content elements. I include within structure:

- the selection and sequencing of content,
- developing a particular focus or approach to specific content areas,
- helping students with the analysis, interpretation or application of content
- integrating and relating different content areas.

Traditionally, content has been structured by breaking a course into a number of topic-related classes delivered in a particular sequence, and within the classes, by instructors 'framing' and interpreting content. (You can see how this mirrors an industrial manufacturing process). However, new technologies provide alternative means to structure content. Learning management systems such as Blackboard or Moodle still enable instructors to select and sequence content material, but students can access this – and other – content anywhere, at any time – and in any order. The availability of a wide range of content over the Internet, and the ability to collect and sort content through blogs, wikis, and e-portfolios, enable students increasingly to impose their own structures on content.

Students need some form of structure within content areas, partly because some things need to be learned in 'the right order', partly because without structure content becomes a jumble of unrelated topics, and partly because students can't know or work out what is important and what is not within a total content domain, at least until they have started studying it. Novice students in particular need to know what they must study each week. There is a good deal of research evidence to suggest that novice students benefit a great deal from tightly structured, sequential approaches to content, but as they become more knowledgeable or experienced in the domain, they seek to develop their own approaches to the selection, ordering and interpretation of content.

Therefore in deciding on the structure of the content in a course or program instructors need to ask:

(a) how much structure should I provide in managing content, and how much should I leave to the students?

(b) how do new technologies affect the way I should structure the content? Will they enable me to provide more flexible structures that will suit a diverse range of student needs?

Similarly, when answering these questions we should ask how important it is for students themselves to be able to structure content, and whether our answers to the two questions above will further help them to do this.

6.4.6 Learner activities

Lastly, what activities do we need to ask students to do to help them learn content? To answer this question will mean returning to the goals for learning content and the overall goals of the course:

- if memorization is important, then automated tests such as computer-marked assignments with correct answers being provided can be used;

- if the aim is to enable students to draw on content such as facts, principles, data or evidence to construct an argument, to solve equations, or to design an experiment, then opportunities for practising such skills will be needed;
- if the aim is to help students to manage knowledge, then we may need to set tasks that require them to select, evaluate, analyse and apply content.

We shall see that technology enables us to widen considerably the range of activities that students can use to master content, but these need to be related to the learning goals set for the course of program. Without a planned set of activities, though, content may just enter the brain one day and leave it the next.

6.4.7 In conclusion

Even or especially in a digital age, content, in terms of things to know, remains critically important, but in a digital age the role of content is subtly changing, in some ways becoming a means to other ends, such as skills development, rather than an end in itself. Because of the rapid growth in knowledge in nearly all subject areas, being clear about the role and purpose of content in a course, and communicating that effectively to students, becomes particularly important.

Activity 6.4 Managing content

1. Look at the overall content in one of the courses or classes you are teaching.
    - How much choice do you have over the content in this course? (In at least two ways: the choice of topics; the way content is approached. For instance often in high schools in many economically advanced countries, the curriculum is decided at a state or provincial level, but within that, teachers have a good deal of freedom about how to teach that curriculum.)
    - What purpose does this content serve? Does it have value in its own right or is it there to serve other purposes (such as skills development)?
    - What would be the best source of this content for students: textbook, lecture, online search, other, all of these? Why?
    - What activities are provided to enable students to learn or apply the content in this course? Given the goals of this course, are the activities appropriate?
    - How does the content in this course link to content in related courses (both prior and subsequent to this course)? Is it essential to what follows, does it duplicate what students have covered elsewhere? How do you know this? (e.g. is there a curriculum development process?)
    - Given the goals or learning outcomes for this course, what content could be removed without compromising the achievement of these goals?

There is no feedback on this activity.

6.5 Developing skills

Figure 6.5 Skills

6.5.1 Skills in a digital age

In Chapter 1, Section 1.2, I listed some of the skills that graduates need in a digital age, and argued that consequently a greater focus is now needed on developing such skills, at all levels of education, but particularly at a post-secondary level, where the focus is often on specialised content. Although skills such as critical thinking, problem solving and creative thinking have always been valued in higher education, the identification and development of such skills is often implicit and almost accidental, as if students will somehow pick up these skills from observing faculty themselves demonstrating such skills or through some form of osmosis resulting from the study of content.

It is of course somewhat artificial to separate content from skills, because content is the fuel that drives the development of intellectual skills. My aim here is not to downplay the importance of content, but to ensure that skills development receives as much focus and attention from instructors, and that we approach intellectual skills development in the same rigorous and explicit way as apprentices are trained in manual skills.

6.5.2 Setting goals for skills development

Thus a critical step is to be explicit about what skills a particular course or program is trying to develop, and to define these goals in such a way that they can be implemented and assessed. In other words it is not enough to say that a course aims to develop critical thinking, but to state clearly what this would look like in the context of the particular course or content area, in ways that are clear to students. In particular skills should be defined in such a way that they can be assessed, and students should be aware of the criteria or rubrics that will be used for assessment. Skills development is discussed throughout the book, but particularly in:

- Chapter 1, Section 2
- Chapter 3, Section 5 and Section 6
- Chapter 4, Section 5
- Chapter 11, Section 4

6.5.3 Thinking activities

These include activities that enable students to practice a range of skills, such as critical thinking, problem solving, and decision-making. A skill is not binary, in the sense that you either have it or you don't. There is a tendency to talk about skills and competencies in terms of novice, intermediate, expert, and master, but in reality skills require constant practice and application and there is, at least with regard to intellectual skills, no final destination. With practice and experience, for instance, our critical thinking skills should be much better at 65 than at 25 (although some might call that 'wisdom').

A major challenge over a full program is to ensure a steady progression in the level of a skill, so, for instance, a student's critical thinking skills are better when they graduate than when they started the program. This means identifying what level of skill they have before entering a course, as well as measuring it when they leave. So it is critically important when designing a course or program to design activities that require students to develop, practice and apply thinking skills on a continuous basis, preferably in a way that starts with small steps and leads eventually to larger ones.

There are many ways in which intellectual skills can be developed and assessed, such as written assignments, project work, and focused discussion, but these thinking activities need to be designed, then implemented, on a consistent basis by the instructor.

6.5.4 Practical activities

It is a given in vocational programs that students need lots of practical activities to develop their manual skills. This though is equally true for intellectual skills. Students need to be able to demonstrate where they are along the road to mastery, get feedback on it, and retry as a result. This means doing work that enables them to practice specific skills.

In the history scenario (Scenario D), students had to cover and understand the essential content in the first three weeks, do research in a group, develop an agreed project report, in the form of an e-portfolio, share it with other students and the instructor for comments, feedback and assessment, and present their report orally and online. Ideally, they will have the opportunity to carry over many of these skills into other courses where the skills can be further refined and developed. Thus, with skills development, a longer term horizon than a single course will be necessary, so integrated program as well as course planning is important.

6.5.5 Discussion as a tool for developing intellectual skills

Discussion is a very important tool for developing thinking skills. However, not *any* kind of discussion. It was argued in Chapter 2 that academic knowledge requires a different kind of thinking to everyday thinking. It usually requires students to see the world differently, in terms of underlying principles, abstractions and ideas.

Thus discussion needs to be carefully managed by the instructor, so that it focuses on the development of skills in thinking that are integral to the area of study. This requires the instructor to plan, structure and support discussion within the class, keeping the discussions in focus, and providing opportunities to demonstrate how experts in the field approach topics under discussion, and comparing students' efforts. The role of discussion is covered more fully in Chapter 3, Section 4, Chapter 4, Section 4 and Chapter 12, Section 10.

6.5.6 In conclusion

There are many opportunities in even the most academic courses to develop intellectual and practical skills that will carry over into work and life activities in a digital age, without corrupting the values or standards of academia. Even in vocational courses, students need opportunities to practice intellectual or conceptual skills such as problem-solving, communication skills, and collaborative learning. However, this won't happen merely through the delivery of content. Instructors need to:

- think carefully about exactly what skills their students need;
- how this fits with the nature of the subject matter;
- the kind of activities that will allow students to develop and improve their intellectual skills;
- how to give feedback and to assess those skills, within the time and resources available.

This is a very brief discussion of how and why skills development should be an integral part of any learning environment.

Activity 6.5 Developing skills

1. Returning to the HIST 305 scenario, what specific skills was Ralph Goodyear trying to develop in his course?
2. Are the skills being developed by students in the history scenario relevant to a digital age?
3. Is this section likely to change the way you think about teaching your subject, or do you already cover skills development adequately? If you feel you do cover skills development well, does your approach differ from mine?

For feedback in the first two questions, click on the podcast below.

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=370

6.6 Learner support

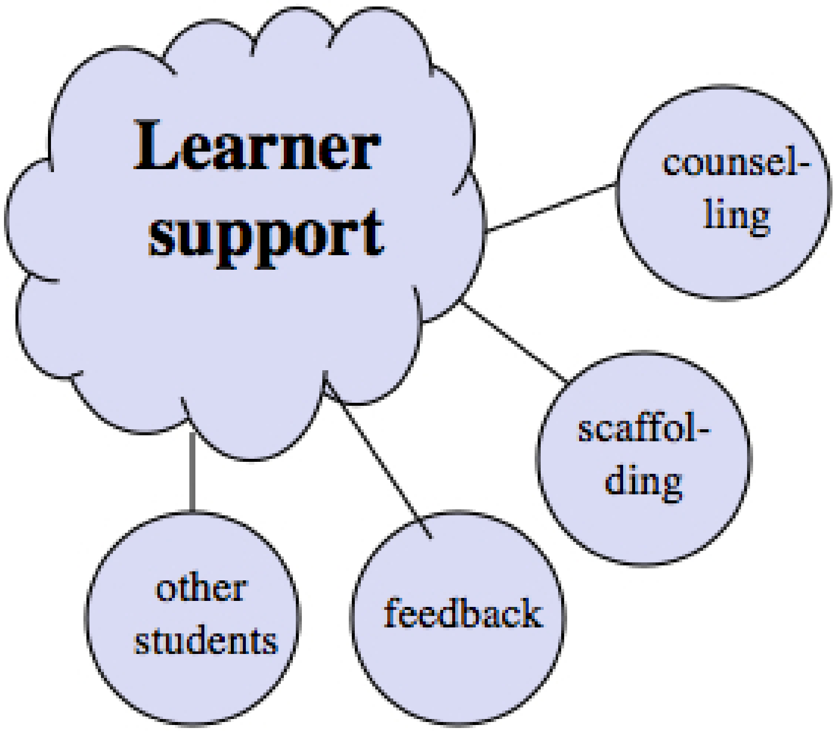


Figure 6.6.1 Learner support

6.6.1 Learner support within a learning environment

Learner support focuses on forms of assistance to learners beyond the delivery of content, skills development, or formal assessment. Learner support covers a wide range of functions, and is discussed throughout the book, but particularly in:

- Chapter 3, Section 7
- Chapter 4, Section 4
- Chapter 9, Section 6
- Chapter 12, Section 10.

Brindley et al. (2004) provide an extensive overview of the full range of activities in providing learner support for online and distance education learners. Here though my focus is limited to indicating why it is an essential element of an effective learning environment, and to describe briefly some of the main sub-components of learner support.

6.6.2 Scaffolding

Figure 6.6.2 Learner support

I use the term scaffolding to cover the many functions in diagnosing and responding to learners' difficulties, including:

- helping students when they struggle with new concepts or ideas;
- helping students to gain a deeper understanding of a topic or subject;
- helping students to evaluate a range of different ideas or practices;
- helping students to understand the limits of knowledge;
- above all challenging students to go beyond their current level of thinking or practice to acquire deeper understanding or a higher level of competency.

These activities normally take the form of personal interventions and communication between an instructor and an individual or a group of students, in face-to-face contexts or online. These activities tend not to be pre-planned, requiring a good deal of spontaneity and responsiveness on the part of the teacher or instructor.

However, more recently there have been examples of automated learner support, such as virtual assistants or chatbots (for a review of research on chatbots in education, see Winkler and Söllner, 2018).

Also learning analytics have been used to determine a student's performance and where necessary to direct them to further readings or work (see for instance, Vesin et al., 2018).

Scaffolding is usually a means of individualising the learning, enabling student differences in learning to be better accommodated as they occur.

6.6.3 Feedback

This could be seen as a sub-category of scaffolding, but it covers the role of providing feedback on student performance of activities such as writing assignments, project work, creative activities, and other student activities beyond the current and perhaps future scope of automated computer feedback. Again, the instructor's role here is to provide more individualisation of feedback to deal with more qualitatively assessed student activities, and may or may not be associated with formal assessment or grading.

6.6.4 Counselling

As well as direct support within their academic studying, learners often need help and guidance on administrative or personal issues, such as financial difficulties, or whether to repeat a course, delay an assignment because of sickness in the family, or cancel enrollment in a course and postpone it to another date. Although such services may be available outside the provision of a particular course, this potential source of help needs to be considered in the design of an effective learning environment, with the aim of doing all that can be done to ensure that students can manage external pressures while meeting the academic standards of a program.

6.6.5 Other students

Other students can be a great support for learners. Much of this will happen informally, through students talking after class, through social media, or helping each other with assignments. However, instructors can make more formal use of other students by designing collaborative learning activities, group work, and designing online discussions so that students need to work together rather than individually.

6.6.6 Why learner support is so important

We shall see in Chapter 12 that good design can substantially reduce demand for learner support, by ensuring clarity and by building in appropriate learning activities. Students also vary enormously in their need for support in learning. Many lifelong learners, who have already been through a post-secondary education, have families, careers and a great deal of life experience, can be self-managed, autonomous learners, identifying what they need to learn and how best to do this. At the other extreme, there are students for whom the formal school system was a disaster, who lack basic learning skills or foundations, such as reading, writing and mathematical skills, and therefore lack confidence in learning. These will need a lot of support to succeed.

However the vast majority of learners are somewhere in the middle of the spectrum, occasionally running into problems, unsure what standards are expected, and needing to know how they are doing in their studying. Indeed, there is a good deal of research that indicates that 'instructor presence' is associated with student success or failure in a course, at least in online learning (see, for instance, Shea et al., 2010). Where students feel the instructor is not present, both learner performance and completion rates decline. For such students, good, timely learner support is the difference between success and failure.

It should be noted that the need for good learner support, and the ability to provide it, is not dependent on the medium of instruction. The kind of credit online courses that have been designed and delivered long before MOOCs came along often provided high levels of learner support, through having a strong instructor presence and careful design to ensure students were supported.

At the same time, although computer programs can go some way to providing learner support, many of the most important functions of learner support associated with high-level conceptual learning and skills development still need to be provided by an expert teacher or instructor, whether present or at a distance. Furthermore, this kind of learner support is difficult to scale up, as it tends to be relatively labour intensive and requires instructors with a deep level of knowledge within the subject area. Thus, the need to provide adequate levels of learner support cannot just be wished away, if we are to achieve successful learning on a large scale.

This may seem obvious to teachers, but the importance of learner support for student success is not always recognised or appreciated, as can be seen from the design of many MOOCs, and the reaction of politicians and the media to the cost savings promised by the kind of MOOCs that focus on eliminating learner support. There are also different attitudes from instructors and institutions towards the need for learner support. Some faculty may believe that 'It's my job to instruct and yours to learn'; in other words, once students are presented with the necessary content through lectures or reading, the rest is up to them.

Nevertheless, the reality is that in any system with a wide diversity of students, as is so common today, effective learner support is essential for student success.

References

Brindley, J., Walti, C. and Zawacki-Richter, O. (eds.) (2004) *Learner Support in Open, Distance and Online Learning Environments* Oldenburg, Germany: Biblioteks- und informationssystem der Universität Oldenburg

Shea, P. et al. (2010) Online Instructional Effort Measured through the Lens of Teaching Presence in the Community of Inquiry Framework: A Re-Examination of Measures and Approach *International Review of Research in Open and Distributed Learning*, Vol. 11, No. 3

Vesin, B. at al. (2018) Learning in smart environments: user-centered design and analytics of an adaptive learning system *Smart Learning Environments*, Vol. 5, No. 24

Winkler, R. & Söllner, M. (2018): Unleashing the Potential of Chatbots in Education: A State-Of-The-Art Analysis. *Academy of Management Annual Meeting (AOM)* Chicago: Illinois

Activity 6.6 Building learner support

1. Do you think it is possible to design an effective course or program without the need for high levels of learner support? If so, what would it look like? A development of MOOCs or something completely different?
2. Do you share my views about the limitations of computers for providing the kind of high-level learner support needed for conceptual learning in a digital age? What do computers or AI do well in terms of supporting learners?
3. Is 'scaffolding' the best term to describe the kind of learning support I described in that section?

If not is there a better term for this?

For my feedback on these questions click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=374

6.7 Resources

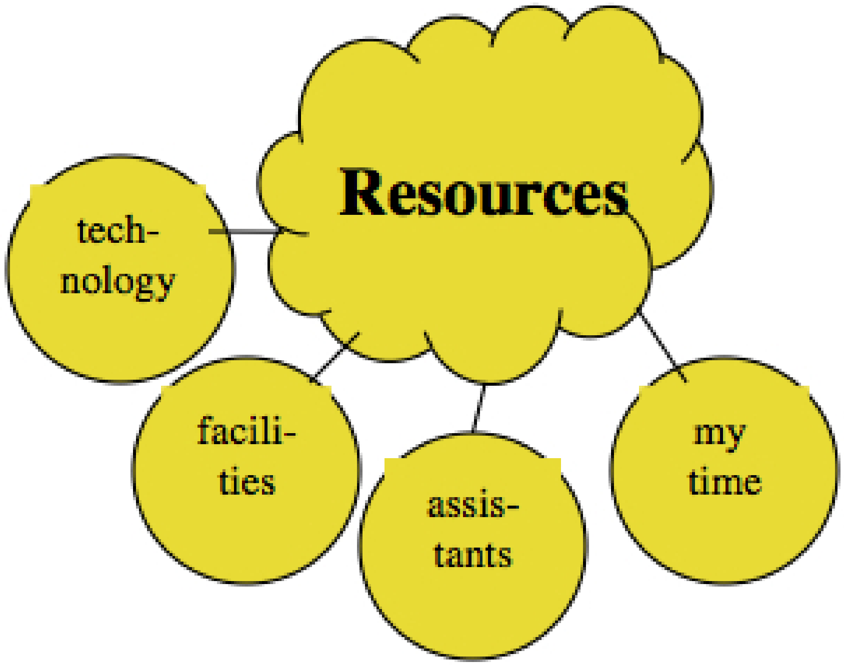


Figure 6.7.1 Resources

As in the case of learner characteristics, you may not have a lot of control over the resources available, but resources (or the lack of them) will impact a great deal on the design of teaching. Securing appropriate resources is often one of the most challenging tasks for many teachers and instructors. The role of resources in the design of learning is also discussed throughout the book, but particularly in:

- Chapter 1, Section 5
- Chapter 9, Section 7
- Chapter 10, Section 4.2
- Chapter 12, Section 6
- Chapter 13, Section 3
- Chapter 13, Section 4

Here the focus is just on outlining the overall role of resources in creating an effective learning environment.

6.7.1 Teaching assistance

Teaching assistance is the equivalent for instructors to what learner support is for students. Adjunct or sessional instructors, teaching assistants, librarians, faculty development workshops, and technical support staff, including instructional designers, media producers and IT technical support are all forms of teaching assistance.

It is important to think about the best way to use supporting staff. In universities, the tendency is to chop a large class into sections, with each section with its own sessional instructor or teaching assistant, which then operate relatively independently, with often large differences in the quality of the teaching in different sections, depending on the ability of the teaching assistants. However, new technologies enable the teaching to be organised differently and more consistently.

For instance, a senior professor may determine the overall curriculum and assessment strategy, and working with an instructional designer, provide the overall design of a course. Sessionals and/or teaching assistants then are hired to deliver the course either face-to-face or online or more often a mix of both, under the supervision of the senior professor (see the National Center for Academic Transformation for examples). Flipped classrooms are another way to organise resources differently (see Blended Learning in Introductory Psychology as an example.) One model is for the senior professor to record lectures which students view in their own time, then for students to meet in sub-groups with a teaching assistant or assistants to clarify concepts, discuss topics, or other class activities. These sub-groups may meet either face-to-face or online.

There are also opportunities to increase resources through the use of technology. Online learning may bring in more new students (for instance from outside the normal catchment area) and hence more revenues through government grants for the extra students and/or direct tuition revenue, so there may be economies of scale which would enable the institution to hire more core faculty or sessionals from the extra revenues generated by the additional online students.

Indeed, there are now examples of fully online masters' programs more than covering their full cost, including the hiring of research professors to teach the program, from tuition revenues alone (the University of British Columbia's online Master in Educational Technology is one example, even though its tuition fees are the same as those for masters' programs offered on campus – see Bates and Sangra, 2011).

Thus resources (or the lack of them) can have a profound influence on the effectiveness of a learning environment.

6.7.2 Facilities

Physical facilities available to an instructor and students include classrooms, labs, and the library. These are the more traditional components of a learning environment. However, physical facilities also can constrain the design of learning, because for example the physical set-up of a lecture hall or classroom may limit opportunities for discussion or project work, or an instructor may be forced to organise the teaching around three hours of lecturing and six hours of labs per week, to 'fit' with broader institutional requirements for classroom allocations (see How Online Learning is Going to Affect Classroom Design regarding attempts to re-design classrooms for the digital age.)

Online learning can free instructors and students from such rigid physical constraints, but there is still a need for structure and organization of units or modules of teaching, even or especially when teaching online. For instance learning management systems such as Blackboard or Moodle provide a structured online environment, but they too come with their own constraints.

6.7.3 Technology

Classroom technology such as whiteboards, projectors and computers for presentation are traditional technology support. I would also include textbooks here because we will see in Chapter 8 that they are a form of technology. However, the development of new technologies, and especially learning management systems, lecture capture, video streaming, and social media, have radical implications for the design of teaching and learning. This is discussed in much more depth in Chapters 7, 8 and 9, but for the purpose of describing an effective learning environment, the technologies available to an instructor can contribute immensely to creating interactive and engaging learning environments for students. However, it is important to emphasise that technology is just one component within any effective learning environment, and needs to be balanced and integrated with all the other components.

6.7.4 The instructor's time

This is the greatest and most precious resource of all! Building an effective learning environment is an iterative process, but in the end, the teaching design, and to some extent the learning environment as a whole, will be dependent on the time available from the instructor (and his or her team) for teaching. The less time available, the more restrictive the learning environment is likely to be, unless the instructor's time is very carefully managed. Again, though, good design takes into account the time available for teaching (see Chapter 12, Section 9 in particular).

6.7.5 Resources, class size and control

Nothing drives an instructor to distraction more than trying to manage with inadequate resources. Certainly, if a teacher or instructor is allocated a class of 200 students, in a large lecture hall, with no additional teaching support, then the instructor is going to have difficulty creating a rich and effective learning environment, because the lack of resources limits the options. On the other hand, an instructor with 30 students, access to a wide range of technology, freedom to organise and structure the curriculum, and with support from an instructional designer and a web designer, has the luxury of exploring a range of different designs and possible learning environments.

Nevertheless it is probably when resources are most scarce that the most creativity is needed to break out of traditional teaching models. New technology, if properly used and available, does enable even large classes with otherwise few resources to be designed with a relatively rich learning environment. This is discussed in more detail in Chapter 13, Section 5. At the same time, expectations need to be realistic. Providing adequate learner support with an instructor:student ratio of 1:200 or more will always be a challenge. Improvements are possible through re-design – but not miracles. (For more on increasing productivity through online teaching, see Productivity and Online Learning Redux.)

References

Bates, A. and Sangrà, A. (2011) *Managing Technology in Higher Education: Strategies for Transforming Teaching and Learning* San Francisco: Jossey Bass

Activity 6.7 What resources matter?

1. Are there other resources that influence the design of an effective learning environment that I should have included?
2. Winston Churchill once said ‘We shape our buildings and in turn our buildings shape us.’ To what extent do you think online learning can free us of some of the constraints that buildings impose on the design of teaching and learning? What new constraints does online learning bring in terms of design?
3. How do you feel about the whole issue of teaching assistance? I have grave reservations myself about the use of students as teaching assistants in universities, in terms of the quality of the teaching (not so much the principle, but the practice.). I also believe that sessionals and adjunct instructors are badly treated in terms of how they are managed. In British Columbia we have had two Supreme Court cases and a major teachers’ strike over class size and composition in schools, and in particular how much help school teachers should receive for coping with students with learning disabilities. But by bringing in less qualified (and cheaper) support for instructors, do we strengthen or weaken the learning environment for students?

No podcast from me – this activity is for your personal reflection – my views are stated above.

6.8 Assessment of learning

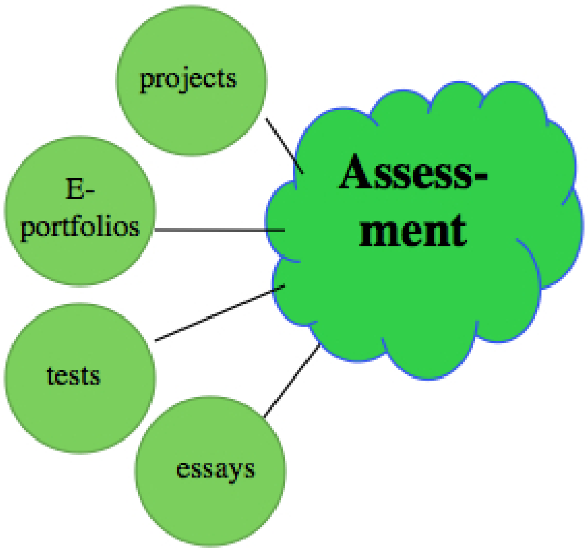


Figure 6.8.1 Assessment

'I was struck by the way assessment always came at the end, not only in the unit of work but also in teachers' planning….Assessment was almost an afterthought…

Teachers…are being caught between competing purposes of …assessment and are often confused and frustrated by the difficulties that they experience as they try to reconcile the demands.'

Earle, 2003

6.8.1 Learner assessment in a digital age

Because assessment is a huge topic, it is important to be clear that the purpose of this section is:

(a) to look at one of the components that constitute an effective and comprehensive learning environment, and;

(b) briefly to examine the extent to which assessment is or should be changing in a digital age.

Assessment again is discussed throughout the book, but particularly in:

- Scenario C
- Chapter 5, Section 4.6
- Chapter 8.7 c

- Chapter 11, Section 4.3
- Chapter 12, Section 11.

However, assessment requires a section on its own. Probably nothing drives the behaviour of students more than how they will be assessed. Not all students are instrumental in their learning, but given the competing pressures on students' time in a digital age, most 'successful' learners focus on what will be examined and how they can most effectively meet the assessment requirements (which for most students means in as little time as possible). Therefore decisions about methods of assessment will in most contexts be fundamental to building an effective learning environment.

6.8.2 The purpose of assessment

There are many different reasons for assessing learners. It is important to be clear about the purpose of the assessment, because it is unlikely that one single assessment instrument will meet all assessment needs. Here are some reasons (you can probably think of many more):

- to improve and extend students' learning;
- to assess students' knowledge and competence in terms of desired learning goals or outcomes;
- to provide the teacher/instructor with feedback on the effectiveness of their teaching and how it might be improved;
- to provide information for employers about what the student knows and/or can do;
- to filter students for further study, jobs or professional advancement;
- for institutional accountability and/or financial purposes.

I leave it to you to decide the order of importance of these reasons for creating an effective learning environment.

6.8.3 Methods of assessment

The form the assessment takes, as well as the purpose, will be influenced by the instructors' or examiners' underlying epistemology: what they believe constitutes knowledge, and therefore how students need to demonstrate their knowledge. The form of assessment should also be influenced by the knowledge and skills that students need in a digital age, which means focusing as much on assessing skills as on assessing knowledge of content. Thus continuous or formative assessment will be as important a consideration as summative or 'end-of-course' assessment.

There is a wide range of possible assessment methods. I have selected just a few to illustrate how technology can change the way we assess learners in ways that are relevant to a digital age:

6.8.3.1 No assessment

A question to be considered is whether there is a *need* for assessment of learning in the first place. There may be contexts, such as a community of practice, where learning is informal, and the learners themselves decide what they wish to learn, and whether they are satisfied with what they have learned.

In other cases, learners may not want or need to be formally evaluated or graded, but do want or need feedback on how they are doing with their learning. 'Do I really understand this?' or 'How am I doing compared to other learners?'

However, even in these contexts, some informal methods of assessment by experts, specialists or more experienced participants could help other participants extend their learning by providing feedback and indicating the level of competence or understanding that a participant has achieved or has yet to accomplish. Lastly, students themselves can extend their learning by participating in both self-assessment and peer assessment, preferably with guidance and monitoring from a more knowledgeable or skilled instructor.

6.8.3.2 Computer-based multiple-choice tests

This method is good for testing 'objective' knowledge of facts, ideas, principles, laws, and quantitative procedures in mathematics, science and engineering etc., and is cost-effective for these purposes. This form of testing though tends to be limited for assessing higher-level intellectual skills, such as complex problem-solving, creativity, and evaluation, and therefore less likely to be useful for developing or assessing many of the skills needed in a digital age.

6.8.3.3 Written essays or short answers

This method is good for assessing comprehension and some of the more advanced intellectual skills, such as critical thinking, but it is labour intensive, open to subjectivity, and not good for assessing practical skills.

Experiments are taking place with automated essay marking, using developments in artificial intelligence, but so far automated essay marking still struggles to identify valid semantic meaning, especially at a higher education level. For more discussion of automated essay marking, see Chapter 8.7c.4.4

6.8.3.4 Peer assessment

This is a very large and specialised topic, which I touched on in Chapter 5, Section 4.6.2. There are three main advantages of peer assessment:

- if conducted properly, it can be an excellent pedagogical benefit to student learning as it requires students to think critically about what they have learned in order to judge other students' work. It enables them to see other students' perspectives on the concepts and ideas, thus widening and deepening their understanding;
- it enables learner support to be scaled up, allowing instructors to handle larger numbers of students;
- it develops a core 21st century skill of peer evaluation that will be critical when working in a digital society.

However, if not done properly, peer assessment can have disastrous consequences. I am not a specialist in this area but I have used peer assessment in online learning, but only at a graduate level. These are some of the lessons I learned:

- There must be an intrinsic benefit to students doing the assessment. They must see how this will be useful to their own learning.
- The instructor must give clear criteria or rubrics for assessment, preferably with examples of good or poor answers.
- Students should be rewarded either with marks or praise by the instructor for excellent peer reviews.
- Students must know that the instructor will not only monitor the peer assessments but also will take responsibility for final decisions on student-awarded grades or marks and will over-rule poor assessments by students.
- Don't put all your eggs in one basket. It is wise to have a parallel or independent method of assessment, such as multiple-choice tests or having half the total course assessment done in more traditional ways.

Thus there are best practices that must be followed. Anyone intending to use peer assessment should prepare themselves properly by looking carefully into the literature. Macdonald (2015) or Topping (2018) offer guides for teachers. For an example of the successful use of peer assessment at a post-secondary level, see Peer Evaluation as a Learning and Assessment Strategy at the School of Business at Simon Fraser University

6.8.3.5 Project work

Project work encourages the development of authentic skills that require understanding of content, knowledge management, problem-solving, collaborative learning, evaluation, creativity and practical outcomes. Designing valid and practical project work needs a high level of skill and imagination from the instructor, and the assessment process can be labour-intensive, but project work is one of the best ways to assess the high level skills needed in a digital age.

'Assessing student project work' by Melinda Kolk on The Creative Educator web site provides an excellent guideline on assessing student project work. Although intended for k-12 teachers, it is also very appropriate for post-secondary educators.

6.8.3.6 e-Portfolios (an online compendium of student work)

E-portfolios enable self-assessment through reflection, knowledge management, recording and evaluation of learning activities, such as teaching or nursing practice, and recording of an individual's contribution to project work (as an example, see the use of e-portfolios in Visual Arts and Built Environment at the University of Windsor.); e-portfolios are usually self-managed by the learner but can be made available or adapted for formal assessment purposes or job interviews.

6.8.3.7 Simulations, educational games (usually online) and virtual worlds

These enable the practice and evaluation of skills, such as:

- complex and real time decision-making,
- operation of (simulated or remote) complex equipment,
- the development of safety procedures and awareness,

- risk taking and decision-making in a safe environment, activities that require a combination of manual and cognitive skills (see the training of Canadian Border Service officers at Loyalist College, Ontario).

Figure 6.8.2 Virtual world border crossing, Loyalist College, Ontario

Simulations and serious or educational games (discussed more extensively in Chapter 13) are currently expensive to develop, but cost-effective with multiple use, where they replace the use of extremely expensive equipment, where operational activities cannot be halted for training purposes, or where available as open educational resources. Because students' actions and decision-making are recorded, authentic assessment is embedded in the process.

6.8.4 In conclusion

Nothing is likely to drive student learning more than the method of assessment. At the same time, assessment methods are rapidly changing and are likely to continue to change. It can be seen that some of these assessment methods are both formative, in helping students to develop and increase their competence and knowledge, as well as summative, in assessing knowledge and skill levels at the end of a course or program. In a digital age, assessment and teaching will become even more closely integrated and contiguous.There is an increasing range of digitally based tools that can enrich the quality and range of student assessment. Therefore the choice of assessment methods, and their relevance to other components, are vital elements of any effective learning environment.

References

Earle, L. (2003) *Assessment as Learning* Thousand Oaks CA: Corwin Press

Macdonald, B. (2015) *Peer assessment that works: A guide for teachers* Lanham MD: Rowan and Littlefield

Topping, K. (2108) *Using Peer Assessment to Inspire Reflection and Learning* London UK: Routledge

Activity 6. 8 What assessments work in a digital age?

1. Are there other methods of assessment relevant to a digital age that I should have included?
2. There is still a heavy reliance on computer-based multiple-choice tests in much teaching, mainly for cost reasons. However, although there are exceptions, I would argue in general that these really don't assess the high level conceptual skills needed in a digital age. Do you agree?
3. Are there other methods that are equally as economical, particularly in terms of instructor time, that are more suitable for assessment in a digital age? For instance, do you think automated essay grading is a viable alternative?
4. Would it be helpful to think about assessment right at the start of course planning, rather than at the end? Is this feasible?
5. In Scenario D, 'Developing historical thinking', did the instructor use assessment to help develop and assess the skills needed in a digital age in an effective manner? If so, how and if not, why not?

For my comments on this activity, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=380

6.9 Culture and learning environments

Figure 6.9.1 Old Sun Anglican Aboriginal School, Southern Alberta: note the Union Jack on the board at the back.

6.9.1 The importance of culture

Within every learning environment there is a prevailing culture that influences all the other components. In most learning environments, culture is often taken for granted or may be even beyond the consciousness of learners or even teachers. I will try to show why faculty, instructors and teachers should pay special attention to cultural factors, so that they can make conscious decisions about how the different components of a learning environment are implemented. Although the concept of culture may seem a little abstract at this stage, I will show how critical it is for designing an effective online learning environment,

6.9.2 Defining culture

I define culture as

> *the dominant values and beliefs that influence decision-making.*

The choice of content, the skills and attitudes that are promoted, the relationship between instructors and students, and many other aspects of a learning environment, will all be deeply influenced by the prevailing culture of an institution or class (used to mean any grouping of students and a teacher). Thus in a learning environment, every one of the components I described will be influenced by the dominant culture.

For instance, parents tend to place their children in schools that reflect their owns values and beliefs, and so the characteristics of learners in that school will also often be influenced by the culture not only of their parents but also of their school. This is one of the many ways that culture can be self-reinforcing.

6.9.3 Identifying cultures

I first noticed the impact of different cultures many years ago, when I was doing research in the U.K. on the administration of large comprehensive (high) schools. Given that these schools had deliberately been created by a left-of-centre government in Britain in the 1960s to provide equal access to secondary education for all, and that these schools had many things in common (their large size – often with 1,500 students or more, their curricula, the idea that every student should have the same educational opportunities) one would have expected that they all would have had a similar prevailing culture. However, I visited over 50 such schools to collect information on the how they were managed and the key issues they faced, and every one was different.

Some were created from formerly highly selective grammar schools, and operated on a strict system of sorting students by tests, so that each year successful students would go up a level and the 'weakest' students would drop down a level, in order to identify the best prospects for university. Here the dominant value was academic excellence.

Some schools were single sex (I am still puzzled by how a school segregated by sex could be considered 'comprehensive'). One of the key objectives of a girls' school I visited was to teach girls about 'poise'. (This led to a very confused miscommunication between me and the headmistress, as I initially thought she had said 'boys'.) Here the dominant value was on developing 'ladylike qualities'.

Others were inner city schools, where the focus was often on bringing the best out of each child, whatever their abilities. In such schools, each class would contain children with as wide a range of abilities as possible, but they were often rowdy, raucous places in comparison to the more elite-oriented institutions. Here the emphasis was on inclusiveness and equal opportunity.

The differing cultures of each of these schools was so strong I could sometimes detect it just by walking in the door, by the way students reacted with staff and each other in the corridors, or even by the way the students walked (or ran).

6.9.4 Culture and learning environments

Whether you consider culture to be a good or bad influence in a learning environment will depend on whether you share or reject the underlying values and beliefs of the dominant culture.

Residential schools in Canada into which aboriginal children were often forcibly placed are a prime example of how culture drives the way schools operate. The main purpose of such schools was deliberately to destroy aboriginal cultures and replace them with a religious-influenced Western culture. In these schools children were punished for being what they were. In such schools, all the other components of their learning environment were used to reinforce the dominant culture that was being imposed.

Although the outcomes for most children that attended these schools have turned out to be disastrous, those responsible (state and church working together) truly believed they were doing the right thing. We are still struggling in Canada to 'do the right thing' for aboriginal education, but any successful solution must take into account aboriginal cultures, as well as the surrounding predominant 'Western' culture.

Culture is perhaps more nebulous in higher education institutions, but it is still a powerful influence, differing not just between institutions but often between academic departments within the same institution.

6.9.5 Culture and new learning environments

Because prevailing cultures are often so dominant, they are very difficult to change. It is particularly difficult for a single individual to change a dominant culture. Even charismatic leaders will struggle, as many university presidents have found.

However, as new technologies allow us to develop new learning environments, instructors now have a rare opportunity consciously to create a culture that can support those values and beliefs that they consider to be important for today's learners.

For instance, in an online learning environment, I consciously attempt to create a culture that reflects the following:

- mutual respect (between instructor and students, and especially between students)
- open-ness to differing views and opinions; respect for diversity
- evidence-based argument and reasoning
- making learning engaging and fun
- making explicit and encouraging the underlying values and epistemology of a subject discipline
- transparency in assessment (e.g. rubrics and criteria)
- recognition of and respect for the personalities of each student in the class
- collaboration and mutual support.

The above cultural elements of course reflect *my* beliefs and values; yours may well be different. However, it is important that you are aware of your beliefs and values, so that you can design the learning environment in a way that best supports them.

You may also consider these cultural elements to be more like learning outcomes but I disagree. These cultural elements are broader and more general, and reflect what I believe are really necessary conditions for building an effective learning environment in a digital age.

Lastly you may question the right of an instructor to impose their personal cultural conditions on a learning environment. For myself, I have no problems with this. As a subject expert or professional in teaching, you are usually in a better position than learners to know the learning requirements and the cultural elements that will best achieve these. In any case, if you believe that learners should have more say in determining the culture in which they learn, that too is your choice and could be accommodated within the culture.

6.9.6 Summary

Culture is a critical component of any learning environment. It is important to be aware of the influence of culture within any particular learning context, and to try and shape that culture as much as possible towards supporting the kind of learning environment that you believe will be most effective. However, changing a pre-existing, dominant culture is very difficult. Nevertheless, new technologies enable new learning environments to be developed, and thus provide an opportunity to develop the kind of culture within that learning environment that will best serve your learners.

However, in every learning environment there will be cultural elements that prevail through all components, which is why I have added culture as a background to all the components of a learning environment in the graphic below.

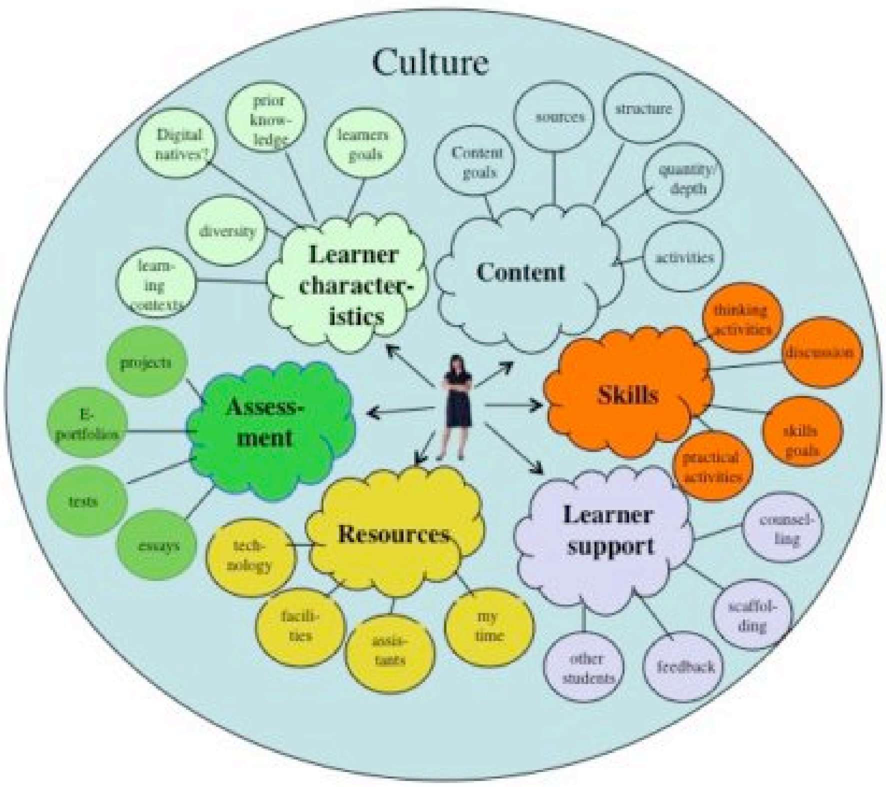


Figure 6.9.2: All the components of an effective learning environment

6.9.7 Next

Section 6.10 provides a brief conclusion to this chapter on building effective learning environments.

Activity 6.9 Considering culture in a learning environment

1. Do you agree with my definition of 'culture' as used in describing an effective learning environment? If not, how would you define it? Would you use another term for what I am

discussing?

2. Can you describe the culture of the institution in which you work? What are its prime characteristics or goals? Or are there many cultures?
3. Can you describe the culture within your own class or classes? What do you ‘inherit’ and what can you create or change?
4. Do you share my views on the importance of understanding the culture within a learning environment? Or is culture something a teacher should/can ignore?
5. What would be the ideal culture for your classes/teaching? How could you foster or create such a culture?

These questions are for your reflection. There is no feedback provided for this activity.

6.10 Conclusions

Figure 6.10 What kind of learning environment do you want to create? Image: Vidyo.com

There is no one way to build an effective learning environment. The learning environment needs to be appropriate for the context in which students will learn. However, before even beginning to design a course or program, we should be thinking of what this learning environment could look like. Whatever the learning environment, though, the learners must do the learning. We need to make sure that learners are able to work within an environment that helps them do this. In other words, our job as teachers is to create the conditions for success.

One component within an effective learning environment that I have not discussed is the actual teacher (although in Figure 6.9.2 you will see that she is at the centre of the learning environment). In some sense the importance of a teacher or instructor within a learning environment is a given, but really the rest of the book is about the role of the teacher within this environment. Also by concentrating on the other components, this chapter enables the possibility of a learning environment without an actual teacher, although someone such as a teacher or educator or even an individual learner (but definitely *not* a computer scientist) may need to be responsible for the design and maintenance of such a learning environment.

Technology now enables us to build a wide variety of effective learning environments that can differ significantly from the traditional classroom. But technology alone is not enough. Many technology-based learning environments are bereft of some of the key components that make an effective learning environment. An effective learning environment needs to include the other components for learner success. This is not to say that self-managing learners cannot build their own effective, personal learning environments, but they need to consider the other components as well as the technology.

Activity 6.10 Designing your own learning environment

1. Describe the current learning environment in which you are teaching a particular course or program.
2. What are the main components to which you give the most attention?
3. Would you make changes to that learning environment as a result of reading this chapter? Why?
4. Now: can you design a completely different learning environment that would better fit the needs of the course and your students? For instance if you moved your course from classroom to online, or from fully online to blended, how would you accommodate the main components of this learning environment? Or could you re-design the learning environment within the current mode of delivery? If so, what elements would you change, and what would you keep?

I provide no feedback for this activity. It is for your own reflection.

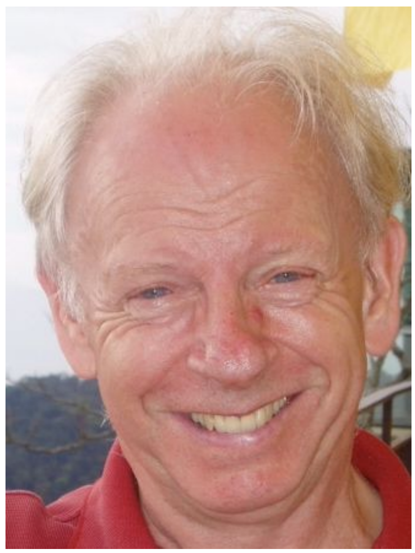
This concludes Part 1 of the book, which focuses on the fundamentals of teaching and learning in a digital age. Part 2 of the book (Chapters 7-13) pays special attention to the impact of digital technologies on teaching and learning, starting with Chapter 7, which examines the nature and role of media and technologies in education.

Chapter 7: Understanding technology in education

Purpose of this chapter

When you have completed this chapter you should:

- be able to understand the difference between media and technologies in educational contexts;
- be able to place different media and technologies, including new and emerging technologies, within an analytical framework.



For a my personal introduction to the next few chapters, please click on the podcast below.

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=168

What is covered in this chapter

Understanding the nature and role of media and technologies in education, and being able to use media and technologies appropriately, are critical to teaching well in a digital age. This is the first of three chapters that discuss media choice and use.

In this chapter, which focuses on the foundations of educational technology, you will cover the following topics

Also in this chapter you will find the following activities:

Key Takeaways

1. Technologies are merely tools that can be used in a variety of ways. What matters more is how technologies are applied. The same technology can be applied in different ways, even or especially in education. So in judging the value of a technology, we need to look more closely at the ways in which it is being or could be used. In essence this means focusing more on media – which represent the more holistic use of technologies – than on individual tools or technologies themselves, while still recognising that technology is an essential component of almost all media.
2. By focusing on media rather than technologies, we can then include face-to-face teaching as a medium, enabling comparisons with more technology-based media to be made along a number of dimensions or characteristics.
3. Recognising that in education media are usually used in combination, the six key building blocks of media are:
    1. face-to-face teaching

    2. text
    3. (still) graphics
    4. audio (including speech)
    5. video
    6. computing (including animation, simulations and virtual reality).

4. Media differ in terms of their formats, symbols systems, and cultural values. These unique features are increasingly referred to as the affordances of media or technology. Thus different media can be used to assist learners to learn in different ways and achieve different outcomes, thus also individualising learning more.
5. There are many dimensions along which some technologies are similar and others are different. By focusing on these dimensions, we have a basis for analysing new media and technologies, to see where they 'fit' within the existing landscape, and to evaluate their potential benefits or limitations for teaching and learning.
6. There are probably other characteristics or dimensions of educational media that might also be identified, but three key characteristics or dimensions are particularly important:
    - broadcast vs communicative
    - synchronous (live) vs asynchronous (recorded)
    - single vs rich media
7. However, the identification of where a particular medium fits along any specific characteristic or dimension will depend in most cases on how that medium is designed. On the other hand, there is usually a limit to how far a technology can be forced along one of these dimensions; there is likely to be a single, 'natural' position on each dimension, subject to good design, in terms of exploiting the educational affordances of the medium.
8. These characteristics or dimensions of media then need to be evaluated against the learning goals and outcomes desired, while recognising that a new educational medium or application might enable goals to be achieved that had not been previously considered possible.
9. Over time, media have tended to become more communicative, asynchronous, and 'rich', thus offering teachers and learners more powerful tools for teaching and learning.
10. The Internet is an extremely powerful medium because through a combination of tools and media it can encompass all the characteristics and dimensions of educational media.

7.1 Choosing technologies for teaching and learning: the challenge

Figure 7.1 How many technologies can you identify in this home entertainment system? Image: Tony Bates, 2014

7.1 Defining the role of technology in education

Even an electronics engineer will be hard pressed to identify all the technologies in the photo of a not untypical home entertainment system in a North American home in 2014. The answer will depend on what you mean by technology:

- hardware? (e.g. TV monitor, laptop computer)
- software? (e.g. computer operating system, channel selection)
- networks? (e.g. Internet, cable)
- services? (e.g. television, telephone)

The answer of course is all these, plus the systems that enable everything to be integrated. Indeed, the technologies represented in just this one photograph are too many to list (although I make an attempt in the feedback on Activity 7.1 at the end of the book. Nevertheless it is a futile exercise as I was forced to change the whole system a couple of years later due to technological 'upgrades' by the service provider.)

In a digital age we are immersed in technology. Education, although often a laggard in technology adoption, is nevertheless no exception today. Yet learning is also a fundamental human activity that can function quite well (some would say better) without any technological intervention. So in an age immersed in technology, what is its role in education? What are the strengths (or affordances) and what are the limitations of technology in education? When should we use technology, and which technologies should we use for what purposes?

7.2 The need for decision models

The aim of this and the next two chapters is to provide some frameworks or models for decision-making that are both soundly based on theory and research and are also pragmatic within the context of education. This will not be an easy exercise. There are deep philosophical, technical and pragmatic challenges in trying to provide a model or set of models flexible but practical enough to handle the complexity.

For instance, theories and beliefs about education will influence strongly the choice and use of different technologies. On the technical side, it is becoming increasingly difficult to classify or categorize technologies, not just because they are changing so quickly, but also because technologies have many different qualities and affordances that change according to the contexts in which they are used. On the pragmatic side, it would be a mistake to focus solely on the pedagogical characteristics of technologies. There are social, organizational, cost and accessibility issues also to be considered.

The selection and use of technologies for teaching and learning is driven as much by context and values and beliefs as by hard scientific evidence or rigorous theory. So there will not be one 'best' framework or model. On the other hand, given the rapidly escalating range of technologies, educators are increasingly caught between technological determinism (inappropriate applications of artificial intelligence, for instance) or the total rejection of technology for teaching because it is so complex.Thus we need some models to guide their selection and use.

We shall also see though that even with such models or frameworks for decision-making, there are in fact still some fundamental, unanswered questions regarding the use of technology for teaching, including:

- what is best done face-to-face and what online, and in what contexts?
- what is the role of the human teacher, and can/should/will the human teacher be replaced by technology?

Nevertheless, if we consider a teacher facing a group of students and a curriculum to teach, or a learner seeking to develop their own learning, there is need for practical guidance *now* about when to use one technology or another. In this and the next two chapters I will provide some theoretical models or frameworks that will enable such questions to be answered effectively and pragmatically so that the learning experience is optimized.

In the meantime let's start with what your views are at the moment about choosing technology for teaching and learning.

Activity 6.1 How do you currently make decisions about what technology to use for teaching?

1. How do you decide at the moment about what technologies to use for teaching?
   - Use what's in the room?
   - Ask the IT support people?

- Use a theory or set of principles for making such a decision? If so, what are these?

2. Is justifying your use of technology (or lack of it) in teaching easy to do? What are the reasons for your answer?

3. How many technologies can you see in Figure 7.1? List them

For my answer to question 3, see Feedback on Activity 7.1 at the end of the book. There is no feedback on questions 1 and 2.

7.2 A short history of educational technology

Figure 7.2.1 Charlton Heston as Moses. Are the tablets of stone an educational technology? (See [Selwood, 2014](), for a discussion of the possible language of the Ten Commandments)
Image: Allstar/Cinetext/Paramount

Arguments about the role of technology in education go back at least 2,500 years. To understand better the role and influence of technology on teaching, we need a little history, because as always there are lessons to be learned from history. Paul Saettler's 'The Evolution of American Educational Technology' (1990) is one of the most extensive historical accounts, but only goes up to 1989. A lot has happened since then. What I'm giving you here is the postage stamp version of ed tech history, and a personal one at that.

7.2.1 Oral communication

One of the earliest means of formal teaching was oral – through human speech – although over time, technology has been increasingly used to facilitate or 'back-up' oral communication. In ancient times, stories, folklore, histories and news were transmitted and maintained through oral communication, making accurate memorization a critical skill, and the oral tradition is still the case in many aboriginal cultures. For the ancient Greeks, oratory and speech were the means by which people learned and passed on learning. Homer's Iliad and the Odyssey were recitative poems, intended for public performance. To be learned, they had to be memorized by listening, not by reading, and transmitted by recitation, not by writing. Lectures go back at least as far as the ancient Greeks. Demosthenes (384-322 BC) was an outstanding orator whose speeches influenced the politics of Athens.

Nevertheless, by the fifth century B.C, written documents existed in considerable numbers in ancient Greece. If we believe Plato, education has been on a downward spiral ever since. According to Plato, Socrates caught one of his students (Phaedrus) pretending to recite a speech from memory that in fact he had learned from a written version. Socrates then told Phaedrus the story of how the god Theuth offered the King of Egypt the gift of writing, which would be a 'recipe for both memory and wisdom'. The king was not impressed. According to the king:

> *it [writing] will implant forgetfulness in their souls; they will cease to exercise memory because they will rely on what is written, creating memory not from within themselves, but by means of external symbols. What you have discovered is a recipe not for memory, but for reminding. And it is no true wisdom that you offer your disciples, but only its semblance, for by telling them many things without teaching them anything, you will make them seem to know much, while for the most part they will know nothing. And as men filled not with wisdom but the conceit of wisdom, they will be a burden to their fellow men.*
>
> Phaedrus, 274c-275, translation adapted from Manguel, 1996

I can just hear some of my former colleagues saying the same thing about social media.

Slate boards were in use in India in the 12th century AD, and blackboards/chalkboards became used in schools around the turn of the 18th century. At the end of World War Two the U.S. Army started using overhead projectors for training, and their use became common for lecturing, until being largely replaced by electronic projectors and presentational software such as Powerpoint around 1990. This may be the place to point out that most technologies used in education were not developed specifically for education but for other purposes (mainly for the military or business.)

Although the telephone dates from the late 1870s, the standard telephone system never became a major educational tool, not even in distance education, because of the high cost of analogue telephone calls for multiple users, although audio-conferencing has been used to supplement other media since the 1970s. Video-conferencing using dedicated cable systems and dedicated conferencing rooms have been in use since the 1980s. The development of video compression technology and relatively low cost video servers in the early 2000s led to the introduction of lecture capture systems for recording and streaming classroom lectures in 2008. Webinars now are used largely for delivering lectures over the Internet.

None of these technologies though changes the oral basis of communication for teaching.

7.2.2 Written communication

The role of text or writing in education also has a long history. According to the Bible, Moses used chiseled stone to convey the ten commandments in a form of writing, probably around the 7th century BC. Even though Socrates is reported to have railed against the use of writing, written forms of communication make analytic, lengthy chains of reasoning and argument much more accessible, reproducible without distortion, and thus more open to analysis and critique than the transient nature of speech.

The invention of the printing press in Europe in the 15th century was a truly disruptive technology, making written knowledge much more freely available, very much in the same way as the Internet has done today. As a result of the explosion of written documents resulting from the mechanization of printing, many more people in government and business were required to become literate and analytical, which led to a rapid expansion of formal education in Europe. There were many reasons for the development of the Renaissance and the Enlightenment, and the triumph of reason and science over superstition and beliefs in Europe, but the technology of printing was a key agent of change.

Improvements in transport infrastructure in the 19th century, and in particular the creation of a cheap and reliable postal system in the 1840s, led to the development of the first formal correspondence education, with the University of London offering an external degree program by correspondence from 1858. This first formal distance degree program still exists today in the form of the University of London Worldwide. In the 1970s, the Open University transformed the use of print for teaching through specially designed, highly illustrated printed course units that integrated learning activities with the print medium, based on advanced instructional design.

With the development of web-based learning management systems in the mid-1990s, textual communication, although digitized, became, at least for a brief time, the main communication medium for Internet-based learning, although lecture capture and video streaming is now changing that.

7.2.3 Broadcasting and video

Figure 7.2.3 BBC television studio and radio transmitter, Alexandra Palace, London

The British Broadcasting Corporation (BBC) began broadcasting educational radio programs for schools in the 1920s. The first adult education radio broadcast from the BBC in 1924 was a talk on *Insects in Relation to Man*, and in the same year, J.C. Stobart, the new Director of Education at the BBC, mused about 'a broadcasting university' in the journal Radio Times (Robinson, 1982). Television was first used in education in the 1960s, for schools and for general adult education (one of the six purposes in the current BBC's Royal Charter is still 'promoting education and learning').

In 1969, the British government established the Open University (OU), which worked in partnership with the BBC to develop university programs open to all, using a combination originally of printed materials specially designed by OU staff, and television and radio programs made by the BBC but integrated with the courses. Although the radio programs involved mainly oral communication, the television programs did not use lectures as such, but focused more on the common formats of general television, such as documentaries, demonstration of processes, and cases/case studies (see Bates, 1984). In other words, the BBC focused on the unique 'affordances' of television, a topic that will be discussed in much more detail later. Over time, as new technologies such as audio- and video-cassettes were introduced, live broadcasting, especially radio, was cut back for OU programs, although there are still some general educational channels broadcasting around the world (e.g. TVOntario in Canada; PBS, the History Channel, and the Discovery Channel in the USA).

The use of television for education quickly spread around the world, being seen in the 1970s by some, particularly in international agencies such as the World Bank and UNESCO, as a panacea for education in developing countries, the hopes for which quickly faded when the realities of lack of electricity, cost, security of publicly available equipment, climate, resistance from local teachers, and local language and cultural issues became apparent (see, for instance, Jamison and Klees, 1973). Satellite broadcasting started to become available in the 1980s, and similar hopes were expressed of delivering 'university lectures from the world's leading universities to the world's starving masses', but these hopes too quickly faded for similar reasons. However, India, which had launched its own satellite, INSAT, in 1983, used it initially for delivering locally produced educational television programs throughout the country, in several indigenous languages, using Indian-designed receivers and television sets in local community centres as well as schools (Bates, 1984).

In the 1990s the cost of creating and distributing video dropped dramatically due to digital compression and high-speed Internet access. This reduction in the costs of recording and distributing video also led to the development of lecture capture systems. The technology allows students to view or review lectures at any time and place with an Internet connection. The Massachusetts Institute of Technology (MIT) started making its recorded lectures available to the public, free of charge, via its OpenCourseWare project, in 2002. YouTube started in 2005 and was bought by Google in 2006. YouTube is increasingly being used for short educational clips that can be downloaded and integrated into online courses. The Khan Academy started using YouTube in 2006 for recorded voice-over lectures using a digital blackboard for equations and illustrations. Apple Inc. in 2007 created iTunesU to became a portal or a site where videos and other digital materials on university teaching could be collected and downloaded free of charge by end users.

Until lecture capture arrived, learning management systems had integrated basic educational design features, but this required instructors to redesign their classroom-based teaching to fit the LMS environment. Lecture capture on the other hand required no changes to the standard lecture model, and in a sense reverted back to primarily oral communication supported by Powerpoint or even writing on a chalkboard. Thus oral communication remains as strong today in education as ever, but has been incorporated into or accommodated by new technologies.

7.2.4 Computer technologies

7.2.4.1 Computer-based learning

In essence the development of programmed learning aims to computerize teaching, by structuring information, testing learners' knowledge, and providing immediate feedback to learners, without human intervention other than in the design of the hardware and software and the selection and loading of content and assessment questions. B.F. Skinner started experimenting with teaching machines that made use of programmed learning in 1954, based on the theory of behaviourism (see Chapter 2, Section 3). Skinner's teaching machines were one of the first forms of computer-based learning. There has been a recent revival of programmed learning approaches as a result of MOOCs, since machine based testing scales much more easily than human-based assessment.

PLATO was a generalized computer assisted instruction system originally developed at the University of Illinois, and, by the late 1970s, comprised several thousand terminals worldwide on nearly a dozen different networked mainframe computers. PLATO was a highly successful system, lasting almost 40 years, and incorporated key on-line concepts: forums, message boards, online testing, e-mail, chat rooms, instant messaging, remote screen sharing, and multi-player games.

Attempts to replicate the teaching process through artificial intelligence (AI) began in the mid-1980s, with a focus initially on teaching arithmetic. Despite large investments of research in AI for teaching over the last 30 years, the results generally have been disappointing. It has proved difficult for machines to cope with the extraordinary variety of ways in which students learn (or fail to learn.) Recent developments in cognitive science and neuroscience are being watched closely but at the time of writing the gap is still great between the basic science, and analysing or predicting specific learning behaviours from the science.

More recently we have seen the development of adaptive learning, which analyses learners' responses then re-directs them to the most appropriate content area, based on their performance. Learning analytics, which also collects data about learner activities and relates them to other data, such as student performance, is a related development. These developments will be discussed in further detail in Section 7.7.

7.2.4.2 Computer networking

Arpanet in the U.S.A was the first network to use the Internet protocol in 1982. In the late 1970s, Murray Turoff and Roxanne Hiltz at the New Jersey Institute of Technology were experimenting with blended learning, using NJIT's internal computer network. They combined classroom teaching with online discussion forums, and termed this 'computer-mediated communication' or CMC (Hiltz and Turoff, 1978). At the University of Guelph in Canada, an off-the-shelf software system called CoSy was developed in the 1980s that allowed for online threaded group discussion forums, a predecessor to today's forums contained in learning management systems. In 1988, the Open University in the United Kingdom offered a course, DT200, that as well as the OU's traditional media of printed texts, television programs and audio-cassettes, also included an online discussion component using CoSy. Since this course had 1,200 registered students, it was one of the earliest 'mass' open online courses. We see then the emerging division between the use of computers for automated or programmed learning, and the use of computer networks to enable students and instructors to communicate with each other.

The Word Wide Web was formally launched in 1991. The World Wide Web is basically an application running on the Internet that enables 'end-users' to create and link documents, videos or other digital media, without the need for the end-user to transcribe everything into some form of computer code. The first web browser, Mosaic, was made available in 1993. Before the Web, it required lengthy and time-consuming methods to load text, and to find material on the Internet. Several Internet search engines have been developed since 1993, with Google, created in 1999, emerging as one of the primary search engines.

7.2.4.3 Online learning environments

In 1995, the Web enabled the development of the first learning management systems (LMSs), such as WebCT (which later became Blackboard). LMSs provide an online teaching environment, where content can be loaded and organized, as well as providing 'spaces' for learning objectives, student activities, assignment questions, and discussion forums. The first fully online courses (for credit) started to appear in 1995, some using LMSs, others just loading text as PDFs or slides. The materials were mainly text and graphics. LMSs became the main means by which online learning was offered until lecture capture systems arrived around 2008.

By 2008, George Siemens, Stephen Downes and Dave Cormier in Canada were using web technology to create the first 'connectivist' Massive Open Online Course (MOOC), a community of practice that linked webinar presentations and/or blog posts by experts to participants' blogs and tweets, with just over 2,000 enrollments. The courses were open to anyone and had no formal assessment. In 2012, two Stanford University professors launched a lecture-capture based MOOC on artificial intelligence, attracting more than 100,000 students, and since then MOOCs have expanded rapidly around the world.

7.2.5 Social media

Social media are really a sub-category of computer technology, but their development deserves a section of its own in the history of educational technology. Social media cover a wide range of different technologies, including blogs, wikis, You Tube videos, mobile devices such as phones and tablets, Twitter, Skype and Facebook. Andreas Kaplan and Michael Haenlein (2010) define social media as

> *a group of Internet-based applications that …allow the creation and exchange of user-generated content, based on interactions among people in which they create, share or exchange information and ideas in virtual communities and networks.*

Social media are strongly associated with young people and 'millenials' – in other words, many of the students in post-secondary education. At the time of writing social media are only just being integrated into formal education, and to date their main educational value has been in non-formal education, such as fostering online communities of practice, or around the edges of classroom teaching, such as 'tweets' during lectures or rating of instructors. It will be argued though in Chapters 8, 9 and 10 that they have much greater potential for learning.

7.2.6 A paradigm shift

It can be seen that education has adopted and adapted technology over a long period of time. There are some useful lessons to be learned from past developments in the use of technology for education, in particular that many claims made for a newly emerging technology are likely to be neither true nor new. Also new technology rarely completely replaces an older technology. Usually the old technology remains, operating within a more specialised 'niche', such as radio, or integrated as part of a richer technology environment, such as video in the Internet.

However, what distinguishes the digital age from all previous ages is the rapid pace of technology development and our immersion in technology-based activities in our daily lives. Thus it is fair to describe the impact of the Internet on education as a paradigm shift, at least in terms of educational technology. We are still in the process of absorbing and applying the implications. The next section attempts to pin down more closely the educational significance of different media and technologies.

Activity 7.2 What does history tell us?

1. What constitutes an educational technology? How would you classify a recorded lecture from MIT that is accessed as an open educational resource? When is a technology educational and not just a technology?

2. An early version of the Internet (Arpanet) existed long before 1990, but the combination of Internet protocols and the development of html and the World Wide Web were clearly a turning point in both telecommunications and education (at least for me). What then makes the Internet/the Web a paradigm shift? Or are they just an evolution, an orderly next step in the development of technology?

3. Is writing a technology? Is a lecture a technology? Does it matter to decide this?

4. The more sharp eyed or analytical of you may be asking questions about the categorization or definition of some of the technologies listed above (quite apart from the issue of how to deal with people as a means of communication). For instance computer-mediated communication (CMC) existed before the Internet (from 1978 in fact), but isn't it an Internet technology? (It is now, but wasn't then.) How do social media differ from CMC? Does it make sense to distinguish television technologies such as broadcast, cable, satellite, DVDs or video-conferencing, and is this relevant any more? If so, what distinguishes them and what do they have in common from an educational perspective?

These are some of the issues that will become clearer in the following sections.

References

Bates, A. (1984) *Broadcasting in Education: An Evaluation* London: Constables

Hiltz, R. and Turoff, M. (1978) *The Network Nation: Human Communication via Computer* Reading MA: Addison-Wesley

Jamison, D. and Klees, S. (1973) *The Cost of Instructional Radio and Television for Developing* Countries Stanford CA: Stanford University Institute for Communication Research

Kaplan, A. and Haenlein, M. (2010), Users of the world, unite! The challenges and opportunities of social media, *Business Horizons*, Vol. 53, No. 1, pp. 59-68

Manguel, A. (1996) *A History of Reading* London: Harper Collins

Robinson, J. (1982) *Broadcasting Over the Air* London: BBC (out of print)

Saettler, P. (1990) *The Evolution of American Educational Technology* Englewood CO: Libraries Unlimited

Selwood, D. (2014) What does the Rosetta Stone tell us about the Bible? Did Moses read hieroglyphs? *The Telegraph*, July 15

7.3 Media or technology?

Figure 7.3.1 A book: medium or technology?

7.3.1. Defining media and technology

Philosophers and scientists have argued about the nature of media and technologies over a very long period. The distinction is challenging because in everyday language use, we tend to use these two terms interchangeably. For instance, television is often referred to as both a medium and a technology. Is the Internet a medium or a technology? And does it matter?

I will argue that there are differences, and it does matter to distinguish between media and technology, especially if we are looking for guidelines on when and how to use them. There is a danger, particularly in education, in looking too much at the raw technology, and not enough at the personal, social and cultural contexts in which we use technology. The terms ‘media’ and ‘technology’ represent different ways altogether of thinking about the choice and use of technology in teaching and learning.

7.3.2 Technology

There are many definitions of technology (see Wikipedia for a good discussion of this). Essentially definitions of technology range from the basic notion of tools, to systems which employ or exploit technologies. Thus

- '*technology refers to tools and machines that may be used to solve real-world problems*' is a simple definition;
- '*the current state of humanity's knowledge of how to combine resources to produce desired products, to solve problems, fulfill needs, or satisfy wants*' is a more complex and grandiose definition (and has a smugness about it that I think is undeserved – technology often does the opposite of satisfy wants, for instance.).

In terms of educational technology we have to consider a broad definition of technology. The technology of the Internet involves more than just a collection of tools, but a system that combines computers, telecommunications, software and rules and procedures or protocols. However, I baulk at the very broad definition of the '*current state of humanity's knowledge*'. Once a definition begins to encompass many different aspects of life it becomes unwieldy and ambiguous.

I tend to think of technology in education as things or tools used to support teaching and learning. Thus computers, software programs such as a learning management system, or a transmission or communications network, are all technologies. A printed book is a technology. Technology often includes a combination of tools with particular technical links that enable them to work as a technology system, such as the telephone network or the Internet.

However, for me, technologies or even technological systems do not of themselves communicate or create meaning. They just sit there until commanded to do something or until they are activated or until a person starts to interact with the technology. At this point, we start to move into media.

Figure 7.3.2 Don't just sit there – DO something!
Image: © Alex Dawson, Flickr, 2006

7.3.3 Media

Media (plural of medium) is another word that has many definitions.

The word 'medium' comes from the Latin, meaning in the middle (a median) and also that which intermediates or interprets. Media require an active act of creation of content and/or communication, and someone who receives and understands the communication, as well as the technologies that carry the medium.

The term 'media' has two distinct meanings relevant for teaching and learning, both of which are different from definitions of technology

7.3.3.1 Media linked to senses and 'meaning'.

We use our senses, such as sound and sight, to interpret media. In this sense, we can consider text, graphics, audio and video as media 'channels', in that they intermediate ideas and images that convey meaning. Every interaction we have with media, in this sense, is an interpretation of reality, and again usually involves some form of human intervention, such as writing (for text), drawing or design for graphics, talking, scripting or recording for audio and video. Note that there are two types of intervention in media: by the 'creator' who constructs information, and by the 'receiver', who must also interpret it.

Media of course depend on technology, but technology is only one element of media. Thus we can think of the Internet as merely a technological system, or as a medium that contains unique formats and symbol systems that help convey meaning and knowledge. These formats, symbol systems and unique characteristics of a particular medium (e.g. the 280 character limit in Twitter) are deliberately created and need to be interpreted by both creators and end users. Furthermore, at least with the Internet, people can be at the same time both creators and interpreters of knowledge.

Computing can also be considered a medium in this context. I use the term computing, not computers, since although computing uses computers, computing involves some kind of intervention, construction and interpretation. Computing as a medium would include coding, animations, online social networking, using a search engine, or designing and using simulations. Thus Google uses a search engine as its primary technology, but I classify Google as a medium, since it needs content and content providers, and an end user who defines the parameters of the search, in addition to the technology of computer algorithms to assist the search. Thus the creation, communication and interpretation of meaning are added features that turn a technology into a medium.

In terms of representing knowledge it is useful to think of the following media for educational purposes within which there are sub-systems (only some examples given):

- **Text:** textbooks, novels, poems
- **Graphics:** diagrams, photographs, drawings, posters, graffiti
- **Audio:** sounds, speech, podcasts, radio programs
- **Video and film:** television programs, movies, YouTube clips, 'talking heads'
- **Computing:** animation, simulations, online discussion forums, virtual worlds**.**

Furthermore, within these sub-systems there are ways of influencing communication through the use of unique symbol systems, such as story lines and use of characters in novels, composition in photography, voice modulation to create effects in audio, cutting and editing in film and television, and the design of user interfaces or web pages in computing. The study of the relationship between these different symbol systems and the interpretation of meaning is a whole field of study in itself, called semiotics.

In education we could think of classroom teaching as a medium. Technology or tools are used (e.g. chalk and blackboards, or Powerpoint and a projector) but the key component is the intervention of the teacher and the interaction with the learners in real time and in a fixed time and place. We can also then think of online teaching as a different medium, with computers, the Internet (in the sense of the communication network) and a learning management system as core technologies, but it is the interaction between teachers, learners and online resources within the unique context of the Internet that are the essential component of online learning.

From an educational perspective, it is important to understand that media are not neutral or 'objective' in how they convey knowledge. They can be designed or used in such a way as to influence (for good or bad) the interpretation of meaning and hence our understanding. Some knowledge therefore of how media work is essential for teaching in a digital age. In particular we need to know how best to design and apply media (rather than technology) to facilitate learning.

Over time, media have become more complex, with newer media (e.g. television) incorporating some of the components of earlier media (e.g. audio) as well as adding another medium (video). Digital media and the Internet increasingly are incorporating and integrating all previous media, such as text, audio, and video, and adding new media components, such as animation, simulation, and interactivity. When digital media incorporate many of these components they become 'rich media'. Thus one major advantage of the Internet is that it encompasses all the representational media of text, graphics, audio, video and computing.

7.3.3.2 Media as organisations

The second meaning of media is broader and refers to the industries or significant areas of human activity that are organized around particular technologies, for instance film and movies, television, publishing, and the Internet. Within these different media are particular ways of representing, organizing and communicating knowledge.

Thus for instance within television there are different formats, such as news, documentaries, game shows, action programs, while in publishing there are novels, newspapers, comics, biographies, and so on. Sometimes the formats overlap but even then there are symbol systems within a medium that distinguish it from other media. For instance in movies there are cuts, fades, close-ups, and other techniques that are markedly different from those in other media. All these features of media bring with them their own conventions and assist or change the way meaning is extracted or interpreted.

Lastly, there is a strong cultural context to media organisations. For instance, Schramm (1972) found that broadcasters often have a different set of professional criteria and ways of assessing ‘quality’ in an educational broadcast from those of educators (which made my job of evaluating the programs the BBC made for the Open University very interesting). Today, this professional ‘divide’ can be seen between the differences between computer scientists and educators in terms of values and beliefs with regard to the use of technology for teaching. At its crudest, it comes down to issues of control: who is in charge of using technology for teaching? Who makes the decisions about the design of a MOOC or the use of an animation?

7.3.4 The affordances of media

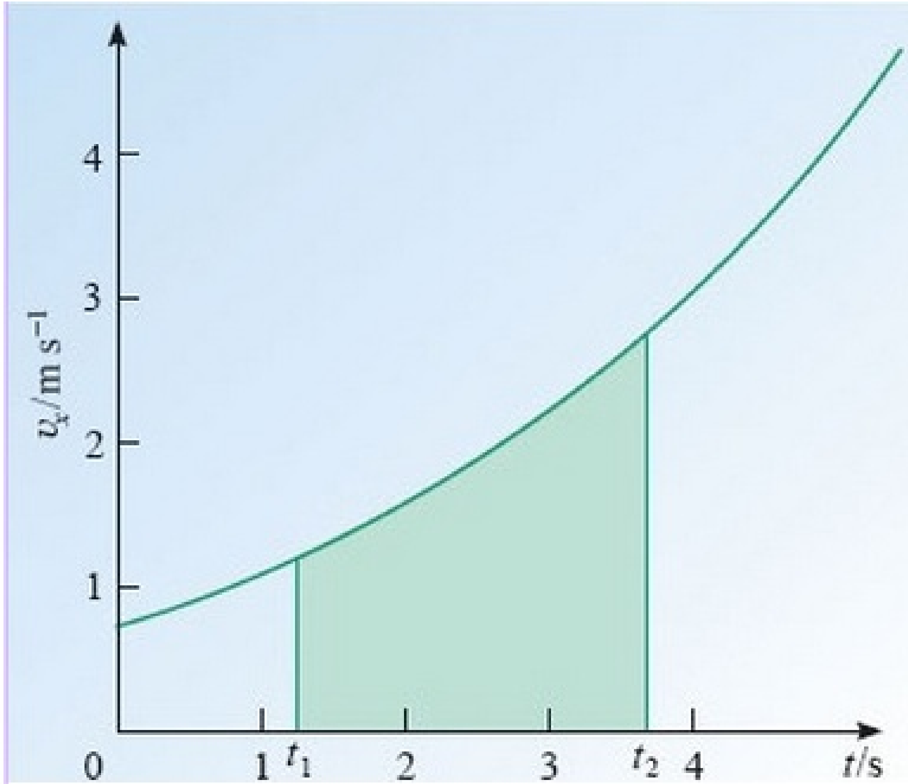


Figure 7.3.3 Graphs can represent, in a different way, the same concepts as written descriptions or formulae. Understanding the same thing in different ways generally leads to deeper understanding.
Image: © Open University 2013

Different media have different educational effects or affordances. If you just transfer the same teaching to a different medium, you fail to exploit the unique characteristics of that medium. Put more positively, you can do different and often better teaching by adapting it to the medium. That way students will learn more deeply and effectively. To illustrate this, let's look at an example from early on in my career as a researcher in educational media.

7.3.4.1 A personal story

In 1969, I was appointed as a research officer at the Open University in the United Kingdom. At this point the university had just received its royal charter. I was the 20th member of staff appointed. My job was to research into the pilot programs being offered by the National Extension College, which was delivering low cost non-credit distance education programs in partnership with the BBC. The NEC was 'modelling' the kind of integrated multimedia courses, consisting of a mix of print and broadcast radio and TV, that were to be offered by the Open University when it started.

My colleague and I sent out questionnaires by mail on a weekly basis to students taking the NEC courses. The questionnaire contained both pre-coded responses, and the opportunity for open-ended comments, and asked students for their responses to the print and broadcast components of the courses. We were looking for what worked and what didn't work in designing multimedia distance education courses.

When I started analyzing the questionnaires, I was struck particularly by the 'open-ended' comments in response to the television and radio broadcasts. Responses to the printed components tended to be 'cool': rational, calm, critical, constructive. The responses to the broadcasts were the opposite: 'hot', emotional, strongly supportive or strongly critical or even hostile, and rarely critically constructive. Something was going on here.

7.3.4.2 Findings from the research: how media differ

The initial discovery that different media affected students differently came very quickly, but it took longer to discover in what ways media are different, and even longer why, but here are some of the discoveries made by my colleagues and me in the Audio-Visual Media Research Group at the OU (Bates, 1984):

- the BBC producers (all of whom had a degree in the subject area in which they were making programs) thought about knowledge differently from the academics with whom they were working. In particular, they tended to think more visually and more concretely about the subject matter. Thus they tended to make programs that showed concrete examples of concepts or principles in the texts, applications of principles, or how academic concepts worked in real life. Academic learning is about abstraction and higher order levels of thinking. However, abstract concepts are better understood if they can be related to concrete or empirical experiences, from which, indeed, abstract concepts are often drawn. The television programs enabled learners to move backwards and forwards between the abstract and the concrete. Where this was well designed, it really helped a large number of students – but not all;

- students responded very differently to the TV programs in particular. Some loved them, some hated them, and few were indifferent. The ones that hated them wanted the programs to be didactic and repeat or reinforce what was in the printed texts. Interestingly though the TV-haters tended to get lower grades or even fail in the final course exam. The ones that loved the TV programs tended to get higher grades. They were able to see how the programs illustrated the principles in the texts, and the programs 'stretched' these students to think more widely or critically about the topics in the course. The exception was math, where borderline students found the TV programs most helpful;

- the BBC producers rarely used talking heads or TV lectures. With radio and later audio-cassettes, some producers and academics integrated the audio with texts, for instance in mathematics, using a radio program and later audio-cassettes to talk the students through equations or formulae in the printed text (similar to Khan Academy lectures today on video);

- using television and radio to develop higher level learning is a skill that can be taught. In the initial foundation (first year) social science course (D100), many of the programs were made in a typical BBC documentary style. Although the programs were accompanied by extensive broadcast notes that attempted to link the broadcasts to the academic texts, many students struggled with these programs. When the course was remade five years later a distinguished academic (Stuart Hall) was used as an 'anchor' for all the programs. The first few programs were somewhat like lectures, but in each program Stuart Hall introduced more and more visual clips and helped students analyze each clip. By the end of the course the programs were almost entirely in the documentary format. Students rated the remade programs much higher and used examples from the TV programs much more in their assignments and exams for the remade course.

7.3.4.3 Why are these findings significant?

At the time (and for many years afterwards) researchers such as Richard Clark (1983) argued that 'proper', scientific research showed no significant difference between the use of different media. In particular, there were no differences between classroom teaching and other media such as television or radio or satellite. Even today, we are getting similar findings regarding online learning (e.g. Means et al., 2010).

However, this is because the research methodology that is used by researchers for such comparative studies requires the two conditions being compared to be the same, except for the medium being used (called matched comparisons, or sometimes quasi-experimental studies). Typically, for the comparison to be scientifically rigorous, if you gave lectures in class, then you had to compare lectures on television. If you used another television format, such as a documentary, you were not comparing like with like. Since the classroom was used as the base, for comparison, you had to strip out all the affordances of television – what it could do better than a lecture – in order to compare it. Indeed Clark argued that when differences in learning were found between the two conditions, the differences were a result of using a different pedagogy in the non-classroom medium.

The critical point is that different media can be used to assist learners to learn in different ways and achieve different outcomes. In one sense, researchers such as Clark were right: the teaching methods matter, but different media can more easily support different ways of learning than others. In our example, a documentary TV program aims at developing the skills of analysis and the application or recognition of theoretical constructs, whereas a classroom lecture is more focused on getting students to understand and correctly recall the theoretical constructs. Thus requiring the television program to be judged by the same assessment methods as for the classroom lecture unfairly measures the potential value of the TV program. In this example, it may be better to use both methods: didactic teaching to teach understanding, then a documentary approach to apply that understanding. (Note that a television program could do both, but the classroom lecture could not.)

Perhaps even more important is the idea that many media are better than one. This allows learners with different preferences for learning to be accommodated, and to allow subject matter to be taught in different ways through different media, thus leading to deeper understanding or a wider range of skills in using content. On the other hand, this increases costs.

7.3.5 How do these findings apply to digital learning?

Digital learning can incorporate a range of different media: text, graphics, audio, video, animation, simulations. We need to understand better the affordances of each medium within the Internet, and use them differently but in an integrated way so as to develop deeper knowledge, and a wider range of learning outcomes and skills. The use of different media also allows for more individualization and personalization of the learning, better suiting learners with different learning styles and needs. Most of all, we should stop trying merely to move classroom teaching to other media such as MOOCs, and start designing digital learning so its full potential can be exploited.

7.3.6 Implications for education

If we are interested in selecting appropriate technologies for teaching and learning, we should not just look at the technical features of a technology, nor even the wider technology system in which it is located, nor even the educational beliefs we bring as a classroom teacher. We also need to examine the unique features of different media, in terms of their formats, symbols systems, and cultural values. These unique features are increasingly referred to as the affordances of media or technology.

The concept of media is much ‘softer’ and ‘richer’ than that of ‘technology’, more open to interpretation and harder to define, but ‘media’ is a useful concept, in that it can also incorporate the inclusion of face-to-face communication as a medium. Another reason to distinguish between media and technology is to recognise that technology on its own does not of itself lead to the transfer of meaning .

As new technologies are developed, and are incorporated into media systems, old formats and approaches are carried over from older to newer media. Education is no exception. New technology is ‘accommodated’ to old formats, as with clickers and lecture capture, or we try to create the classroom in virtual space, as with learning management systems. However, new formats, symbols systems and organizational structures that exploit the unique characteristics of the Internet as a medium are gradually being discovered. It is sometimes difficult to see these unique characteristics clearly at this point in time. However, e-portfolios, mobile learning, open educational resources such as animations or simulations, and self-managed learning in large, online social groups are all examples of ways in which we are gradually developing the unique ‘affordances’ of the Internet.

More significantly, it is likely to be a major mistake to use computers to replace or substitute for humans in the educational process, given the need to create and interpret meaning when using media, at least until computers have much greater facility to recognize, understand and apply semantics, value systems, and organizational features, which are all important components of ‘reading’ different media. But at the same time it is equally a mistake to rely only on the symbol systems, cultural values and organizational structures of classroom teaching as the means of judging the effectiveness or appropriateness of the Internet as an educational medium.

Thus we need a much better understanding of the strengths and limitations of different media for teaching purposes if we are successfully to select the right medium for the job. However, given the widely different contextual factors influencing learning, the task of media and technology selection becomes infinitely complex. This is why it has proved impossible to develop simple algorithms or decision trees for effective decision making in this area. Nevertheless, there are some guidelines that can be used for identifying the best use of different media within an Internet-dependent society. To develop such guidelines we need to explore in particular the unique educational affordances of text, audio, video and computing, which is the next task of this chapter.

Activity 6.3 Media or technology?

1. Do you find the distinction between media and technology helpful? If so, how would you classify the following (medium or technology):

- newspaper
- printing press
- television program

- Netflix
- classroom
- MOOC
- discussion forum

2. Do you think that knowledge becomes something different when represented by different media? For instance, does an animation of a mathematical function represent something different from a written or printed equation of the same function? Which is the most 'mathematical': the formula or the animation?

3. What in your view makes the Internet unique from a teaching perspective, or is it just old wine in new bottles?

4. Text has publishers and newspaper corporations, audio has radio stations, and video has both television companies and YouTube. Is there a comparable organization for the Internet or is it not really a medium in the sense of publishing, radio or television?

For feedback on this activity, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=178

More reading

Bates, A. (1984) *Broadcasting in Education: An Evaluation* London: Constables

Bates, A. (2012) Pedagogical roles for video in online learning, Online Learning and Distance Education Resources

Clark, R. (1983) 'Reconsidering research on learning from media' *Review of Educational Research*, Vol. 53, pp. 445-459

Kozma, R. (1994) 'Will Media Influence Learning? Reframing the Debate', *Educational Technology Research and Development*, Vol. 42, No. 2, pp. 7-19

Means, B. et al. (2009) *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies* Washington, DC: US Department of Education (http://www.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf)

Russell, T. L. (1999) *The No Significant Difference Phenomenon* Raleigh, NC: North Carolina State University, Office of Instructional Telecommunication

Schramm, W. (1972) *Quality in Instructional Television* Honolulu HA: University Press of Hawaii

If you want to go deeper into the definitions of and differences between media and technology, you might want to read any of the following:

Bates, A. (2011) Marshall McLuhan and his relevance to teaching with technology, *Online learning and distance education resources*, July 20 (for a list of McLuhan references as well as a discussion of his relevance)

Guhlin, M. (2011) Education Experiment Ends, *Around the Corner – MGuhlin.org*, September 22

LinkedIn: Media and Learning Discussion Group
Salomon, G. (1979) *Interaction of Media, Cognition and Learning* San Francisco: Jossey Bass

7.4 Assessing media affordances: the SAMR model

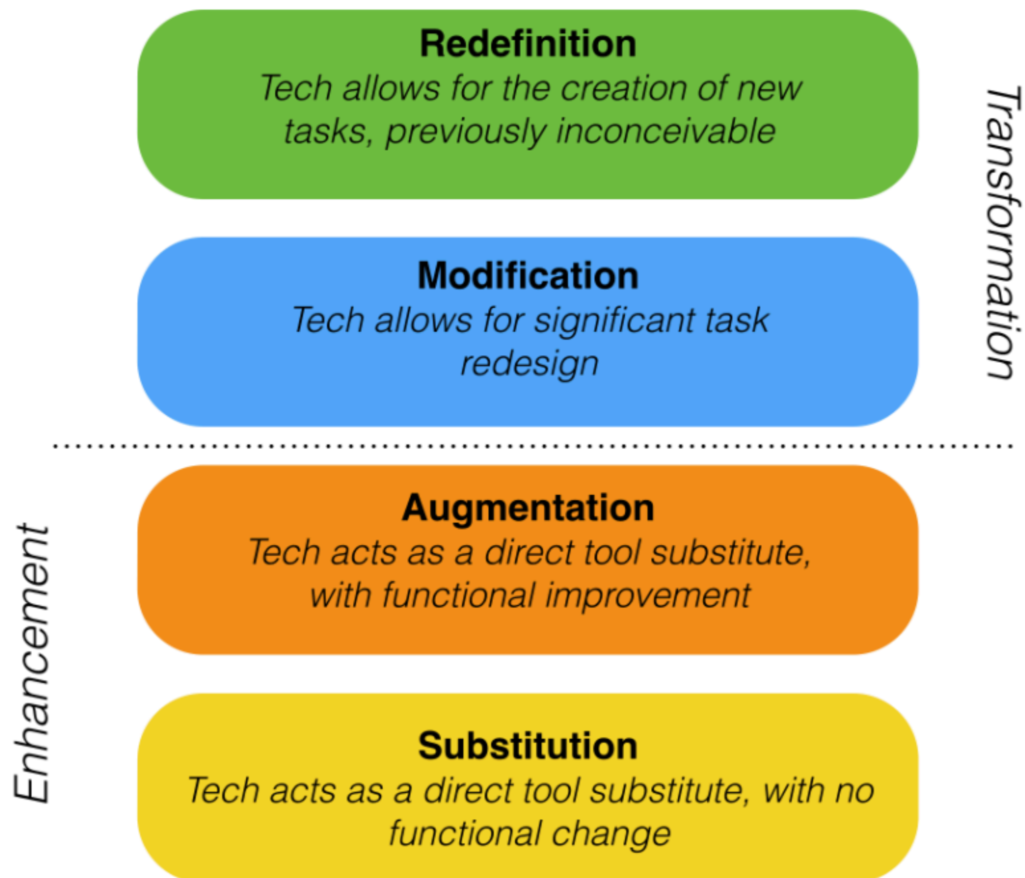


Figure 7.4 The SAMR model Image: Ruben Puentedura

7.4.1 Exploiting the affordances of a medium

It was noted in the previous section that video technology can be used as a straight replacement for a face-to-face lecture by merely substituting the face-to-face delivery with online delivery. The mode of delivery has changed but not the pedagogy. The full affordances of the medium of video have not been exploited.

On the other hand, using video to show a documentary can bring powerful examples of situations to which can be applied the ideas and concepts covered in an academic course. A documentary thus has the potential to make better use of the affordances of video than recording a lecture because the learning experience from watching a documentary is different from watching a lecture; at the same time, using a documentary video will require a different approach to teaching than using a lecture and will probably have different outcomes. With the video lecture students will focus on comprehension and understanding; with the documentary the students' focus will be on analysing and critiquing the material.

7.4.2 The SAMR model

A good way to assess whether a particular application of media or technology is making full use of the affordances of a medium is to apply the SAMR model developed by Dr. Ruben Puentedura, a technology consultant based in the USA.

Puentedura suggests four 'levels' of technology application in education:

- **substitution**: *a direct tool substitute, with no functional change*, for example, a video recording of a classroom lecture on water quality, made available for downloading by students; students are assessed on the content of the lecture by written exams at the end of the course.
- **augmentation**: *a direct tool substitute, with functional improvement*, for example, the video lecture is embedded in an LMS, and edited into four sections, with online multiple-choice questions at the end of each section for students to answer.
- **modification**: *significant task redesign*, for example, the instructor provides video recordings of water being tested, and asks students to analyse each of the recordings in terms of the principles taught in the course in the form of essay-type questions that are assessed.
- **redefinition**: *creation of new tasks, inconceivable without the use of technology*, for example, the instructor provides readings and online guidance through the LMS, and students are asked to record with their mobile phones how they selected samples of water for testing quality, and integrate their findings and analysis in the form of an e-portfolio of their work.

In the first two levels, substitution and augmentation, video is used to enhance the method of teaching but it is only where video is used in the final two stages, modification and redefinition, that teaching is actually transformed. Significantly, Puentedura links the modification and transformation levels to the development of Bloom's higher order '21st century' skills such as analysis, evaluation and creativity (Puentedura, 2014). For a more detailed description of the model and how it works, see the video: Introduction to the SAMR model.

7.4.3 Strengths and limitations of the model

First, I was unable to find any research that validated this model. It has a powerful feel of common sense behind it, but it would be good to see it more empirically validated, although there are many examples of its actual use, particularly in teacher education in the k-12 sector (you can find some examples collected by Kelly Walsh here. For a more critical response to the SAMR model, see Linderoth, 2013).

Second, while the model is a useful means of evaluating whether a use of technology merely enhances or radically changes teaching, it doesn't help much with the hard part, and that is imagining the transformative ways in which a technology could be used in the first place. Nevertheless it is a good heuristic device to get you to think about the best way to use technology in teaching.

Third, there will be situations where substitution and augmentation will still be a perfectly justifiable use of technology, for instance for students with disabilities, or to increase accessibility to learning materials.

On balance, it is a very useful model by which an instructor can evaluate a potential or actual use of technology. In particular it focuses on the way students will need to interact with the technology and the ways technology can be used to assist the development of 21st century skills. At the same time, we still need to understand how and why media and technology could be used to transform teaching in the first place. The first step then is to understand better the unique properties of different technologies, which is the subject of the next section.

References

Linderoth, J. (2013) Open letter to Dr. Ruben Puentedura *Spelvetenskapliga betraktelser*, 17 October

Puentedura, R. (2014) SAMR and Bloom's Taxonomy: Assembling the Puzzle *common sense education*, September 24

Activity 7.4: Assessing the SAMR model

1. If you are using any technology in your teaching, where does it fit in the SAMR framework in comparison with in-person teacher-student interaction? What could you change to make the technology 'move up the ladder'?
2. Do you *have to* exploit fully the affordances of a medium? If so, why?

For feedback on this activity, click on the podcast below

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=1237

7.5 Broadcast vs communicative media

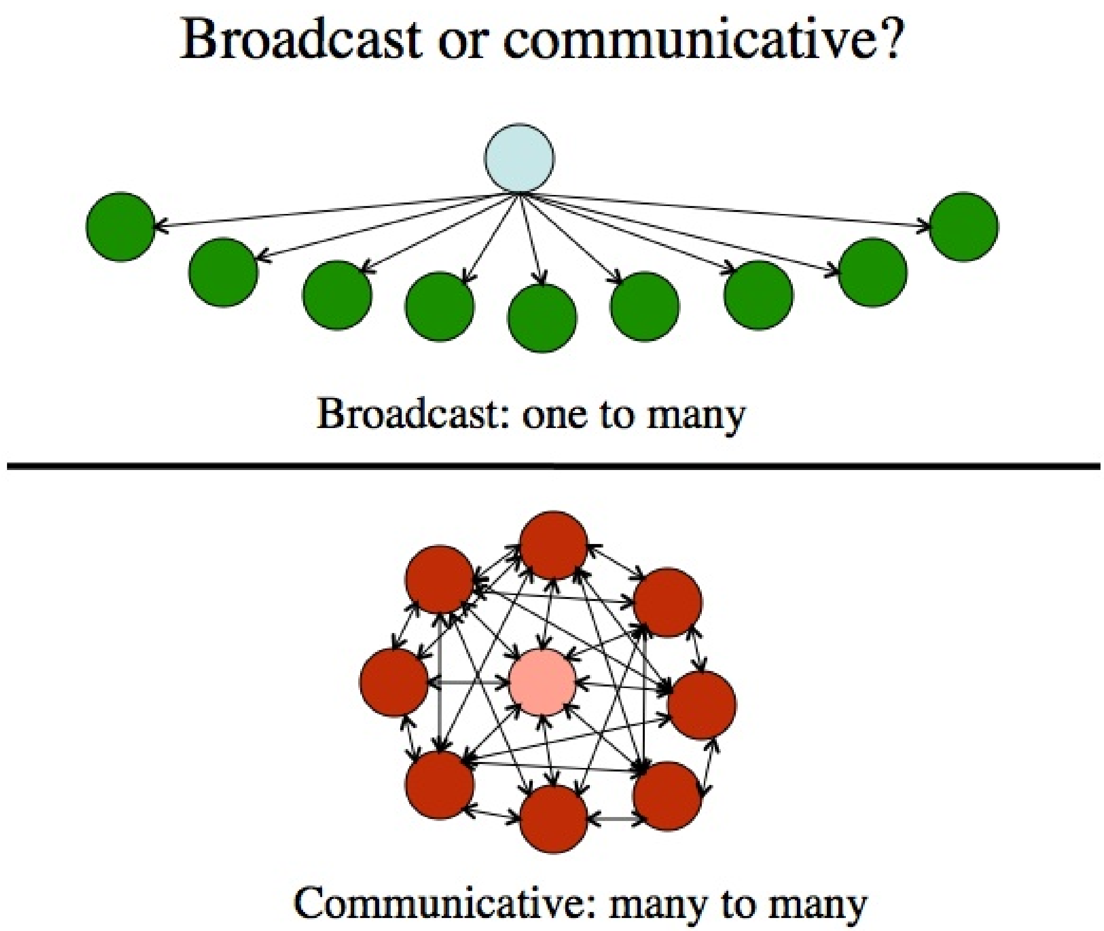


Figure 7.5 The teacher is the lighter-coloured symbol

7.5.1 Key media characteristics

It will help clarify the possible benefits or weaknesses for education of each medium if we understand the characteristics or affordances of each medium. To do this we need to identify where media have common or different features.

There is a wide range of media characteristics or affordances that we could look at, but I will focus on three that are particularly important for education:

- whether media are broadcast (one-way) or communicative (two way);
- whether media are synchronous or asynchronous, including live (transient) or recorded (permanent);
- whether media are single or rich.

We shall see that these characteristics are more dimensional than discrete states, and different media will fit at different points on these dimensions, but the exact point on the continuum will depend to some extent on the way they are designed or used. In this section I will focus on the broadcast/communicative dimension. The other two characteristics will be discussed in subsequent sections

7.5.2 Broadcast or communicative media

A major structural distinction is between 'broadcast' media that are primarily *one-to-many and one-way*, and those media that are primarily *many-to-many* or 'communicative', allowing for two-way or multiple communication connections. Communicative media include those that give equal 'power' of communication between multiple end users.

7.5.2.1 Broadcast media

Television, radio and print for example are primarily broadcast or one-way media, as end users or 'recipients' cannot change the 'message' (although they may interpret it differently or choose to ignore it). Note that it does not matter really what delivery technology (terrestrial broadcast, satellite, cable, DVD, Internet) is used for television, it remains a 'broadcast' or one-way medium. Some Internet technologies are also primarily one way. For instance, an institutional web site is primarily a one-way technology.

One advantage of broadcast media and technologies is that they ensure a common standard of learning materials for all students. This is particularly important in countries where teachers are poorly qualified or of variable quality. Also one-way broadcast media enable the organization to control and manage the information that is being transmitted, ensuring quality control over content. Broadcasting media and technologies are more likely to be favoured by those with an 'objectivist' approach to teaching and learning, since the 'correct' knowledge can be transmitted to everyone receiving the instruction. One disadvantage is that additional resources are needed to provide interaction with teachers or between learners.

7.5.2.2 Communicative media

The telephone, video-conferencing, e-mail, online discussion forums, most social media and the Internet are examples of communicative media or technologies, in that all users can communicate and interact with each other, and in theory at least have equal power in technology terms. The educational significance of communicative media is that they allow for interaction between learners and teachers, and perhaps even more significantly, between a learner and other learners, without the participants needing to be present in the same place.

7.5.2.3 Which is which?

This dimension is not a rigid one, with necessarily clear or unambiguous classifications. Increasingly, technologies are becoming more complex, and able to serve a wide range of functions. In particular the Internet is not so much a single medium as an integrating framework for many different media and technologies with different and often opposite characteristics. Furthermore, most technologies are somewhat flexible in that they can be used in different ways. However, if we stretch a technology too far, for instance trying to make a broadcast medium such as an xMOOC also more communicative, stresses are likely to occur. So I find the dimension still useful, so long as we are not dogmatic about the characteristics of individual media or technologies. This means though looking at each case separately.

Thus I see a learning management system as primarily a broadcast or one-way technology, although it has features such as discussion forums that allow for some forms of multi-way communication. However, it could be argued that the communication functions in an LMS require additional technologies, such as a discussion forum, that just happen to be plugged in to or embedded within the LMS, which is primarily a database with a cool interface. We shall see that in practice we often have to combine technologies if we want the full range of functions required in education, and this adds cost and complexity.

Web sites can vary on where they are placed on this dimension, depending on their design. For instance, an airline web site, while under the full control of the company, has interactive features that allow you to find flights, book flights, reserve seats, and hence, while you may not be able to ‘communicate’ or change the site, you can at least interact with it and to some extent personalize it. However, you cannot change the page showing the choice of flights. This is why I prefer to talk about dimensions. An airline web site that allows end user interaction is less of a broadcast medium. However it is not a ‘pure’ communicative medium either. The power is not equal between the airline and the customer, because the airline controls the site.

It should be noted too that some social media (e.g. YouTube and blogs) are also more of a broadcast than a communicative medium, whereas other social media use mainly communicative technologies with some broadcast features (for example, personal information on a Facebook page). A wiki is clearly more of a ‘communicative’ medium. Again though it needs to be emphasized that intentional intervention by teachers, designers or users of a technology can influence where on the dimension some technologies will be, although there comes a point where the characteristic is so strong that it is difficult to change significantly without introducing other technologies.

The role of the teacher or instructor also tends to be very different when using broadcast or communicative media. In broadcast media, the role of the teacher is central, in that content is chosen and often delivered by the instructor. xMOOCs are an excellent example. However, in communicative media, while the instructor’s role may still be central, as in online collaborative learning or seminars, there are learning contexts where there may be no identified ‘central’ teacher, with contributions coming from all or many members of the community, as in communities of practice or cMOOCs.

Thus it can be seen that ‘power’ is an important aspect of this dimension. What ‘power’ does the end-user or student have in controlling a particular medium or technology? If we look at this from an historical perspective, we have seen a great expansion of technologies in recent years that give increasing power to the end user. The move towards more communicative media and away from broadcast media then has profound implications for education (as for society at large).

7.5.3 Applying the dimension to educational media

We can also apply this analysis to non-technological means of communication, or ‘media’, such as classroom teaching. Lectures have broadcast characteristics, whereas a small seminar group has communicative characteristics. In Figure 7.5.3, I have placed some common technologies, classroom media and online media along the broadcast/communicative continuum.

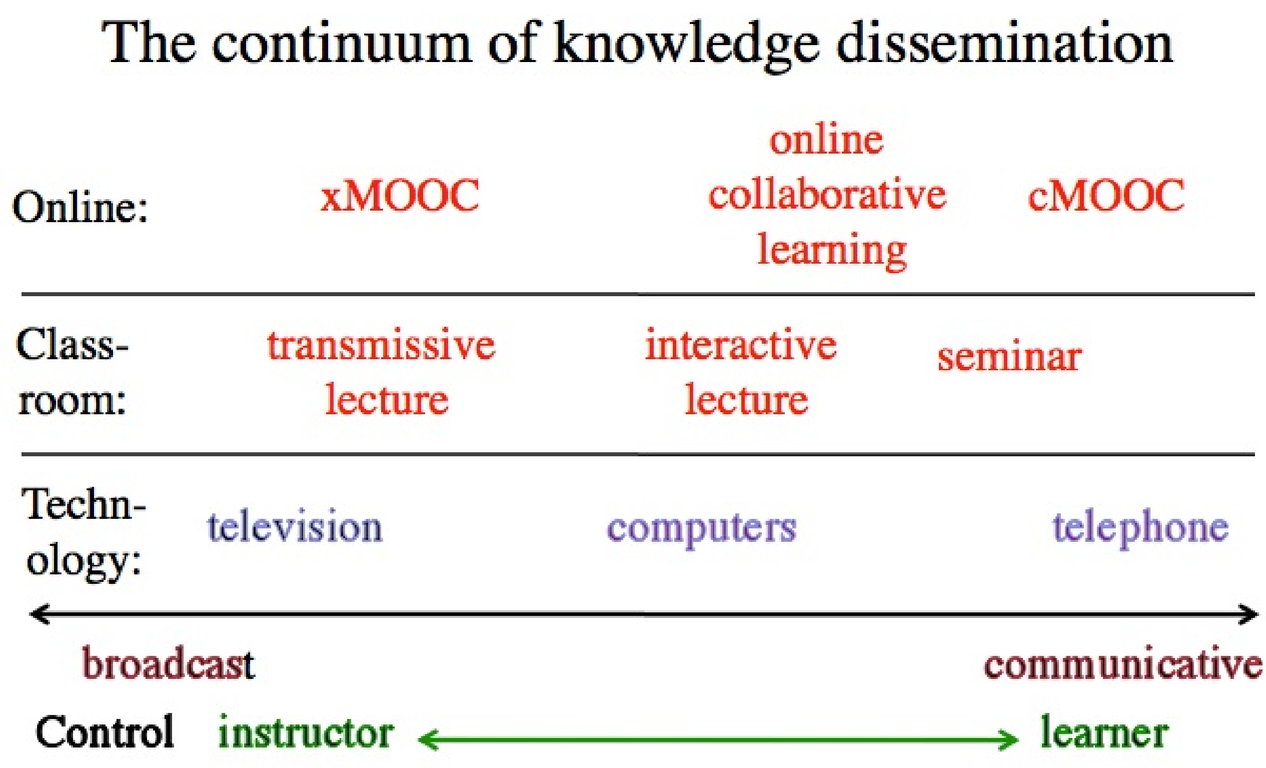


Figure 7.5.3 The continuum of knowledge dissemination

When doing this exercise, it is important to note that:

- there is no general normative or evaluative judgement about the continuum. Broadcasting is an excellent way of getting information in a consistent form to a large number of people; interactive communication works well when all members of a group have something equal to contribute to the process of knowledge development and dissemination. The judgement of the appropriateness of the medium or technology will very much depend on the context, and in particular the resources available and the general philosophy of teaching to be applied;
- where a particular medium or technology is placed on the continuum will depend to some extent on the actual design, use or application. For instance, if the lecturer talks for 45 minutes and allows 10 minutes for discussion, an interactive lecture might be further towards broadcasting than if the lecture session is more of a question and answer session;
- I have placed ‘computers’ in the middle of the continuum. They can be used as a broadcast

medium, such as for programmed learning, or they can be used to support communicative uses, such as online discussion. Their actual placement on the continuum therefore will depend on how we choose to use computers in education;

- the important decision from a teaching perspective is deciding on the desired balance between 'broadcasting' and 'discussion' or communication. That should then be one factor in driving decisions about the choice of appropriate technologies;
- the continuum is a heuristic device to enable a teacher to think about what medium or technology will be most appropriate within any given context, and not a firm analysis of where different types of educational media or technology belong on the continuum.

Thus where a medium or technology 'fits' best on a continuum of broadcast vs communicative is one factor to be considered when making decisions about media or technology for teaching and learning.

Activity 7.5 Broadcast or communicative?

From the list below:

- a blog
- online collaborative learning
- Twitter
- virtual worlds
- a podcast
- an open textbook

1. Determine which is a medium and which a technology, or which could be both, and under what conditions.

2. Decide where, from your experience, each medium or technology should be placed on Figure 7.5.3. Write down why.

3. Which were easy to categorize and which difficult?

4. How useful is this continuum in making decisions about which medium or technology to use in your teaching? What would help you to decide?

My analysis can be accessed by clicking here.

7.6 The time and space dimensions of media

Figure 7.6.1 Audio cassettes are a recorded, asynchronous technology

Different media and technologies operate differently over space and time. These dimensions are important for both facilitating or inhibiting learning, and for limiting or enabling more flexibility for learners. There are actually two closely related dimensions here:

- 'live' or recorded
- synchronous or asynchronous

7.6.1 Live or recorded

These are fairly obvious in their meaning. Live media by definition are face-to-face events, such as lectures, seminars, and one-on-one face-to-face tutorials. A 'live' event requires everyone to be present at the same place and time as everyone else. This could be a rock concert, a sports event or a lecture. Live events, such as for instance a seminar, work well when personal relations are important, such as building trust, or for challenging attitudes or positions that are emotionally or strongly held (either by students or instructors.) The main educational advantage of a live lecture is that it may have a strong emotive quality that inspires or encourages learners beyond the actual transmission of knowledge, or may provide an emotional 'charge' that may help students shift from previously held positions. Live events, by definition, are transient. They may be well remembered, but they cannot be repeated, or if they are, it will be a different experience or a different audience. Thus there is a strong qualitative or affective element about live events.

Recorded media on the other hand are permanently available to those possessing the recording, such as a video-cassette or an audio-cassette. Books and other print formats are also recorded media. The key educational significance of recorded media is that students can access the same learning material an unlimited number of times, and at times that are convenient for the learner.

Live events of course can also be recorded, but as anyone who has watched a live sports event compared to a recording of the same event knows, the experience is different, with usually a lesser emotional charge when watching a recording (especially if you already know the result). Thus one might think of 'live' events as 'hot' and recorded events as 'cool.' Recorded media can of course be emotionally moving, such as a good novel, but the experience is different from actually taking part in the events described.

7.6.2 Synchronous or asynchronous

Synchronous technologies require all those participating in the communication to participate together, at the same time, but not necessarily in the same place.

Thus live events are one example of synchronous media, but unlike live events, technology enables synchronous learning without everyone having to be in the same *place*, although everyone does have to participate in the event at the same *time*. A video-conference or a webinar are examples of synchronous technologies which may be broadcast 'live', but not with everyone in the same place. Other synchronous technologies are television or radio broadcasts. You have to be 'there' at the time of transmission, or you miss them. However, the 'there' may be somewhere different from where the teacher is.

Asynchronous technologies enable participants to access information or communicate at different points of time, usually at the time *and* place of choice of the participant. All recorded media are asynchronous. Books, DVDs, on-demand You Tube videos, lectures recorded through lecture capture and available for streaming on demand, and online discussion forums are all asynchronous media or technologies. Learners can log on or access these technologies at times and the place of their own choosing.

Figure 7.6.2 illustrates the main differences between media in terms of different combinations of time and place.

		Place		
		Same	**Different**	
Time	**Same**	*Live (face-to-face) media*: lectures, seminars, tutorial, labs, workshops	Webinars Video-conferencing Virtual worlds Remote labs	**Synchronous**
	Different	Self-managed labs/workshops/ studios Library/learning centres	*Recorded media*: books, cassettes, LMSs, online discussion forums, lecture capture/ streamed video, blogs, wikis	**Asynchronous**

Figure 7.6.2 The separation of teachers/instructors from learners by time and space

7.6.3 Why does this matter?

Overall there are huge educational benefits associated with asynchronous or recorded media, because the ability to access information or communicate at any time offers the learner more control and flexibility. The educational benefits have been confirmed in a number of studies. For instance, Means et al. (2010) found that students did better on blended learning because they spent more time on task, because the online materials were always available to the students.

Research at the Open University found that students much preferred to listen to radio broadcasts recorded on cassette than to the actual broadcast, even though the content and format was identical (Grundin, 1981; Bates at al., 1981). However, even greater benefits were found when the format of the audio was changed to take advantage of the control characteristics of cassettes (stop, replay). It was found that students learned more from 'designed' cassettes than from cassette recordings of broadcasts, especially when the cassettes were co-ordinated or integrated with visual material, such as text or graphics. This was particularly valuable, for instance, in talking students through mathematical formulae (Durbridge, 1983).

This research underlines the importance of changing design as one moves from synchronous to asynchronous technologies. Thus we can predict that although there are benefits in recording live lectures through lecture capture in terms of flexibility and access, or having readings available at any time or place, the learning benefits would be even greater if the lecture or text was redesigned for asynchronous use, with built-in activities such as tests and feedback, and points for students to stop the lecture and do some research or extra reading, then returning to the teaching.

The ability to access learning materials on demand (recorded lectures or webinars, learning management systems, web sites, social media) is particularly important for increasing access and flexibility for learners, especially those working as well as studying, for those with young families, or for students with long commutes. Thus there should be clearly justified pedagogical benefits that could not be provided by the use of technology if students must be present either in the same place or at the same time as an instructor. In particular, what are the social or pedagogical reasons why students should come to the school or campus or be present at a set time when so much teaching and learning can now be done asynchronously?

The ability to access media asynchronously through recorded and streamed materials is one of the biggest changes in the history of teaching, but the dominant paradigm in higher education is still the live lecture or seminar. There are, as we have seen, some advantages in live media, and direct inter-personal contact, but they need to be used more selectively to exploit their unique advantages or affordances.

7.6.4 The significance of the Internet

Broadcast/communicative and synchronous/asynchronous are two separate dimensions. By placing them in a matrix design, we can then assign different technologies to different quadrants, as in Figure 7.6.4 below. (I have included only a few – you may want to place other technologies on this diagram):

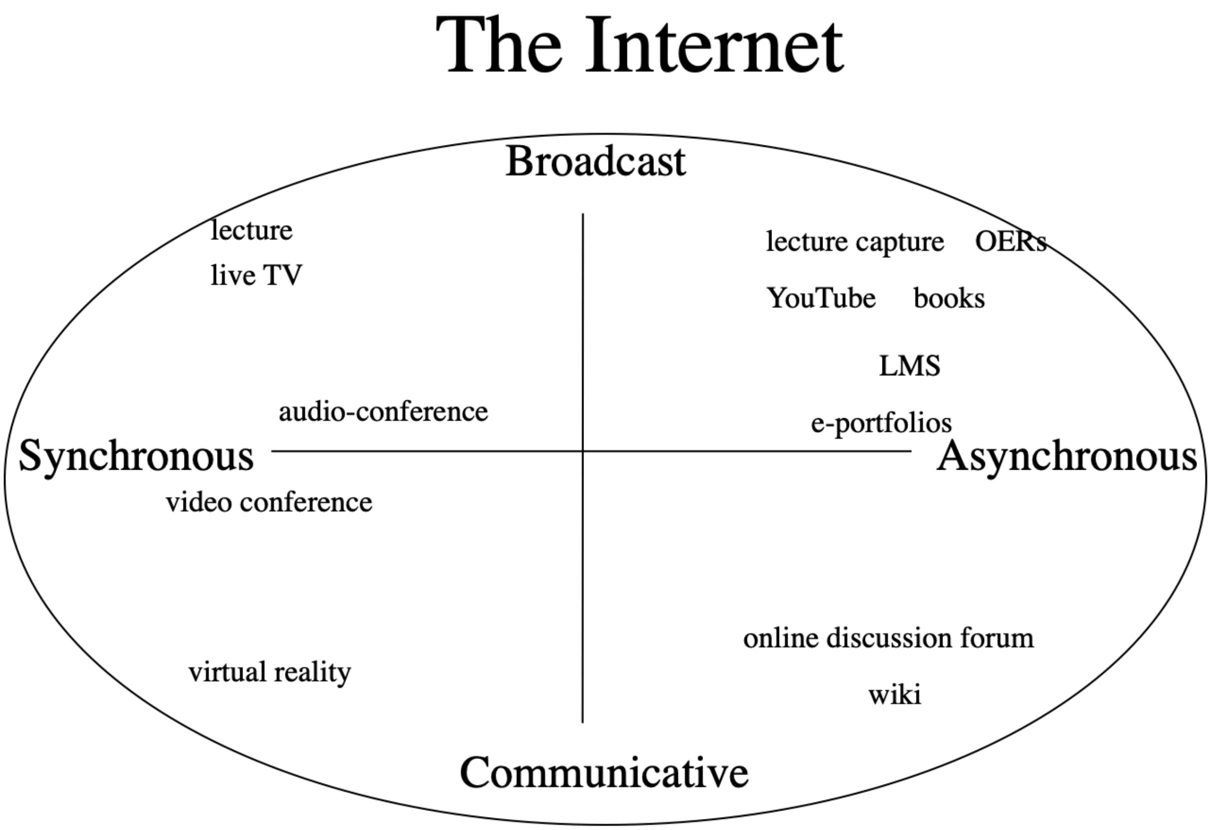


Figure 7.6.4 The significance of the Internet in terms of media characteristics

Why the Internet is so important is that it is an encompassing medium that embraces all these other media and technologies, thus offering immense possibilities for teaching and learning. This enables us, if we wish, to be very specific about how we design our teaching, so that we can exploit all the characteristics or dimensions of technology to fit almost any learning context through this one medium.

7.6.5 Conclusion

It should be noted at this stage that although I have identified some strengths and weaknesses of the four characteristics of broadcast/communicative, and synchronous/asynchronous media, we still need an evaluative framework for deciding when to use or combine different technologies. This means developing criteria that will enable us to decide within specific contexts the optimum choice of technologies.

References

Bates, A. (1981) 'Some unique educational characteristics of television and some implications for teaching or learning' *Journal of Educational Television* Vol. 7, No.3

Durbridge, N. (1983) *Design implications of audio and video cassettes* Milton Keynes: Open University Institute of Educational Technology (out of print)

Grundin, H. (1981) *Open University Broadcasting Times and their Impact on Students' Viewing/ Listening* Milton Keynes: The Open University Institute of Educational Technology (out of print)

Means, B. et al. (2009) *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies* Washington, DC: US Department of Education

Activity 7.6 Time and space dimensions of technology

1. Does this categorization of technologies make sense to you?

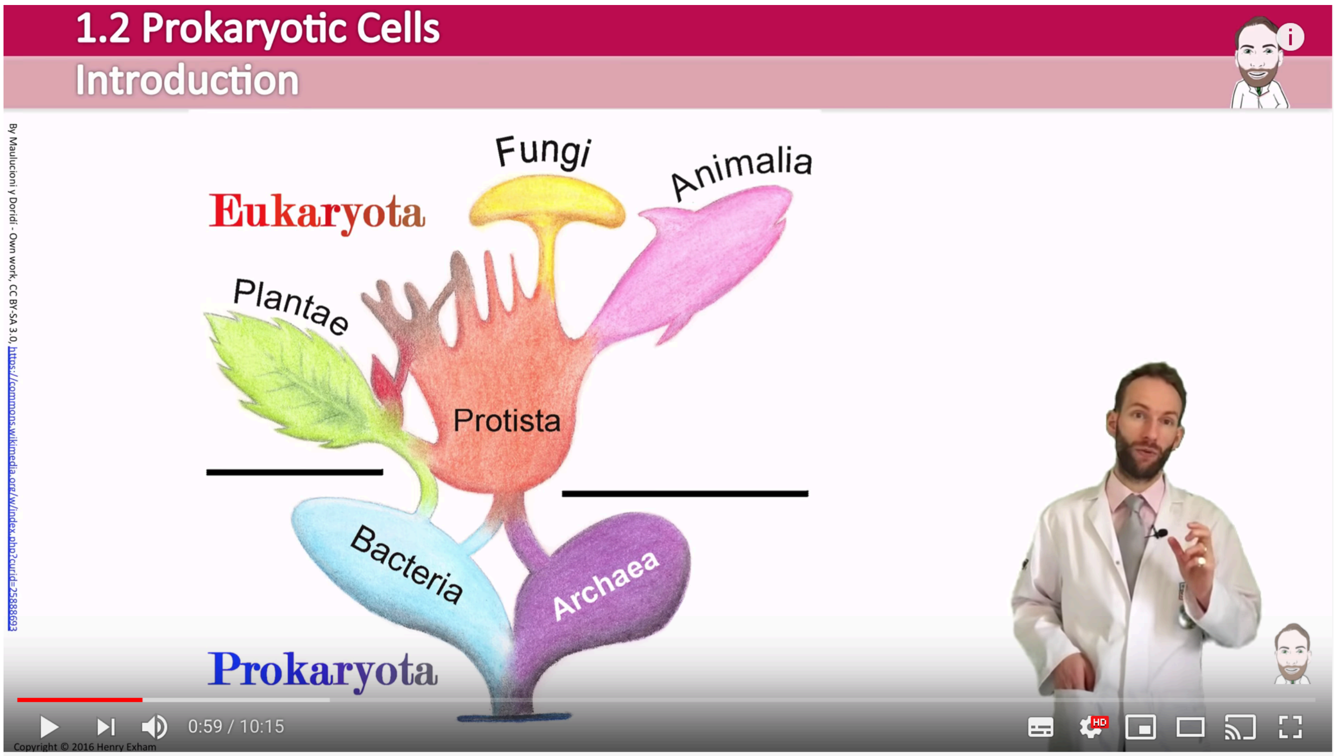
2. Can you easily place other media or technologies into Figures 7.6.2 and 7.6.4? What media or technologies don't fit? Why not?

3. Can you imagine a situation where a podcast might be a better choice for teaching and learning than virtual reality (assuming students have access to both technologies)? And can you imagine the opposite (of where virtual reality would be better than an audio-cassette)? What are the defining criteria or conditions?

For my comments on the last question, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=187

7.7 Media richness



Prokaryotic Cells - Introduction and Structure - Post 16 Biology (A Level, Pre-U, IB, AP Bio)

Figure 7.7.1 Making sense of biology: MrExham

7.7.1 The historical development of media richness

In Section 7.2, '[A short history of educational technology](#)', the development of different media in education was outlined, beginning with oral teaching and learning, moving on to written or textual communication, then to video, and finally computing. Each of these means of communication has usually been accompanied by an increase in the richness of the medium, in terms of how many senses and interpretative abilities are needed to process information.

Another way of defining the richness of media is by the symbol systems employed to communicate through the medium. Thus textual material from an early stage incorporated graphics and drawings as well as words. Television or video incorporates audio as well as still and moving images. Computing now can incorporate text, audio, video, animations, simulations, computing, and networking, all through the Internet.

7.7.2 The continuum of media richness

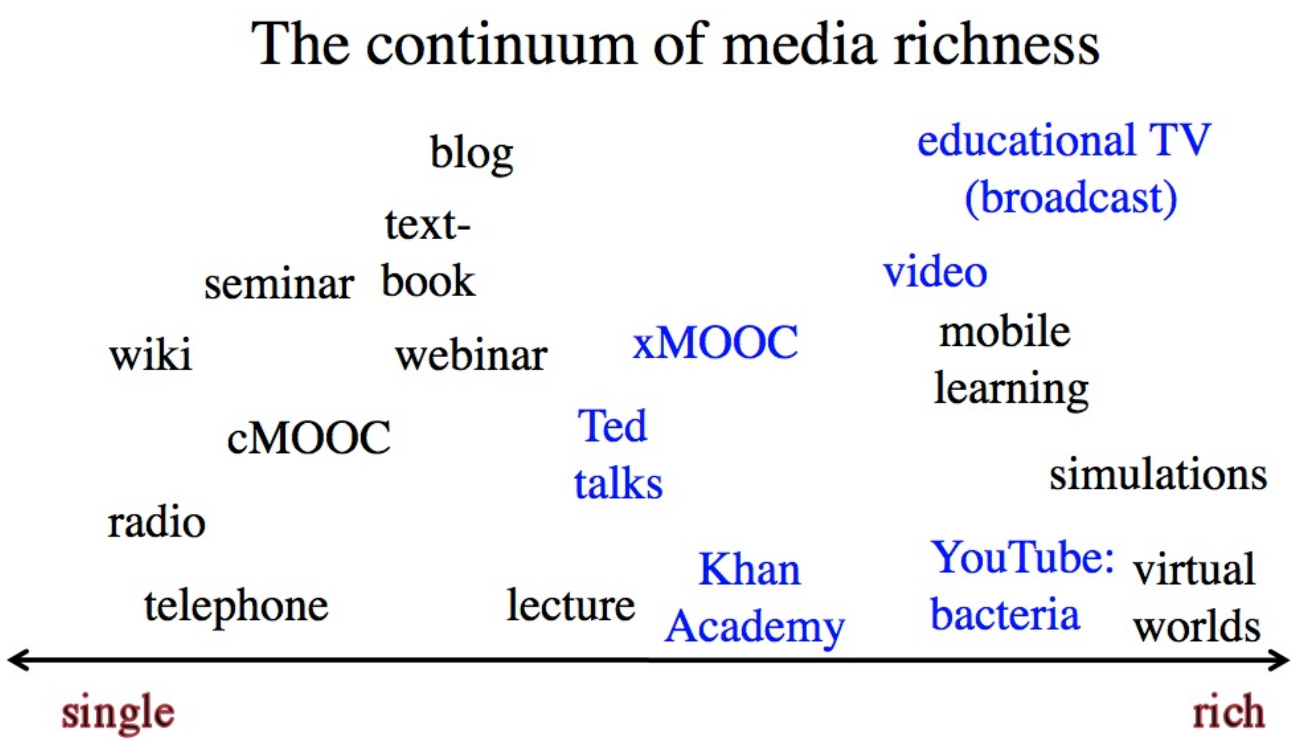


Figure 7.7.2 The continuum of media richness

Once again then there is a continuum in terms of media richness, as illustrated in Figure 7.7.2 above. Also once again, design of a particular medium can influence where on the continuum it would be placed. For instance in Figure 7.7.2, different forms of teaching using video are represented in blue. Ted Talks, a televised lecture, and often xMOOCs are usually mainly talking heads. The Khan Academy uses dynamic graphics as well as voice over commentary, and MrExham's YouTube video on prokaryotic cells uses colour graphics and animation as well as a 'talking head' commentary. Educational television broadcasts are likely to use an even wider range of video techniques.

However, although the richness of video can be increased or decreased by the way it is used, video is always going to be richer in media terms than radio or textbooks. Radio is never going to be a rich medium in terms of its symbols systems because it depends on a single medium, audio, and even talking head video is richer symbolically than radio.

There is no normative or evaluative judgment here. Radio can be 'rich' in the sense of fully exploiting the characteristics or symbol systems of the medium. A well produced radio program is more likely to be educationally effective than a badly produced video. But in terms of representation of knowledge, the possibilities of radio in terms of media richness will always be less than the possibilities of video.

7.7.3 The educational value of media richness

But how rich should media be for teaching and learning? From a teaching perspective, rich media have advantages over a single medium of communication, because rich media enable the teacher to do more. For example, many activities that previously required learners to be present at a particular time and place to observe processes or procedures such as demonstrating mathematical reasoning, experiments, medical procedures, or stripping a carburetor, can now be recorded and made available to learners to view at any time. Sometimes, phenomena that are too expensive or too difficult to show in a classroom can be shown through animation, simulations, video recordings or virtual reality.

Furthermore, each learner can get the same view as all the other learners, and can view the process many times until they have mastery. Good preparation before recording can ensure that the processes are demonstrated correctly and clearly. The combination of voice over video enables learning through multiple senses. Even simple combinations, such as the use of audio over a sequence of still frames in a text, have been found more effective than learning through a single medium of communication (see for instance, Durbridge, 1984). The Khan Academy videos have exploited very effectively the power of audio combined with dynamic graphics. Computing adds another element of richness, in the ability to network learners or to respond to learner input.

From a learner's perspective, though, some caution is needed with rich media. Two particularly important concepts are cognitive overload and Vygotsky's Zone of Proximal Development. Cognitive overload results when students are presented with too much information at too complex a level or too quickly for them to properly absorb it (Sweller, 1988). Vygotsky's Zone of Proximal Development or ZPD (Vygotsky, 1934) is the difference between what a learner can do without help and what can be done with help. Rich media may contain a great deal of information compressed into a very short time period and its value will depend to a large extent on the learner's level of preparation for interpreting it.

For instance, a documentary video may be valuable for demonstrating the complexity of human behaviour or complex industrial systems, but learners may need either preparation in terms of what to look for, or to identify concepts or principles that may be illustrated within the documentary. On the other hand, interpretation of rich media is a skill that can be explicitly taught through demonstration and examples (Bates and Gallagher, 1977). Although YouTube videos are limited in length to around eight minutes mainly for technical reasons, they are also more easily absorbed than a continuous video of 50 minutes. Thus again design is important for helping learners to make full educational use of rich media.

7.7.4 Simple or rich media?

It is a natural tendency when choosing media for teaching to opt for the 'richest' or most powerful medium. Why would I use a podcast rather than a video? There are in fact several reasons:

- cost and ease of use: it may just be quicker and simpler to use a podcast, especially if it can achieve the same learning objective;
- there may be too many distractions in a rich medium for students to grasp the essential point of the teaching. For instance, video recording a busy intersection to look at traffic flow may include all kinds of distractions for the viewer from the actual observation of traffic patterns. A simple diagram or an animation that focuses only on the phenomenon to be observed might be better;
- the rich medium may be inappropriate for the learning task. For instance, if students are to

> follow and critique a particular argument or chain of reasoning, text may work better than a video of a lecturer with annoying mannerisms talking about the chain of reasoning.

In general, it is tempting always to look for the simplest medium first then only opt for a more complex or richer medium if the simple medium can't deliver the learning goals as adequately. However, consideration needs to be given to media richness as a criterion when making choices about media or technology, because rich media may enable learning goals to be achieved that would be difficult with a simple medium.

This is the last of the characteristics of media and technology that can influence decisions about teaching and learning. The next section will provide an overview and summary.

References

Bates, A. and Gallagher, M. (1977) *Improving the Effectiveness of Open University Television Case-Studies and Documentaries* Milton Keynes: The Open University I.E.T. Papers on Broadcasting, No. 77 (out of print – copies available from tony.bates@ubc.ca).

Durbridge, N. (1984) Audio cassettes, in Bates, A. (ed.) *The Role of Technology in Distance Education* London: Routledge (re-published in 2014)

Sweller, J. (1988) Cognitive load during problem solving: effects on learning, *Cognitive Science*, Vol. 12

Vygotsky, L.S. (1987). Thinking and speech, in R.W. Rieber & A.S. Carton (eds.), *The collected works of L.S. Vygotsky, Volume 1: Problems of general psychology (pp. 39–285)*. New York: Plenum Press. (Original work published 1934.)

Activity 7.7 How rich is your medium?

1. What media are you using at the moment for teaching? Where would you place these on the 'richness' continuum? What benefits might there be to your teaching in changing your media to either increase or decrease the richness of media you are using?
2. Do you agree that: '*it is a useful guideline always to look for the simplest medium first*'.
3. How important do you think the richness of medium is when making decisions about the use of media and technology?
4. Do you agree with the placement of different media on this continuum in Figure 7.7.2. If not, why not?

I provide no feedback for this activity.

7.8 Understanding the foundations of educational media

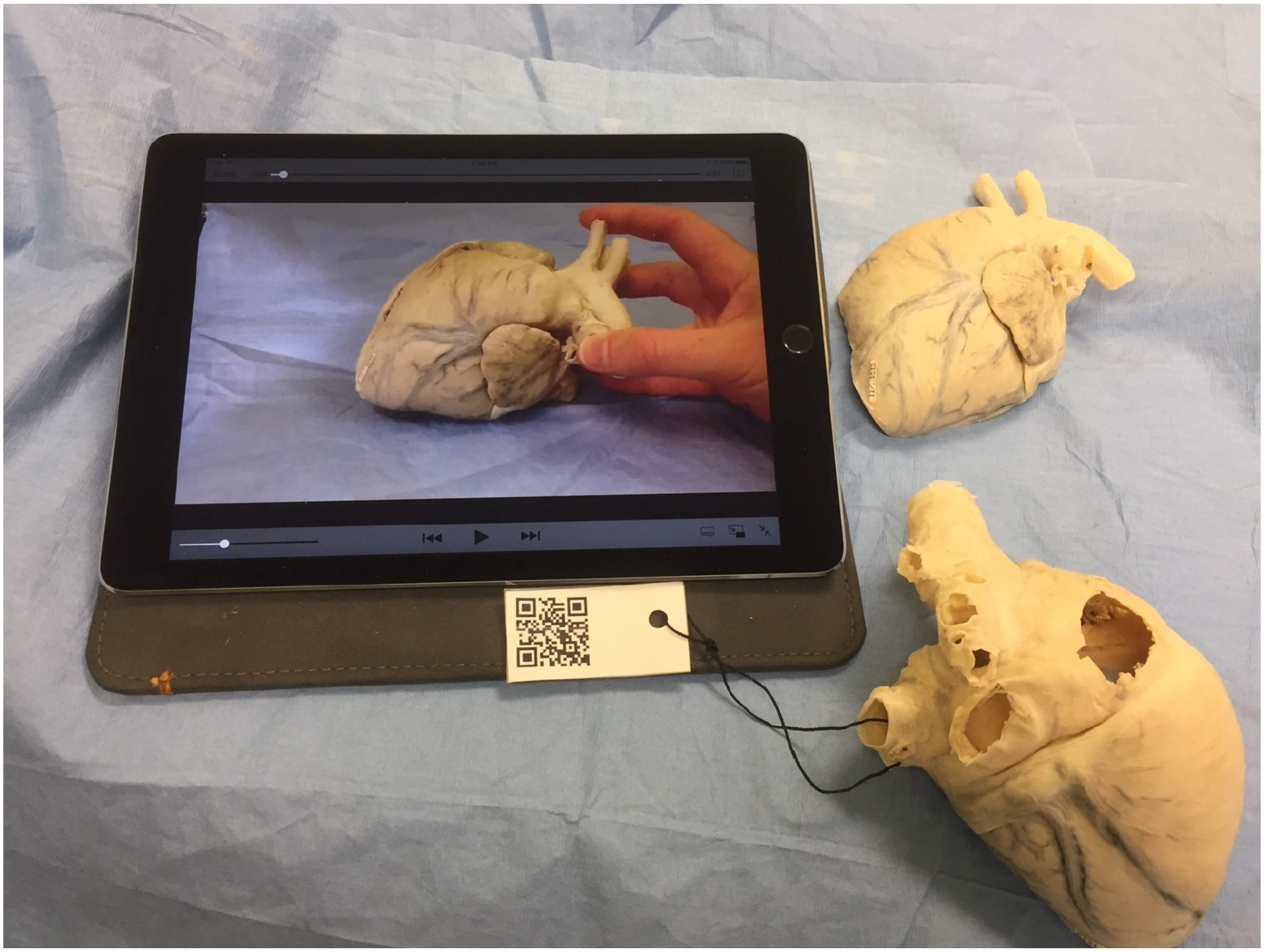


Figure 7.8 Video explanation of a (plastinated) dog's heart: note the QR code which enables students to access the video from their own phones or tablets. Image: Dr. Sue Dawson, University of Prince Edward Island

I am aware that this chapter may appear somewhat abstract and theoretical, but in any subject domain, it is important to understand the foundations that underpin practice. This applies with even more force to understanding media and technology in education, because it is such a dynamic field that changes all the time. What seem to be the major media developments this year are likely to be eclipsed by new developments in technology next year. In such a shifting sea, it is therefore necessary to look at some guiding concepts or principles that are likely to remain constant, whatever changes take place over the years.

So in summary here are the main points that I have been emphasising throughout this chapter.

Key Takeaways

1. Technologies are merely tools that can be used in a variety of ways. What matters more is how technologies are applied. The same technology can be applied in different ways, even or especially in education. So in judging the value of a technology, we need to look more closely at the ways in which it is being or could be used. In essence this means focusing more on media – which represent the more holistic use of technologies – than on individual tools or technologies themselves, while still recognising that technology is an essential component of almost all media.
2. By focusing on media rather than technologies, we can then include face-to-face teaching as a medium, enabling comparisons with more technology-based media to be made along a number of dimensions or characteristics.
3. Recognising that in education media are usually used in combination, the six key building blocks of media are:
    1. face-to-face teaching
    2. text
    3. (still) graphics
    4. audio (including speech)
    5. video
    6. computing (including animation, simulations and virtual reality)
4. Media differ in terms of their formats, symbols systems, and cultural values. These unique features are increasingly referred to as the affordances of media or technology. Thus different media can be used to assist learners to learn in different ways and achieve different outcomes, thus also individualising learning more.
5. There are many dimensions along which some technologies are similar and others are different. By focusing on these dimensions, we have a basis for analysing new media and technologies, to see where they 'fit' within the existing landscape, and to evaluate their potential benefits or limitations for teaching and learning.
6. There are probably other characteristics or dimensions of educational media that might also be identified, but I believe these three key characteristics or dimensions to be the most important:
    1. broadcast vs communicative
    2. synchronous (live) vs asynchronous (recorded)
    3. single vs rich media
7. However, the identification of where a particular medium fits along any specific characteristic or dimension will depend in most cases on how that medium is designed. At the same time, there is usually a limit to how far a technology can be forced along one of these dimensions; there is likely to be a single, 'natural' position on each dimension, subject to good design, in terms of exploiting the educational affordances of the medium.
8. These characteristics or dimensions of media then need to be evaluated against the learning goals and outcomes desired, while recognising that a new educational medium or application

might enable goals to be achieved that had not been previously considered possible.

9. Over time, media have tended to become more communicative, asynchronous, and ‘rich’, thus offering teachers and learners more powerful tools for teaching and learning.
10. The Internet is an extremely powerful medium because through a combination of tools and media it can encompass all the characteristics and dimensions of educational media.

Activity 7.8 Analysing your current use of technology

1. Take one of the courses you are teaching at the moment. How could you make your teaching more communicative, asynchronous, and rich in media? What media or technologies would help you do this?

2. Write down what you would see as (a) the advantages (b) the disadvantages of changing your teaching in this way.

3. Do you think applying the three dimensions described here will be useful when deciding whether or not to use a new technology? If not, why not?

The next chapter should provide more feedback on your answers.

Chapter 8: Pedagogical differences between media

Purpose of the chapter

1. To identify the main pedagogical characteristics of the following media:
   - text;
   - audio;
   - video;
   - computing;
   - social media
   - emerging technologies (virtual/augmented reality; serious games; artificial intelligence).
2. To provide a framework of analysis for determining appropriate pedagogical roles for different media.
3. To enable you to apply that analysis to any particular module of teaching

What is covered in this chapter

Also in this chapter you will find the following activities:

- Activity 8.2 Identifying the unique pedagogical characteristics of text
- Activity 8.3 Identifying the unique pedagogical characteristics of audio
- Activity 8.4 Identifying the unique pedagogical characteristics of video
- Activity 8.5 Identifying the unique pedagogical characteristics of computing
- Activity 8.6 Identifying the unique pedagogical characteristics of social media
- Activity 8.7a Using and designing serious games
- Activity 8.7b Using and designing VR and AR
- Activity 8.7c Assessing artificial intelligence
- Activity 8.7d Assessing and developing applications of emerging technologies
- Activity 8.8 Choosing media for a teaching module

Key Takeaways

There is a very wide range of media available for teaching and learning. In particular:

- text, audio, video, computing and social media all have unique characteristics that make them useful for teaching and learning;
- the choice or combination of media will need to be determined by:
  - the overall teaching philosophy behind the teaching;
  - the presentational and structural requirements of the subject matter or content;
  - the skills that need to be developed in learners;
  - and not least by the imagination of the teacher or instructor (and increasingly learners themselves) in identifying possible roles for different media;
- learners now have powerful tools through social media for creating their own learning materials or for demonstrating their knowledge;
- courses can be structured around individual students' interests, allowing them to seek appropriate content and resources to support the development of negotiated competencies or learning outcomes;.
- content is now increasingly open and freely available over the Internet; as a result learners can seek, use and apply information beyond the bounds of what a professor or teacher may dictate;
- students can create their own online personal learning environments;
- many students will still need a structured approach that guides their learning;
- teacher presence and guidance is likely to be necessary to ensure high quality learning via social media;
- teachers need to find the middle ground between complete learner freedom and over-direction to enable learners to develop the key skills needed in a digital age.

8.1 Thinking about the pedagogical differences of media

Figure 8.1.1 Is slow motion a unique characteristic of video?
Image: Pouring mercury into liquid nitrogen: University of Nottingham
Click on image to see video

8.1.1 Identifying the pedagogical differences between media

In the last chapter, I identified three core dimensions of media and technology along which any technology can be placed. In the next two chapters, I will discuss a method for deciding which media to use when teaching. In this chapter I will focus primarily on the pedagogical differences between media. In the following chapter I will provide a model or set of criteria to use when making decisions about media and technology for teaching.

8.1.2 First steps

Embedded within any decision about the use of technology in education and training will be assumptions about the learning process. We have already seen earlier in this book how different epistemological positions and theories of learning affect the design of teaching, and these influences will also determine a teacher's or an instructor's choice of appropriate media. Thus, the first step is to decide what and how you want to teach.

This has been covered in depth through Chapters 2-5, but in summary, there are five critical questions that need to be asked about teaching and learning in order to select and use appropriate media/ technologies:

- what is my underlying epistemological position about knowledge and teaching?
- what are the desired learning outcomes from the teaching?
- what teaching methods will be employed to facilitate the learning outcomes?
- what are the unique educational characteristics of each medium/technology, and how well do these match the learning and teaching requirements?
- what resources are available?

This chapter focuses on the fourth of these questions, but they are best not asked sequentially, but in a cyclical or iterative manner, as media affordances may suggest alternative teaching methods or even the possibility of learning outcomes that had not been initially considered. When the unique pedagogical characteristics of different media are considered, this may lead to some changes in what content will be covered and what skills will be developed. Therefore, at this stage, decisions on content and learning outcomes should still be tentative.

8.1.3 Identifying the unique educational characteristics of a medium

Different media have different potential or 'affordances' for different types of learning. One of the arts of teaching is often finding the best match between media and desired learning outcomes. Before exploring this relationship, first, a summary of the substantial amount of excellent past research on this topic (see, for instance, Trenaman, 1967; Olson and Bruner, 1974; Schramm, 1977; Salomon, 1979, 1981; Clark, 1983; Bates, 1984; Koumi, 2006; Berk, 2009; Mayer, 2009).

This research has indicated that there are three core elements that need to be considered when deciding what media to use:

- content;
- content structure;
- skills.

Olson and Bruner (1974) claim that learning involves two distinct aspects: acquiring knowledge of facts, principles, ideas, concepts, events, relationships, rules and laws; and using or working on that knowledge to develop skills. Again, this is not necessarily a sequential process. Identifying skills then working back to identify the concepts and principles needed to underpin the skills may be another valid way of working. In reality, learning content and skills development will often be integrated in any learning process. Nevertheless, when deciding on media use, it is useful to make a distinction between *content* and *skills*.

8.1.3.1. The representation of content

Media differ in the extent to which they can *represent* different kinds of content, because they vary in the symbol systems (text, sound, still pictures, moving images, etc.) that they use to encode information (Salomon, 1979). We saw in the previous chapter that different media are capable of combining different symbol systems. Differences between media in the way they combine symbol systems influence the way in which different media represent content. Thus there is a difference between a direct experience, a written description, a televised recording, and a computer simulation of the same scientific experiment. Different symbol systems are being used, conveying different kinds of information about the same experiment. For instance, our concept of heat can be derived from touch, mathematical symbols (800 celsius), words (random movement of particles), animation, or observance of experiments. Our 'knowledge' of heat is as a result not static, but developmental. A large part of learning requires the mental integration of content acquired through different media and symbol systems. For this reason, deeper understanding of a concept or an idea is often the result of the integration of content derived from a variety of media sources (Mayer, 2009).

Media also differ in their ability to handle *concrete* or *abstract* knowledge. Abstract knowledge is handled primarily through language. While all media can handle language, either in written or spoken form, media vary in their ability to represent concrete knowledge. For instance, television can show concrete examples of abstract concepts, the video showing the concrete 'event', and the sound track analyzing the event in abstract terms. Well-designed media can help learners move from the concrete to the abstract and back again, once more leading to deeper understanding.

8.1.3.2 Content structure

Media also differ in the way they *structure* content. Books, the telephone, radio, podcasts and face-to-face teaching all tend to present content linearly or sequentially. While these media can represent parallel activities (for example, in print, different chapters may deal with events that occur simultaneously but from different perspectives) such activities still have to be presented sequentially. Computers and television are more able to present or simulate the inter-relationship of multiple variables simultaneously occurring. Virtual reality is an exceptionally powerful example of this. Computers can also handle branching or alternative routes through information, but usually within closely defined limits.

Subject matter varies a great deal in the way in which information needs to be structured. Subject areas (for example, natural sciences, history) structure content in particular ways determined by the internal logic of the subject discipline. This structure may be very tight or logical, requiring particular sequences or relationships between different concepts, or very open or loose, requiring learners to deal with highly complex material in an open-ended or intuitive way.

If media then vary both in the way they present information symbolically and in the way they handle the structures required within different subject areas, media which best match the required mode of presentation and the dominant structure of the subject matter need to be selected. Consequently, different subject areas will require a different balance of media. This means that subject experts should be deeply involved in decisions about the choice and use of media, to ensure that the chosen media appropriately match the presentational and structural requirements of the subject matter.

8.1.3.3 The development of skills

Media also differ in the extent to which they can help develop different skills. Skills can range from intellectual to psychomotor to affective (emotions, feelings). Koumi (2015) has used Krathwohl's (2002) revision of Bloom's Taxonomy of Learning Objectives (1956) to assign affordances of text and video to learning objectives using Krathwold's classification of learning objectives.

Comprehension is likely to be the minimal level of intellectual learning outcome for most education courses. Some researchers (for example, Marton and Säljö, 1976) make a distinction between surface and deep comprehension. At the highest level of skills comes the *application* of what one has comprehended to new situations. Here it becomes necessary to develop skills of analysis, evaluation, and problem solving.

Thus a first step is to identify learning objectives or outcomes, in terms of both content and skills, while being aware that the use of some media may result in new possibilities in terms of learning outcomes.

8.1.4 Pedagogical affordances – or unique media characteristics?

'Affordances' is a term originally developed by the psychologist James Gibson (1977) to describe the perceived possibilities of an object in relation to its environment (for example, a door knob suggests to a user that it should be turned or pulled, while a flat plate on a door suggests that it should be pushed.). The term has been appropriated by a number of fields, including instructional design and human-machine interaction.

Thus the pedagogical affordances of a medium relate to the possibilities of using that medium for specific teaching purposes. It should be noted that an affordance depends on the subjective interpretation of the user (in this case a teacher or instructor), and it is often possible to use a medium in ways that are not unique to that medium. For instance video can be used for recording and delivering a lecture. In that sense there is a similarity in at least one affordance for a lecture and a video. Also students may choose not to use a medium in the way intended by the instructor. For instance, Bates and Gallagher (1977) found that some social science students objected to documentary-style television programs requiring application of knowledge or analysis rather than presentation of concepts.

Others (such as myself) have used the term 'unique characteristics' of a medium rather than affordances, since 'unique characteristics' suggest that there are particular uses of a medium that are less easily replicated by other media, and hence act as a better discriminator in selecting and using media. For instance, using video to demonstrate in slow motion a mechanical process is much more difficult (but not impossible) to replicate in other media. In what follows, my focus is more on unique or particular rather than general affordances of each medium, although the subjective and flexible nature of media interpretation makes it difficult to come to any hard and fast conclusions.

I will now attempt in the next sections to identify some of the unique pedagogical characteristics of the following media:

- text;
- audio;
- video;
- computing;
- social media
- emerging technologies, in particular, virtual/augmented reality, serious games and artificial intelligence.

Technically, face-to-face teaching should also be considered a medium, but I will look specifically at the unique characteristics of face-to-face teaching in Chapter 10, where I discuss different modes of delivery.

8.1.5 Purpose of the exercise

Before starting on the analysis of different media, it is important to understand my goals in this chapter. I am NOT trying to provide a definitive list of the unique pedagogical characteristics of each medium. Because context is so important and because the science is not strong enough to identify unequivocally such characteristics, I am suggesting in the following sections *a way of thinking* about the pedagogical affordances of different media. To do this, I will identify what I think are the most important pedagogical characteristics of each medium.

However, individual readers may well come to different conclusions, depending particularly on the subject area in which they are working. The important point is for teachers and instructors to think about what each medium could contribute educationally within their subject area, and that requires a strong understanding of both the needs of their students and the nature of their subject area, as well as the key pedagogical features of each medium.

Listen to the podcast below for an illustration of the differences between media.

Podcast 8.1 Tony's shaggy dog story: click play on the above podcast (41 seconds).

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=197

References

Bates, A. (1984) *Broadcasting in Education: An Evaluation* London: Constables

Bates, A. and Gallagher, M. (1977) *Improving the Effectiveness of Open University Television Case-Studies and Documentaries* Milton Keynes: The Open University, I.E.T. Papers on Broadcasting, No. 77 (out of print – copies available from tony.bates@ubc.ca)

Berk, R.A. (2009) Multimedia teaching with video clips: TV, movies, YouTube and mtvU in the college classroom, *International Journal of Technology in Teaching and Learning*, Vol. 91, No. 5

Bloom, B. S.; Engelhart, M. D.; Furst, E. J.; Hill, W. H.; Krathwohl, D. R. (1956). *Taxonomy of educational objectives: The classification of educational goals*. *Handbook I: Cognitive domain.* New York: David McKay Company

Clark, R. (1983) Reconsidering research on learning from media *Review of Educational Research*, Vol. 53. No. 4

Gibson, J.J. (1979) *The Ecological Approach to Visual Perception* Boston: Houghton Mifflin

Koumi, J. (2006) *Designing video and multimedia for open and flexible learning*. London: Routledge.

Koumi, J. (2015) Learning outcomes afforded by self-assessed, segmented video-print combinations *Cogent Education*, Vol. 2, No.1

Krathwohl, D.R. (2002) *A Revision of Bloom's Taxonomy: An Overview* in *Theory into Practice*, Vol. 41, No. 4, College of Education, The Ohio State University.

Marton, F. and Säljö, R. (1997) Approaches to learning, in *Marton, F., Hounsell, D. and Entwistle, N. (eds.) The experience of learning:* Edinburgh: Scottish Academic Press

Mayer, R. E. (2009) *Multimedia learning* (2nd ed). New York: Cambridge University Press

Olson, D. and Bruner, J. (1974) 'Learning through experience and learning through media', in Olson, D. (ed.) *Media and Symbols: the Forms of Expression* Chicago: University of Chicago Press (out of print)

Salomon, G. (1979) *Interaction of Media, Cognition and Learning* San Francisco: Jossey-Bass

Salomon, G. (1981) *Communication and Education* Beverly Hills CA/London: Sage (out of print)

Schramm, W. (1977) *Big Media, Little Media* Beverly Hills CA/London: Sage

Trenaman, J. (1967) *Communication and Comprehension* London: Longmans

Activity 8.1: Thinking about the pedagogical differences between media

1. Examine one of your lessons or courses.
    - Can you think of content that would best be presented through video or audio rather than through talking or text? What content is still better offered through talking or a textbook? What are your reasons? Are they pedagogical or for other reasons?
    - can you think of a skill that you are teaching that could be better done through the use of media that you are not currently using?
    - can you think of new learning outcomes that you could achieve through the use of media?

There is no feedback from me on this activity, but the rest of this and the following chapter may help.

8.2 Text

Figure 8.2.1 There's nothing like a good book – or is there?.

8.2.1 The unique pedagogical features of text

Ever since the invention of the Gutenberg press, print has been a dominant teaching technology, arguably at least as influential as the spoken word of the teacher. Even today, textbooks, mainly in printed format, but increasingly also in digital format, still play a major role in formal education, training and distance education. Many fully online courses still make extensive use of text-based learning management systems and online asynchronous discussion forums.

Why is this? What makes text such a powerful teaching medium, and will it remain so, given the latest developments in information technology?

8.2.1.2 Presentational features

Text can come in many formats, including printed textbooks, text messages, novels, magazines, newspapers, scribbled notes, journal articles, essays, novels, online asynchronous discussions and so on.

The key symbol systems in text are written language (including mathematical symbols) and still graphics, which would include diagrams, tables, and copies of images such as photographs or paintings. Colour is an important attribute for some subject areas, such as chemistry, geography and geology, and art history.

Some of the unique presentational characteristics of text are as follows:

- text is particularly good at handling abstraction and generalisation, mainly through written language;
- text enables the linear sequencing of information in a structured format;
- text can present and separate empirical evidence or data from the abstractions, conclusions or generalisations derived from the empirical evidence;
- text's linear structure enables the development of coherent, sequential argument or discussion;
- at the same time text can relate evidence to argument and vice versa;
- text's recorded and permanent nature enables independent analysis and critique of its content;
- still graphics such as graphs or diagrams enable knowledge to be presented differently from written language, either providing concrete examples of abstractions or offering a different way of representing the same knowledge.

There is some overlap of each of these features with other media, but no other medium combines all these characteristics, or is as powerful as text with respect to these characteristics.

Earlier (Chapter 2, Section 2.7.3) I argued that academic knowledge is a specific form of knowledge that has characteristics that differentiate it from other kinds of knowledge, and particularly from knowledge or beliefs based solely on direct personal experience. Academic knowledge is a second-order form of knowledge that seeks abstractions and generalizations based on reasoning and evidence.

Fundamental components of or criteria for academic knowledge are:

- codification: knowledge can be consistently represented in some form (words, symbols, video);
- transparency: the source of the knowledge can be traced and verified;
- reproduction: knowledge can be reproduced or have multiple copies;
- communicability: knowledge must be in a form such that it can be communicated and challenged by others.

Text meets all four criteria above, so it is an essential medium for academic learning.

7.2.1.2 Skills development

Because of text's ability to handle abstractions, and evidence-based argument, and its suitability for independent analysis and critique, text is particularly useful for developing the higher learning outcomes required at an academic level, such as analysis, critical thinking, and evaluation.

It is less useful for showing processes or developing manual skills, for instance.

8.2.2 The book and knowledge

Figure 8.2.2 What is a book? From scrolls to paperbacks to e-books, this one minute video portrays the history and future of books. Click to see the video from the UK Open University (© Open University, 2014)

Although text can come in many formats, I want to focus particularly on the role of the book, because of its centrality in academic learning. The book has proved to be a remarkably powerful medium for the development and transmission of academic knowledge, since it meets all four of the components required for presenting academic knowledge, but to what extent can new media such as blogs, wikis, multimedia, and social media replace the book in academic knowledge?

New media can in fact handle just as well some of these criteria, and provide indeed added value, such as speed of reproduction and ubiquity, but the book still has some unique qualities. A key advantage of a book is that it allows for the development of a sustained, coherent, and comprehensive argument with evidence to support the argument. Blogs can do this only to a limited extent (otherwise they cease to be blogs and become articles or a digital book).

Quantity is important sometimes and books allow for the collection of a great deal of evidence and supporting argument, and allow for a wider exploration of an issue or theme, within a relatively condensed and portable format. A consistent and well supported argument, with evidence, alternative explanations or even counter positions, requires the extra 'space' of a book. Above all, books can provide coherence or a sustained, particular position or approach to a problem or issue, a necessary balance to the chaos and confusion of the many new forms of digital media that constantly compete for our attention, but in much smaller 'chunks' that are overall more difficult to integrate and digest.

Another important academic feature of text is that it can be carefully scrutinised, analysed and constantly checked, partly because it is largely linear, and also permanent once published, enabling more rigorous challenge or testing in terms of evidence, rationality, and consistency. Multimedia in recorded format can come close to meeting these criteria, but text can also provide more convenience and in media terms, more simplicity. For instance I repeatedly find analysing video, which incorporates many variables and symbol systems, more complex than analysing a linear text, even if both contain equally rigorous (or equally sloppy) arguments.

8.2.2.1 The form and function of a book

Does the form or technological representation of a book matter any more? Is a book still a book if downloaded and read on an iPad or Kindle, rather than as printed text?

For the purposes of knowledge acquisition, it probably isn't any different. Indeed, for study purposes, a digital version is probably more convenient because carrying an iPad around with maybe hundreds of books downloaded on it is certainly preferable to carrying around the printed versions of the same books. There are still complaints by students about the difficulties of annotating e-books, but this will almost certainly become a standard feature available in the future.

If the whole book is downloaded, then the function of a book doesn't change much just because it is available digitally. However, there are some subtle changes. Some would argue that scanning is still easier with a printed version. Have you ever had the difficulty of finding a particular quotation in a digital book compared with the printed version? Sure, you can use the search facility, but that means knowing exactly the correct words or the name of the person being quoted. With a printed book, I can often find a quotation just by flicking the pages, because I am using context and rapid eye scanning to locate the source, even when I don't know exactly what I am looking for. On the other hand, searching when you do know what you are looking for (e.g. a reference by a particular author) is much easier digitally.

When books are digitally available, users can download only the selected chapters that are of interest to them. This is valuable if you know just what you want, but there are also dangers. For instance in my book on the strategic management of technology (Bates and Sangrà, 2011), the last chapter summarizes the rest of the book. If the book had been digital, the temptation then would be to just download the final chapter. You'd have all the important messages in the book, right? Well, no. What you would be missing is the evidence for the conclusions. Now the book on strategic management is based on case studies, so it would be really important to check back with how the case studies were interpreted to get to the conclusions, as this will affect the confidence you would have as a reader in the conclusions that were drawn. If just the digital version of only the last chapter is downloaded, you also lose the context of the whole book. Having the whole book gives readers more freedom to interpret and add their own conclusions than just having a summary chapter.

In conclusion, then, there are advantages and disadvantages of digitizing a book, but the essence of a book is not greatly changed when it becomes digital rather than printed. I have also written about the advantages of publishing an online academic textbook, based on my own experience of writing the first edition of this book, which is now available in 10 languages and has been downloaded over 500,000 times since 2015. For another perspective on this, see Clive Shepherd's blog: Weighing up the benefits of traditional book publishing.

8.2.2.2 A new niche for books in academia

We have seen historically that new media often do not entirely replace an older medium, but the old medium finds a new 'niche'. Thus television did not lead to the complete demise of radio. Similarly, I suspect that there will be a continued role for the book in academic knowledge, enabling the book (whether digital or printed) to thrive alongside new media and formats in academia.

However, books that retain their value academically will likely need to be much more specific in their format and their purpose than has been the case to date. For instance, I see no future for books consisting mainly of a collection of loosely connected but semi-independent chapters from different authors, unless there is a strong cohesion and edited presence that provides an integrated argument or consistent set of data across all the chapters. Most of all, books may need to change some of their features, to allow for more interaction and input from readers, and more links to the outside world. It is much more unlikely though that books will survive in a printed format, because digital publication allows for many more features to be added, reduces the environmental footprint, and makes text much more portable and transferable.

Lastly, this is not an argument for ignoring the academic benefits of new media. The value of graphics, video and animation for representing knowledge, the ability to interact asynchronously with other learners, and the value of social networks, are all under-exploited in academia. But text and books are still important.

8.2.3 Text and other forms of knowledge

I have focused particularly on text and academic knowledge, because of the traditional importance of text and printed knowledge in academia. The unique pedagogical characteristics of text though may be less for other forms of knowledge. Indeed, multimedia may have many more advantages in vocational and technical education.

In the k-12 or school sector, text and print are likely to remain important, because reading and writing are likely to remain essential in a digital age, so the study of text (digital and printed) will remain important if only for developing literacy skills.

Indeed, one of the limitations of text is that it requires a high level of prior literacy skills for it to be used effectively for teaching and learning, and indeed much of teaching and learning is focused on the development of skills that enable rigorous analysis of textual materials. Indeed reading ability is one of the core skills identified for the 21st century. Reading and writing literacy is somewhat under attack with the use of truncated language in text messages, automated spelling correction, and emotive symbols in social media. However, we should be giving as much attention to developing literacy skills in using and interpreting multimedia in a digital age.

8.2.4 Assessment

If text is critical for the presentation of knowledge and development of skills in your subject area, what are the implications for assessment? If students are expected to develop the skills that text appears to develop, then presumably text will be an important medium for assessment. Students will need to demonstrate their own ability to use text to present abstractions, argument and evidence-based reasoning.

In such contexts, composed textual responses, such as essays or written reports, are likely to be necessary, rather than multiple-choice questions or multimedia reports.

8.2.5 More evidence, please

Although there has been extensive research on the pedagogical features of other media such as audio, video and computing, text has generally been treated as the default mode, the base against which other media are compared. As a result print in particular is largely taken for granted in academia. We are now though at the stage where we need to pay much more attention to the unique characteristics of text in its various formats, in relation to other media. Until though we have more empirical studies on the unique characteristics of text and print, text will remain central to at least academic teaching and learning.

References

Koumi, J. (1994) Media comparisons and deployment: a practitioner's view *British Journal of Educational Technology*, Vol. 25, No. 1.

Koumi, J. (2006) *Designing video and multimedia for open and flexible learning*. London: Routledge.

Koumi, J. (2015) Learning outcomes afforded by self-assessed, segmented video-print combinations *Cogent Education*, Vol. 2, No.1

Manguel, A. (1996) *A History of Reading* London: Harper Collins

Although there are many publications on text, in terms of typography, structure, and its historical influence on education and culture, I could find no publications where text is compared with other modern media such as audio or video in terms of its pedagogical characteristics, although Koumi (2015) has written about text in combination with audio, and Albert Manguel's book is also fascinating reading from an historical perspective.

However, I am sure that my lack of references is due to my lack of scholarship in the area. If you have suggestions for readings, please send me an email. Also, a study of the unique pedagogical characteristics of text in a digital age might make for a very interesting and valuable Ph.D. thesis.

Activity 8.2 Identifying the unique pedagogical characteristics of text

1. Take one of the courses you are teaching. What key presentational aspects of text are important for this

course? Is text the best medium for representing knowledge in your subject area; if not, what concepts or topics would be best represented through other media?

2. Look at the skills listed in Section 1.2 of this book. Which of these skills would best be developed through the use of text rather than other media? How would you do this using text-based teaching?

3. What do you think about books for learning? Do you think the book is dead or about to become obsolete? If you think books are still valuable for learning, what changes, if any, do you think should be made to academic books? What would be lost if books were entirely replaced by new media? What would be gained?

4. Under what conditions would it be more appropriate for students to be assessed through written essays and under what conditions would multimedia portfolios be more appropriate for assessment?

5. Can you think of any other unique pedagogical characteristics of text?

For feedback on this activity, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=201

8.3 Audio

Figure 8.3.1 Image: © InnerFidelity, 2012

> *Sounds, such as the noise of certain machinery, or the background hum of daily life, have an associative as well as a pure meaning, which can be used to evoke images or ideas relevant to the main substance of what is being taught. There are, in other words, instances where audio is essential for efficiently mediating certain kinds of information.*

Durbridge, 1984

8.3.1 Audio: the unappreciated medium

We have seen that oral communication has a long history, and continues today in classroom teaching and in general radio programming. In this section though I am focusing primarily on recorded audio, which I will argue is a very powerful educational medium when used well.

There has been a good deal of research on the unique pedagogical characteristics of audio. At the UK Open University course teams had to bid for media resources to supplement specially designed printed materials. Because media resources were developed initially by the BBC, and hence were limited and expensive to produce, course teams (in conjunction with their allocated BBC producer) had to specify how radio or television would be used to support learning. In particular, the course teams were asked to identify what teaching functions television and radio would uniquely contribute to the teaching. After allocation and development of a course, samples of the programs were evaluated in terms of how well they met these functions, as well as how the students responded to the programming. In later years, the same approach was used when production moved to audio and video cassettes.

This process of identifying unique roles then evaluating the programs allowed the OU, over a period of several years, to identify which roles or functions were particularly appropriate to different media (Bates, 1984). Koumi (2006), himself a former BBC/OU producer, followed up on this research and identified several more key functions for audio and video. Over a somewhat similar period, Richard Mayer, at the University of California at Santa Barbara, was conducting his own research into the use of multimedia in education (Mayer, 2009).

Although there have been continuous developments of audio technology, from audio-cassettes to Sony Walkman's to podcasts, the pedagogical characteristics of audio have remained remarkably constant over a fairly long period.

8.3.2 Presentational features

Although audio can be used on its own, it is often used in combination with other media, particularly text. On its own, it can present:

- spoken language (including foreign languages) for analysis or practice;
- music, either as a performance or for analysis;
- students with a condensed argument that may:
  - reinforce points made elsewhere in the course;
  - introduce new points not made elsewhere in the course;
  - provide an alternative viewpoint to the perspectives in the rest of the course;
  - analyse or critique materials elsewhere in the course;
  - summarize or condense the main ideas or major points covered in the course;
  - provide new evidence in support of or against the arguments or perspectives covered elsewhere in the course;
- interviews with leading researchers or experts;
- discussion between two or more people to provide various views on a topic;
- primary audio sources, such as bird song, children talking, eye witness accounts, or recorded performances (drama, concerts);
- analysis of primary audio sources, by playing the source followed by analysis;
- 'breaking news' that emphasizes the relevance or application of concepts within the course;
- the instructor's personal spin on a topic related to the course.

Audio however has been found to be particularly 'potent' when combined with text, because it enables students to use both eyes and ears in conjunction. Audio has been found to be especially useful for:

- explaining or 'talking through' materials presented through text, such as mathematical equations, reproductions of paintings, graphs, statistical tables, and even physical rock samples.

This technique was later further developed by Salman Khan, but using video to combine voice-over (audio) explanation with visual presentation of mathematical symbols, formulae, and solutions.

8.3.3 Skills development

Because of the ability of the learner to stop and start recorded audio, it has been found to be particularly useful for:

- enabling students through repetition and practice to master certain auditory skills or techniques (e.g. language pronunciation, analysis of musical structure, mathematical computation);
- getting students to analyse primary audio sources, such as children's use of language, or attitudes to immigration from recordings of interviewed people;
- changing student attitudes by:
    - presenting material in a novel or unfamiliar perspective;
    - by presenting material in a dramatized form, enabling students to identify with someone with a different perspective.

8.3.4 Strengths and weaknesses of audio as a teaching medium

First, some advantages:

- it is much easier to make an audio clip or podcast than a video clip or a simulation;
- audio requires far less bandwidth than video or simulations, hence downloads quicker and can be used over relatively low bandwidths;
- it is easily combined with other media such as text, mathematical symbols, and graphics, allowing more than one sense to be used and allowing for 'integration';
- some students prefer to learn by listening compared with reading;
- audio combined with text can help develop literacy skills or support students with low levels of literacy;
- audio provides variety and another perspective from text, a 'break' in learning that refreshes the learner and maintains interest;
- Nicola Durbridge, in her research at the Open University, found that audio increased distance students' feelings of personal 'closeness' with the instructor compared with video or text, i.e. it is a more intimate medium.

In particular, added flexibility and learner control means that students will often learn better from pre-prepared audio recordings combined with accompanying textual material (such as a web site with slides) than they will from a live classroom lecture.

There are also of course disadvantages of audio:

- audio-based learning is difficult for people with a hearing disability;
- creating audio is extra work for an instructor;
- audio is often best used in conjunction with other media such as text or graphics thus adding complexity to the design of teaching;
- recording audio requires at least a minimal level of technical proficiency;
- spoken language tends to be less precise than text.

Increasingly video is now being used to combine audio over images, such as in the Khan Academy, but there are many instances, such as where students are studying from prescribed texts, where recorded audio works better than a video recording.

So let's hear it for audio!

References

Bates, A. (1984) *Broadcasting in Education: An Evaluation* London: Constables

Bates, A. (2005) *Technology, e-Learning and Distance Education* London/New York: Routledge

Durbridge, N. (1984) Audio-cassettes, in Bates, A. (ed.) *The Role of Technology in Distance Education* London/New York: Croom Hill/St Martin's Press

EDUCAUSE Learning Initiative (2005) *Seven things you should know about… podcasting* Boulder CO: *EDUCAUSE*, June

Koumi, J. (2006). *Designing video and multimedia for open and flexible learning*. London: Routledge.

Mayer, R. E. (2009). Multimedia learning (2nd ed). New York: Cambridge University Press.

Postlethwaite, S. N. (1969) *The Audio-Tutorial Approach to Learning* Minneapolis: Burgess Publishing Company

Salmon, G. and Edirisingha, P. (2008) *Podcasting for Learning in Universities* Milton Keynes: Open University Press

Activity 8.3 Identifying the unique pedagogical characteristics of audio

1. Take one of the courses you are teaching. What key presentational aspects of audio could be important for this course?

2. Look at the skills listed in Section 1.2 of this book. Which of these skills would best be developed through the use of audio rather than other media? How would you do this using audio-based teaching?

3. Under what conditions would it be more appropriate for students to be assessed by asking them to make an audio recording? How could this be done under assessment conditions?

4. To what extent do you think redundancy or duplication between different media is a good thing? What are the disadvantages of covering the same topic through different media?

5. Can you think of any other unique pedagogical characteristics of audio?

Click on the podcast below for feedback on this activity:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=203

8.4 Video

Figure 8.4.1 An OpenLearn video from the Open University on communications technologies in developing countries. Click on the image to play the video

8.4.1 More power, more complexity

Although there have been massive changes in video technology over the last 25 years, resulting in dramatic reductions in the costs of both creating and distributing video, the unique educational characteristics are largely unaffected. (More recent computer-generated media such as simulations, will be analysed under ‘Computing’, in Section 8.5).

Video is a much richer medium than either text or audio, as in addition to its ability to offer text and sound, it can also offer dynamic or moving pictures. Thus while it can offer all the affordances of audio, and some of text, it also has unique pedagogical characteristics of its own. Once again, there has been considerable research on the use of video in education, and again I will be drawing on research from the Open University (Bates, 1984; 2005; Koumi, 2006) as well as from Mayer (2009).

Click on the links to see examples for many of the characteristics listed below.

8.4.2 Presentational features

Video can be used to:

- demonstrate experiments or phenomena, particularly:
    - where equipment or phenomena to be observed are large, microscopic, expensive, inaccessible, dangerous, or difficult to observe without special equipment (see an example from the University of Nottingham);
    - where resources are scarce, or unsuitable for student experimentation (e.g. live animals, human body parts) (see an example of the anatomy of the brain, from the University of British Columbia);
    - where the experimental design is complex (for example, testing whether wild sharks are more attracted to blood than fish oil)
    - where there is an element of risk or danger in conducting the experiment (see an example demonstrating the conservation of momentum)
    - where the experimental behaviour may be influenced by uncontrollable but observable variables;
- illustrate principles involving dynamic change or movement (see an example explaining exponential growth from a course at UBC);
- illustrate abstract principles through the use of specially constructed physical models, for instance an animation of a normal curve of distribution;
- illustrate principles involving three-dimensional space, for example, see this video from Nova Scotia Community College
- demonstrate changes over time through the use of animation, slow-motion, or speeded-up video (see an example of how haemophilus influenzae cells take up DNA, from UBC);
- demonstrate correct procedures in health, safety, repairs and maintenance (for an example, see Brady's EMR Skills Video)
- substitute for a field visit, by:
    - providing students with an accurate, comprehensive visual picture of a site, in order to place the topic under study in context; for instance see the Bodo aboriginal archeological site in Alberta
    - demonstrating the relationship between different elements of a system under study (e.g. production processes, ecological balanc brady's EMRe); for example, see the paper-making process
    - by identifying and distinguishing between different classes or categories of phenomena at the site (e.g. in forest ecology);
    - to observe differences in scale and process between laboratory and mass-production techniques;
    - through the use of models, animations or simulations, to teach certain advanced scientific or technological concepts (such as theories of relativity or quantum

physics) without students having to master highly advanced mathematical techniques; see for instance 'Einstein's Theory of Relativity Made Easy.'

- bring students primary resource or case-study material, i.e. recording of naturally occurring events which, through editing and selection, demonstrate or illustrate principles covered elsewhere in a course;
- demonstrate ways in which abstract principles or concepts developed elsewhere in the course have been applied to real-world problems, for example, innovative stormwater management in the University of British Columbia's Master of Land and Water Management;
- synthesise a wide range of variables into a single recorded event, e.g. to suggest how real world problems can be resolved;
- demonstrate decision-making processes or decisions 'in action' (e.g. triage in an emergency situation) by:
    - recording the decision-making process as it occurs in real contexts;
    - recording 'staged' simulations, dramatisation or role-playing, as in the scenarios in Ryerson University's Therapeutic Communication and Mental Health Assessment Program
- demonstrate correct procedures in using tools or equipment (including safety procedures);
- demonstrate methods or techniques of performance (e.g. mechanical skills such as stripping and re-assembling a carburetor, sketching, drawing or painting techniques, or dance);
- record and archive events that are crucial to topics in a course, but which may disappear or be destroyed in the near future, such as, for instance, street graffiti or condemned buildings (see an example about neon lights in Vancouver);
- demonstrate practical activities to be carried out by students, on their own (for example, see 32 cool experiments to do at home).

Figure 8.4.2 Don't do this yourself at home! Video on the conservation of momentum

8.4.3 Skills development

This usually requires the video to be integrated with student activities. The ability to stop, rewind and replay video becomes crucial for skills development, as student activity usually takes place separately from the actual viewing of the video. This may mean thinking through carefully activities for students related to the use of video.

If video is not used directly for lecturing, research clearly indicates that students generally need to be guided as to what to look for in video, at least initially in their use of video for learning. There are various techniques for relating concrete events with abstract principles, such as through audio narration over the video, using a still frame to highlight the observation, or repeating a small section of the program. Bates and Gallagher (1977) found that using video for developing higher order analysis or evaluation was a teachable skill that needs to be built into the development of a course or program, to get the best results.

Typical uses of video for skills development include:

- enabling students to recognize naturally occurring phenomena or classifications (e.g. classroom teaching strategies, symptoms of mental illness, classroom behaviour) in context;
- enabling students to analyse a situation, using principles either introduced in the video recording or covered elsewhere in the course, such as a textbook or lecture; for example, possible raw material on managing domestic violence,
- interpreting artistic performance (e.g. drama, spoken poetry, movies, paintings, sculpture, or other works of art);

- analysis of music composition, through the use of musical performance, narration and graphics;
- testing the applicability or relevance of abstract concepts or generalisations in real world contexts (see for example the European Space Agency's video on climate change)
- looking for alternative explanations for real world phenomena.

There are many ways in which video can be used for skills development. Nevertheless, however video is used for skill development, as well as the demonstration of the skill, attention must be paid to ensuring opportunities for student practice and feedback, probably using other media, although it is now increasingly easy for students to make their own videos to demonstrate their skill.

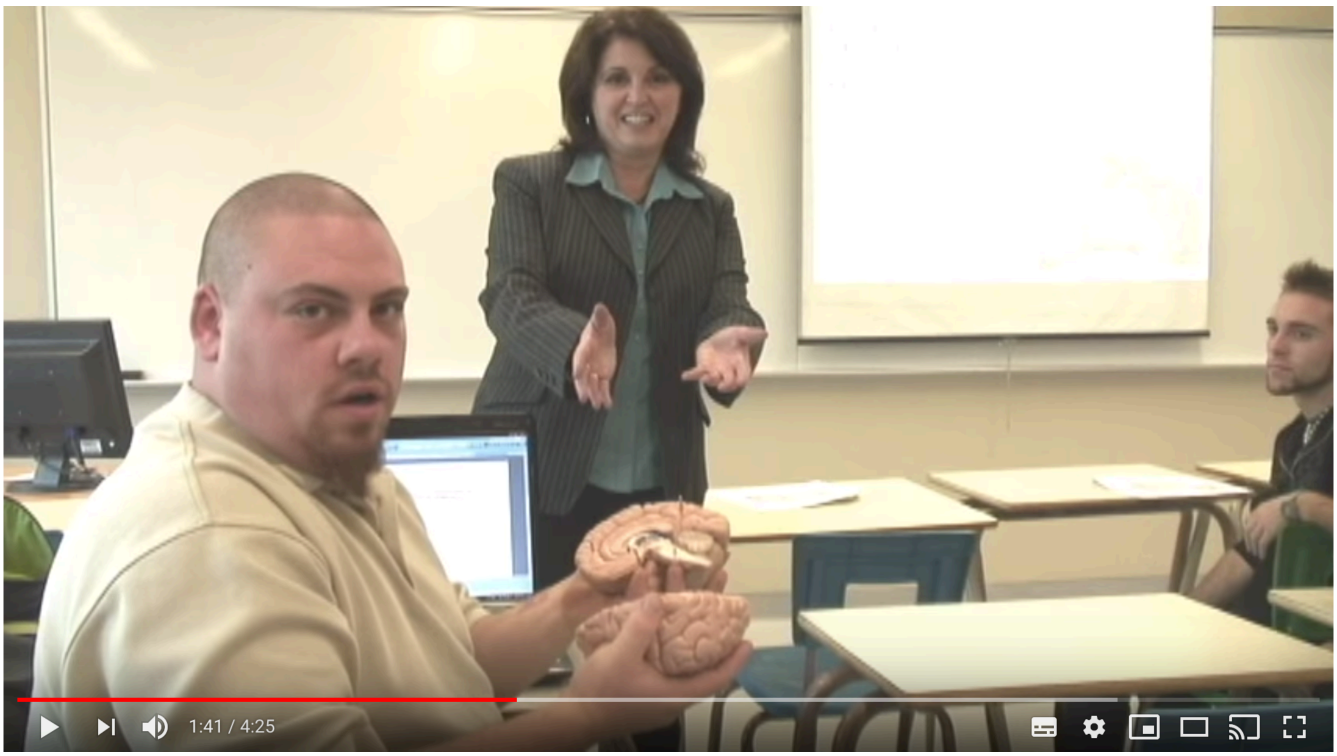


Figure 8.4.3 Demonstrating teaching strategies: kinesthetic learning

8.4.4 Strengths and weaknesses of video as a teaching medium

One factor that makes video powerful for learning is its ability to show the relationship between concrete examples and abstract principles, with usually the sound track relating the abstract principles to concrete events shown in the video (see, for example: Probability for quantum chemistry, UBC). Video is particularly useful for recording events or situations where it would be too difficult, dangerous, expensive or impractical to bring students to such events.

Thus its main strengths are as follows:

- linking concrete events and phenomena to abstract principles and vice versa;
- the ability of students to stop and start, so they can integrate activities with video;
- providing an alternative approach to the presentation of content that can help students having difficulties in learning abstract concepts;
- adding substantial interest to a course by linking it to real world issues;
- a growing amount of freely available, high quality academic videos;
- good for developing some of the higher level intellectual skills and some of the more practical skills needed in a digital age;
- the use of low cost cameras and free editing software enables some forms of video to be cheaply produced.

It should also be remembered that in addition to the features listed above, video can incorporate many of the features of audio as well.

The main weaknesses of video are:

- many faculty have no knowledge or experience in using video other than for recording lecturing;
- there is currently a limited amount of high quality educational video free for downloading, because the cost of developing high quality educational video that exploits the unique characteristics of the medium is still relatively high. Links also often go dead after a while, affecting the reliability of outsourced video. The availability of free material for educational use is improving all the time, but currently finding appropriate and free videos that meet the specific needs of a teacher or instructor can be time-consuming or such material may just not be available or reliable;
- creating original material that exploits the unique characteristics of video is time-consuming, and still relatively expensive, because it usually needs professional video production;
- to get the most out of educational video, students need specially designed activities that often will have to sit outside the video itself;
- students often reject videos that require them to do analysis or interpretation; they often prefer direct instruction that focuses primarily on comprehension. Such students need to be trained to use video differently, which requires time to be devoted to developing such skills.

For these reasons, video is not being used enough in education. When used it is often an afterthought or an ‘extra’, rather than an integral part of the design, or is used merely to replicate a classroom lecture, rather than exploiting the unique characteristics of video.

8.4.5 Assessment

If video is being used to develop the skills outlined in Section 8.4.3, then it is essential that these skills are assessed and count for grading. Indeed, one possible means of assessment might be to ask students to analyse or interpret a selected video, or even to develop their own media project, using video they themselves have collected or produced, using their own devices.

References

Bates, A. (1984) *Broadcasting in Education: An Evaluation* London: Constables

Bates, A. (2005) *Technology, e-Learning and Distance Education* London/New York: Routledge

Bates, A. and Gallagher, M. (1977) *Improving the Effectiveness of Open University Television Case-Studies and Documentaries* Milton Keynes: The Open University, I.E.T. Papers on Broadcasting, No. 77 (out of print – copies available from tony.bates@ubc.ca)

Koumi, J. (2006). *Designing video and multimedia for open and flexible learning*. London: Routledge

Mayer, R. E. (2009). Multimedia learning (2nd ed). New York: Cambridge University Press

The University of British Columbia also provides two annotated bibliographies of digital multimedia research. one collated at UBC and one by the University of Central Florida.

Activity 8.4 Identifying the unique pedagogical characteristics of video

1. Take one of the courses you are teaching. What key presentational aspects of video could be important for this course?

2. Look at the skills listed in Section 1.2 of this book. Which of these skills would best be developed through the use of video rather than other media? How would you do this using video-based teaching?

3. Under what conditions would it be more appropriate for students to be assessed by asking them to analyse or make their own video recording? How could this be done under assessment conditions?

4. Type in the name of your topic + video into Google.

- How many videos come up?
- What's their quality like?
- Could you use any of them in your teaching?
- If so, how would you integrate them into your course?
- Could you make a better video on the topic?
- What would enable you to do this?

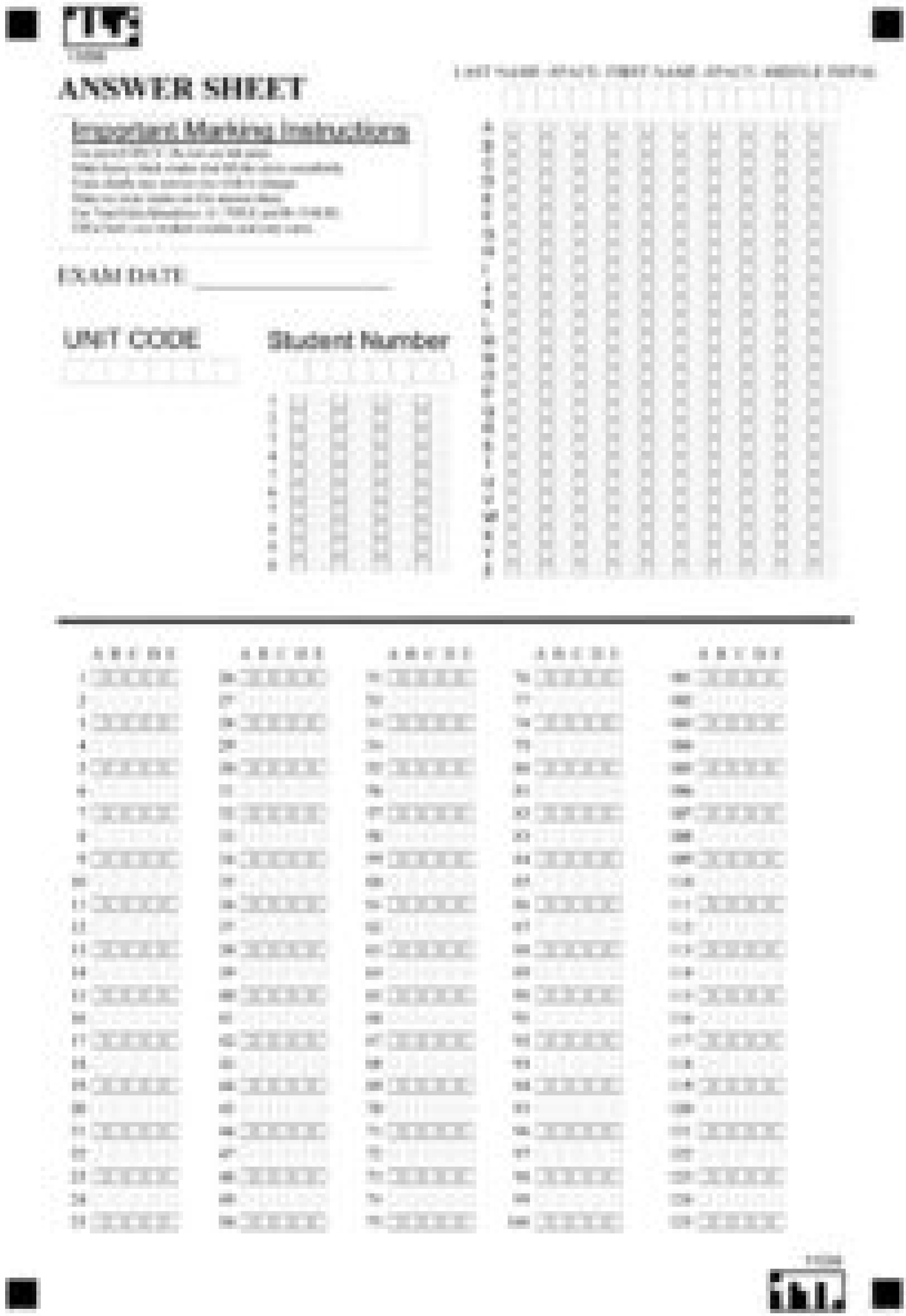
Here are some criteria I would apply to what you find:

- it is relevant to what you want to teach;
- it demonstrates clearly a particular topic or subject and links it to what the student is intended to learn;
- it is short and to the point;
- the example is well produced (clear camera work, good presenter, clear audio);
- it provides something that you could not do easily yourself;
- it is freely available for non-commercial use.

For feedback on this activity, and some further comments on the value of video, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=206

8.5 Computing


ANSWER SHEET

Important Marking Instructions

EXAM DATE

UNIT CODE

Student Number

Figure 8.5.1 A computer-marked assignment form (University of Western Australia)

8.5.1 A volatile and comprehensive medium

It is debatable whether computing should be considered a medium, but I am using the term broadly, and not in the technical sense of writing code. I prefer ‘computing’ to ‘ICTs’ (information and communications technologies). Computing is a medium while ICT refers more to the technologies used. The Internet in particular is an all-embracing medium that accommodates text, audio, video and computing, as well as providing other elements such as distributed communication and access to educational opportunities. Computing is also still an area that is fast developing, with new products and services emerging all the time. Indeed, I will treat recent developments in social media and some emerging technologies separately from computing, although technically they are sub-categories of computing. Once again, though, social media and some emerging technologies contain affordances that are not so prevalent in more conventional computing-based learning environments.

In such a volatile medium, it would be foolish to be dogmatic about unique media characteristics, but once again, the purpose of this chapter is not to provide a definitive analysis, but a way of thinking about technology that will facilitate an instructor’s choice and use of technology. The focus is: what are the pedagogical affordances of computing that are different from those of other media (other than the important fact that it can embrace all the other media characteristics)?

Although there has been a great deal of research into computers in education, there has been less focus on the specifics of its pedagogical media characteristics, although a great deal of interesting research and development has taken place and continues in human-machine interaction and to a lesser extent in artificial intelligence. Thus I am relying more on analysis and experience than research on the unique affordances or characteristics of computing as an educational medium in this section.

8.5.2 Presentational features

Figure 8.5.2 Screen size can be a real presentational limitation with smaller, mobile devices

Presentation is not really where the educational strength of computing lies. It can represent text and audio reasonably well, and video less well, because of the limited size of the screen (and video often has to share screen space with text), and the bandwidth/pixels/download time required. Screen size can be a real presentational limitation with smaller, mobile devices, although tablets such as the iPad are a major advance in screen quality.

However, unlike the other media, computing enables the end user to interact directly with the medium, to the extent that the end user (in education, the student) can add to, change or interact with the content, at least to a certain extent. Also, more controversially, computing can automatically collect end-user responses for analytics. In this sense, computing comes closer to a complete, if virtual, learning environment.

Thus in presentational terms computing can be used to:

- create and present original teaching content in a rich and varied way (using a combination of text, audio, video and webinars);
- enable access to other sources of secondary 'rich' content through the Internet;
- enable students to communicate both synchronously and asynchronously with the instructor and other students;
- structure and manage content through the use of web sites, learning management systems, video servers, and other similar technologies;
- create virtual worlds or virtual environments/contexts through technology such as animations, simulations, augmented or virtual reality, and serious games;
- set multiple-choice tests, automatically mark such tests, and provide immediate feedback to

learners;

- enable learners digitally to submit written (essay-type), or multimedia (project-based) assignments through the use of e-portfolios.

8.5.3 Skills development

Skills development in a computing environment will once again depend very much on the epistemological approach to teaching. Computing can be used to focus on comprehension and understanding, through a behaviourist approach to computer-based learning (present/test/feedback). However, the communications element of computing also enables more constructivist approaches, through online student discussion and student-created multimedia work.

Thus computing can be used (uniquely) to:

- develop and test student comprehension of content through computer-based learning/testing;
- develop computer coding and other computer-based skills;
- develop decision-making skills through the use of digitally-based simulations and/or virtual worlds;
- develop skills of reasoning, evidence-based argument, and collaboration through instructor-moderated online discussion forums;
- enable students to create their own artefacts/online multimedia work through the use of e-portfolios, thus improving their digital communication skills as well as assessing better what they have learned;
- develop skills of experimental design, through the use of simulations, virtual laboratory equipment and remote labs;
- develop skills of knowledge management and problem-solving, by requiring students to find, analyse, evaluate and apply content, accessed through the Internet, to real world problems;
- develop spoken and written language skills through both presentation of language and through communication with other students and/or native language speakers via the Internet
- collect data on end-user/student interactions with computer and associated equipment such as mobile phones and tablets for:
    - learning analytics, which can be used to identify weaknesses in the design of the teaching, and student success and failure regarding learning outcomes, including skills development, as well as identifying at-risk students,
    - adaptive learning, offering learners alternative routes through learning materials, providing an element of personalisation,
    - assessment (including monitoring),
    - automated or human feedback.

These affordances are in *addition* to the affordances that other media can support within a broader computing environment.

8.5.4 Strengths and weaknesses of computing as a teaching medium

Many teachers and instructors avoid the use of computing because they fear it may be used to replace them, or because they believe it results in a very mechanical approach to teaching and learning. This is not helped by misinformed computer scientists, politicians and industry leaders who argue that computers can replace or reduce the need for humans in teaching. Both viewpoints show a misunderstanding of both the sophistication and complexity of teaching and learning, and the flexibility and advantages that computing can bring to teaching.

So here are some of the advantages of computing as a teaching medium:

- it is a very powerful teaching medium in terms of its unique pedagogical characteristics, in that it can combine the pedagogical characteristics of text, audio, video and computing in an integrated manner;
- its unique pedagogical characteristics are useful for teaching many of the skills learners need in a digital age;
- computing can enable learners to have more power and choice in accessing and creating their own learning and learning contexts;
- computing can enable learners to interact directly with learning materials and receive immediate feedback, thus, when well designed, increasing the speed and depth of their learning;
- computing can enable anyone with Internet access and a computing device to study or learn at any time or place;
- computing can enable regular and frequent communication between student, instructors and other students;
- computing is flexible enough to be used to support a wide range of teaching philosophies and approaches;
- computing can help with some of the 'grunt' work in assessment and tracking of student performance, freeing up an instructor to focus on the more complex forms of assessment and interaction with students.

On the other hand, the disadvantages of computing are:

- many teachers and instructors often have no training in or awareness of the strengths and weaknesses of computing as a teaching medium;
- computing is too often oversold as a panacea for education; it is a powerful teaching medium, but it needs to be managed and controlled by educators;
- the traditional user interface for computing, such as pull-down menus, cursor screen navigation, touch control, and an algorithmic-based filing or storage system, while all very functional, are not intuitive and can be quite restricting from an educational point of view. Voice recognition and search interfaces such as Siri and Alexa are an advance, and have potential for education, but at present they have not been used extensively as educational tools (at least by instructors);
- there is a tendency for computer scientists and engineers to adopt behaviourist approaches to

the use of computing for education, which not only alienates constructivist-oriented teachers and learners, but also underestimates or underuses the true power of computing for teaching and learning;

- despite computing's power as a teaching medium, there are many aspects of teaching and learning that require direct interaction between a student and teacher – and between students – even or especially in a fully online environment (see Chapter 4, Section 4) . The importance of face-to-face, human-to-human contact is probably greater the younger or the less mature the learner, but there will still be many learning contexts where face-to-face contact is necessary or highly desirable even for older or mature learners (this is discussed more in Chapter 10, Section 4). The importance of frequent face-to-face teacher-student interaction is also probably less than many instructors believe, but more than many advocates of computer learning understand. It is not either/or, but finding the right balance in the right context.
- computing needs the input and management of teachers and educators, and to some extent learners, to determine the conditions under which computing can best operate as a teaching medium; and teachers need to be in control of the decisions on when and how to use computing for teaching and learning;
- to use computing well, teachers need to work closely with other specialists, such as instructional designers and computer scientists.

The issue around the value of computing as a medium for teaching is less about its pedagogical value and more about control. Because of the complexity of teaching and learning, it is essential that the use of computing for teaching and learning is controlled and managed by educators. As long as teachers and instructors have control, and have the necessary knowledge and training about the pedagogical advantages and limitations of computing, then computing is an essential medium for teaching in a digital age.

8.5.5 Assessment

There is a tendency to focus assessment in computing on multiple choice questions and 'correct' answers. Although this form of assessment has its value in assessing comprehension and for testing a limited range of mechanical procedures, computing also supports a wider range of assessment techniques, from learner-created blogs and wikis to e-portfolios. These more flexible forms of computer-based assessment are more in alignment with measuring the knowledge and skills that many learners will need in a digital age.

Activity 8.5 Identifying the unique pedagogical characteristics of computing

1. Take one of the courses you are teaching. What key presentational aspects of computing could be important for this course?

2. Look at the skills listed in Section 1.2 of this book. Which of these skills would best be developed through the use of computing rather than other media? How would you do this using computer-based teaching?

3. Under what conditions would it be more appropriate in any of your courses for students to be assessed by asking them to create their own multimedia project portfolios rather than through a written exam?

What assessment conditions would be necessary to ensure the authenticity of a student's work? Would this form of assessment be extra work for you?

4. What are the main barriers to your using computing more in your teaching? Philosophical? Practical? Lack of training or confidence in technology use? Or lack of institutional support? What could be done to remove some of these barriers?

For feedback on some of these questions, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=210

8.6 Social media

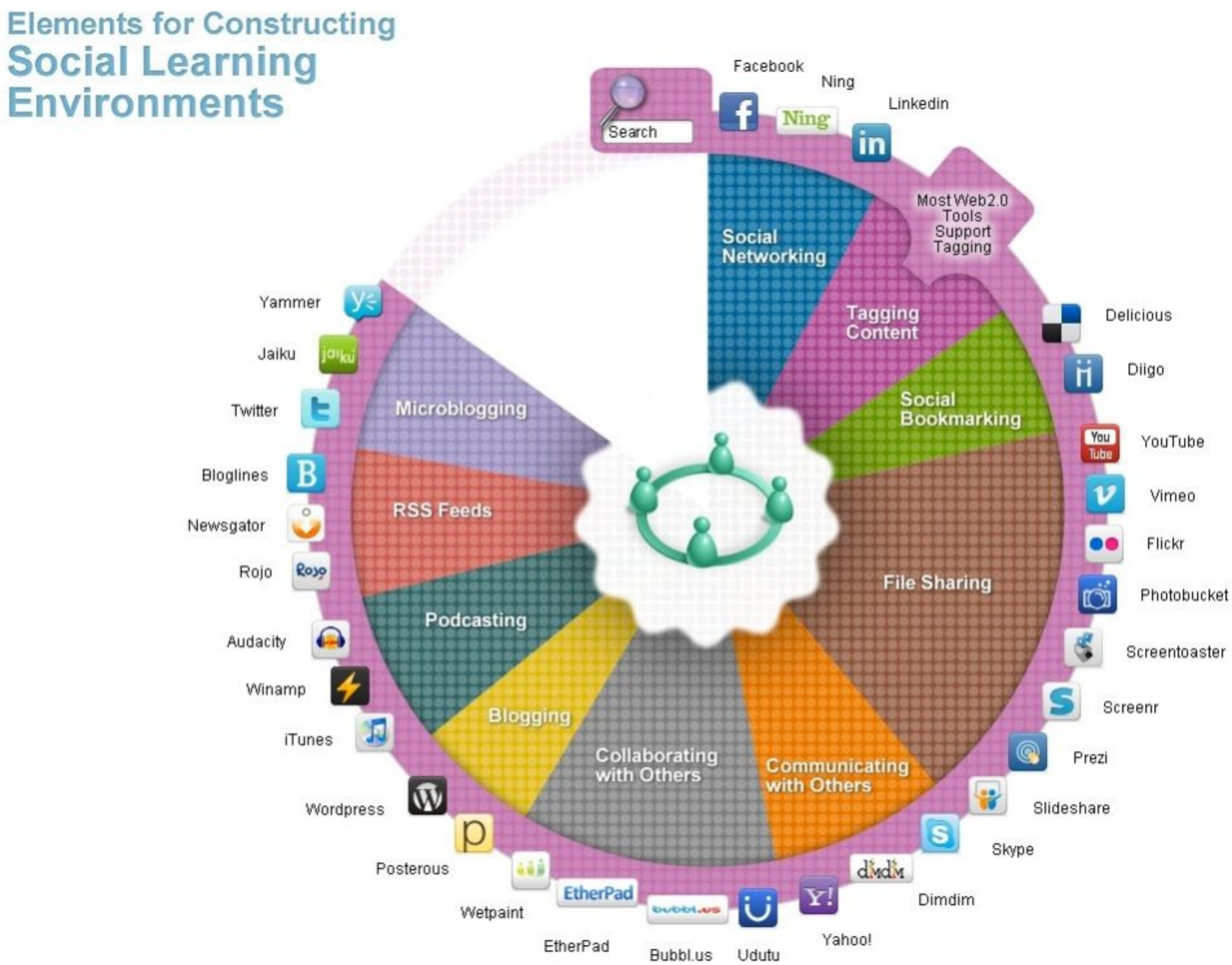


Figure 8.6.1 The range of social media in 2010
Image: © Abhijit Kadle, Upside Learning, 2010

Although social media are mainly Internet-based and hence a sub-category of computing, there are enough significant differences between educational social media use and computer-based learning or online collaborative learning to justify treating social media as a separate medium, although of course they are dependent and often fully integrated with other forms of computing. The main difference is in the extent of control over learning that social media offer to learners.

8.6.1 What are social media?

Around 2005, a new range of web tools began to find their way into general use, and increasingly into educational use. These can be loosely described as social media, as they reflect a different culture of web use from the former 'centre-to-periphery' push of institutional web sites.

Here are some of the tools and their uses (there are many more possible examples: click on each example for an educational application):

Type of tool	Example	Application
Blogs	Stephen's Web Online Learning and Distance Education Resources	Allows an individual to make regular postings to the web, e.g. a personal diary or an analysis of current events
Wikis	Wikipedia UBC's Math Exam Resources	An "open" collective publication, allowing people to contribute or create a body of information
Social networking	FaceBook LinkedIn	A social utility that connects people with friends and others who work, study and interact with them
Multi-media archives	Podcasts You-Tube Flikr e-portfolios MIT Open Course-Ware	Allows end users to access, store, download and share audio recordings, photographs, and videos
Multi-player games	RainbowSix Siege Dragonfly Propulsive Problematics	Enables players to compete or collaborate against each other or a third party/parties represented by the computer, usually in real time
Mobile learning	Mobile phones and apps, e.g. Soil TopARgraphy	Enables users to access multiple information formats (voice, text, video, etc.) at any time, any place

Figure 8.6.2 Examples of social media (adapted from Bates, 2011, p.25)

The main feature of social media is that they empower the end user to access, create, disseminate and share information easily in a user-friendly, open environment. Usually the only direct cost is the time of the end-user. There are often few controls over content, other than those normally imposed by a state or government (such as libel or pornography). One feature of such tools is to empower the end-user – the learner or customer – to self-access and manage data (such as online banking) and to form personal networks (for example through FaceBook). For these reasons, some have called social media the 'democratization' of the web, although at the same time one could argue that social media are now heavily commercialised through advertising.

In general, social media tools are based on very simple software, in that they have relatively few lines of code. As a result, new tools and applications ('apps') are constantly emerging, and their use is either free or very low cost. For a good broad overview of the use of social media in education, see Lee and McCoughlin (2011).

8.6.2 General affordances of social media

The concept of 'affordances' is frequently used in discussions of social media. McLoughlin & Lee (2011) identify the following 'affordances' associated with social media (although they use the term web 2.0) in general:

- connectivity and social rapport;
- collaborative information discovery and sharing;
- content creation;
- knowledge and information aggregation and content modification.

However, we need to specify more directly the unique pedagogical characteristics of social media.

8.6.3 Presentational characteristics

Social media enable:

- networked multimedia communication between self-organising groups of learners;
- access to rich, multimedia content available over the Internet at any time or place, as long as there is a suitable Internet connection;
- learner-generated multimedia materials;
- opportunities to expand learning beyond 'closed' courses and institutional boundaries.

8.6.4 Skills development

Social media,when well designed within an educational framework, can help with the development of the following skills (click on each to see examples):

- digital literacy: this web site was designed by the Library at the University of British Columbia to enable students to manage their digital identity;
- independent and self-directed learning: this is a Wiki built by UBC math graduate students to provide assistance to undergraduate students in their exams;

- collaboration/collaborative learning/teamwork; this was a class project to build Wikipedia entries on Latin American literature by a third year undergraduate class at UBC;
- internationalisation/development of global citizens;
- networking and other inter-personal skills;
- knowledge management; students at UBC use social media to research emerging technologies and build a possible educational business around the technology
- decision-making in specific contexts (for example, emergency management, law enforcement).

8.6.5 Strengths and weaknesses of social media

Some of the advantages of social media are as follows:

- they can be extremely useful for developing some of the key skills needed in a digital age, such as digital communication akills;
- they can enable teachers to set online group work, based on cases or projects, and students can collect data in the field using social media such as mobile phones or iPads;
- learners can post media-rich assignments either individually or as a group;
- these assignments when assessed can be loaded by the learner into their own personal learning environment or e-portfolios for later use when seeking employment or transfer to graduate school;
- learners can take more control over their own learning, as we have seen in connectivist MOOCs in Chapter 5 Section 3.2
- through the use of blogs and wikis, courses and learning can be thrown open to the world, adding richness and wider perspectives to learning.

However, many students are not, at least initially, independent learners (see Candy, 1991). Many students come to a learning task without the necessary skills or confidence to study independently from scratch (Moore and Thompson, 1990). They need structured support, structured and selected content, and recognized accreditation. The advent of new tools that give students more control over their learning will not necessarily change their need for a structured educational experience. However, learners can be taught the skills needed to become independent learners (Moore, 1973; Marshall and Rowland, 1993). Social media can make the learning of how to learn much more effective but still only in most cases within an initially structured environment.

The use of social media raises the inevitable issue of quality. How can learners differentiate between reliable, accurate, authoritative information, and inaccurate, biased or unsubstantiated information, if they are encouraged to roam free? What are the implications for expertise and specialist knowledge, when everyone has a view on everything? As Andrew Keen (2007) has commented, ‘we are replacing the tyranny of experts with the tyranny of idiots.’ Not all information is equal, nor are all opinions.

These are key challenges for the digital age, but as well as being part of the problem, social media can also be part of the solution. Teachers can consciously use social media for the development of knowledge management and the responsible use of social media, but the development of such knowledge and skills through the use of social media will need a teacher-supported environment. Many students look for structure and guidance in their learning, and it is the responsibility of teachers to provide it. We therefore need a middle ground between the total authority and control of the teacher, and the complete anarchy of the children roaming free on a desert island in the novel "Lord of the Flies" (Golding, 1954). Social media allow for such a middle ground, but only if as teachers we have a clear pedagogy or educational philosophy to guide our choices and use of the technology.

For more on social media, see Chapter 9, Section 8.

References

Bates, T. (2011) 'Understanding Web 2.0 and Its Implications for e-Learning' in Lee, M. and McCoughlin, C. (eds.) *Web 2.0-Based E-Learning* Hershey NY: Information Science Reference

Candy, P. (1991) *Self-direction for lifelong learning* San Francisco: Jossey-Bass

Golding, W. (1954) *The Lord of the Flies* London: Faber and Faber

Keen, A. (2007) *The Cult of the Amateur: How Today's Internet is Killing our Culture* New York/ London: Doubleday

Lee, M. and McCoughlin, C. (eds.) *Web 2.0-Based E-Learning* Hershey NY: Information Science Reference

Marshall, L. and Rowland, F. (1993) *A Guide to learning independently* Buckingham UK: Open University Press

McCoughlin, C. and Lee, M. (2011) 'Pedagogy 2.0: Critical Challenges and Responses to Web 2.0 and Social Software in Tertiary Teaching', in Lee, M. and McCoughlin, C. (eds.) *Web 2.0-Based E-Learning* Hershey NY: Information Science Reference

Moore,M. (1973) Toward a Theory of Independent Learning and Teaching, *Journal of Higher Education*, Volume 44, No. 9

Moore, M. and Thompson, M. (1990) *The Effects of Distance Education: A Summary of the Literature* University Park, PA: American Center for Distance Education, Pennsylvania State University

Activity 8.6 Identifying the unique pedagogical characteristics of social media

1. Take one of your courses, and analyse how social media could be used in your course. In particular:
   - what new learning outcomes could the use of social media help develop?
   - would it be better just to add social media to the course or to re-design it around social media?
2. I have offered only a cursory list of the unique pedagogical characteristics of social media. Can you think of others that have not already been covered in this section?
3. How does this chapter influence your views on students bringing their own devices to class?
4. Are you (still) skeptical about the value of social media in education? What do you see as its downsides?

For feedback on some of these questions and some more general points about social media in education, click on the podcast below.

An audio element has been excluded from this version of the text. You can listen to it online here: [*https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=213*](https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=213)

8.7.a Emerging technologies: serious games and gamification

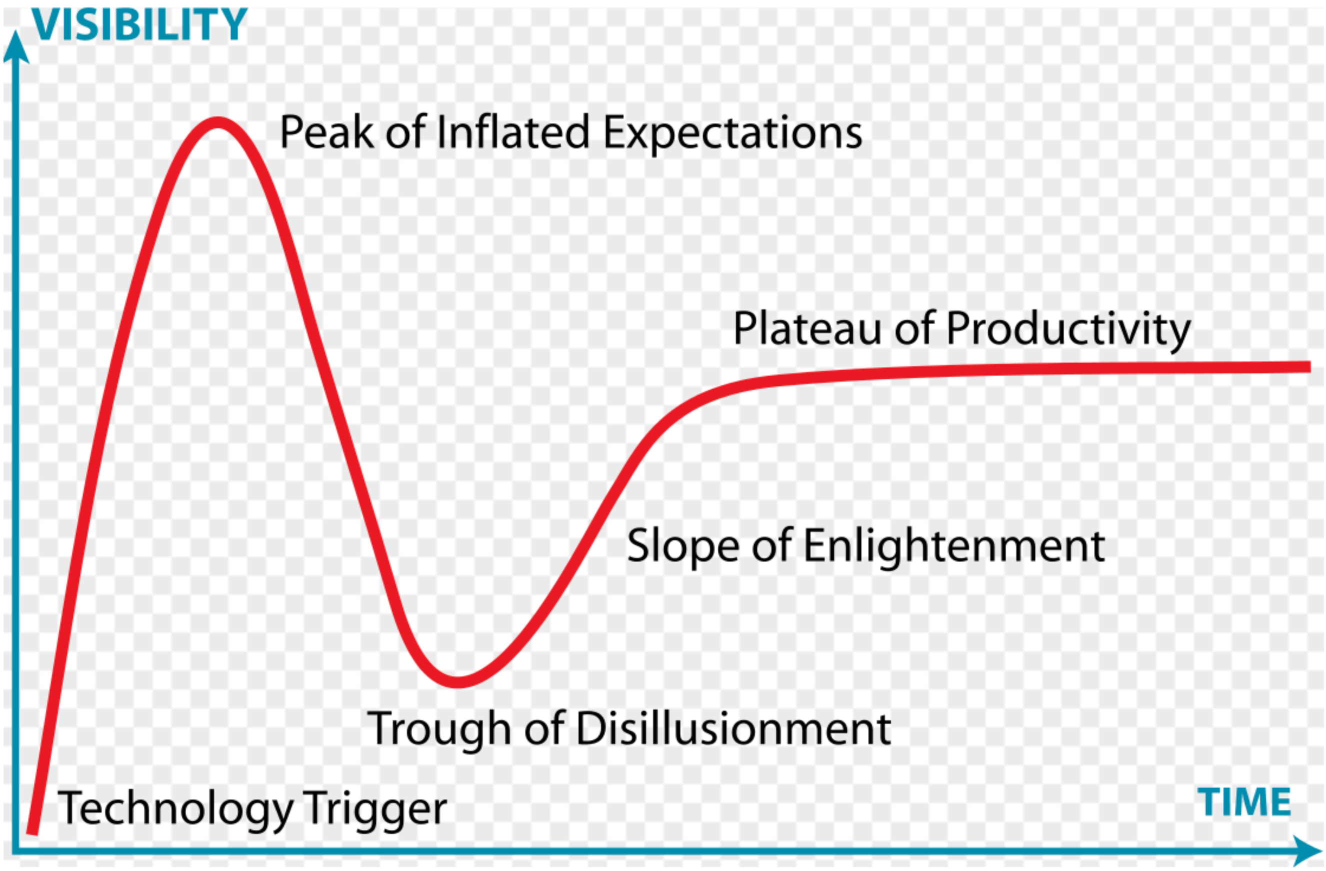


Figure 8.7a.1 The Gartner Hype Cycle for Emerging Technologies. Image: Wikimedia Commons, 2019

8.7a.1 The challenge of emerging technologies

It is not uncommon for a school principal, a college VP Education, or a university president to go to a conference and come back thrilled about the potential of the latest technology for teaching and learning. They are victims of what the consulting firm Gartner calls the hype cycle.

A new technology triggers excitement, the media picks up on it, the technology reaches a peak of inflated expectations, it starts to get more widely applied, disillusionment sinks in when faced with the realities of implementation, then the technology starts to find its niche as better understanding of its strengths and weaknesses emerge, eventually reaching a plateau of productivity, where it works well within its limits. MOOCs are an excellent example of this, with most knowledgeable observers in 2019 placing them towards the top of the slope of enlightenment or just emerging on to the plateau of productivity (see, for instance, Web Courseworks, 2018).

New technologies that have educational applications are constantly emerging. For instance in the first edition of this book (written in 2015) there was no extensive discussion of artificial intelligence, virtual reality or serious games, yet four years later they are now at the forefront of many discussions about the future of digital learning, which is why this section has been added. There are several other technologies that could be included, but many of these will be subsumed under artificial intelligence.

I will not be able to go into depth about any of these three technologies (each deserves its own book), but they are significant enough to bring them to your attention. Once again, I will focus on their potential affordances, although it must be recognised that with all emerging technology, it may take time to identify all their advantages and disadvantages.

8.7a.2 Serious games

Gartner's hype cycle is best considered as a way of thinking about emerging technologies, rather than as a factual representation of their development. For instance, serious games are more of a slow burner. There have never been vastly inflated expectations about their likely impact on education; indeed for a long time they have been written off as too expensive or not appropriate for serious education. However, that view has been changing in recent years.

8.7a.2.1 What are serious games?

There are several different definitions of serious games. I have included two definitions that cover both educational and corporate settings.

The Financial Times Lexicon offers the following definition:

> ***Serious games*** *are games designed for a purpose beyond pure entertainment. They use the motivation levers of game design – such as competition, curiosity, collaboration, individual challenge – and game media, including board games through physical representation or video games, through avatars and 3D immersion, to enhance the motivation of participants to engage in complex or boring tasks. Serious games are therefore used in a variety of professional situations such as education, training, assessment, recruitment, knowledge management, innovation and scientific research.*

Zhonggen (2019) provides this definition in his comprehensive review of the research on serious games:

> ***Serious games*** *are referred to as entertaining tools with a purpose of education, where players cultivate their knowledge and practice their skills through overcoming numerous hindrances during gaming.*

It is important to distinguish between serious games, game-based learning and gamification because of the differences in their purpose, approach and impact on learning.

- **Game-based learning** refers to *"the pedagogical approach of utilizing games in education"*

(Anastasiadis, Lampropoulos and Siakas, 2018)

- **Gamification** is defined as the *"use of game design elements in non-game contexts"* (Deterding et al., 2011)

Note that serious games are not necessarily digital. However, whether digital or not, they are governed by similar principles of of design, such as mechanics, dynamics and aesthetics (Hunicke et al., 2004).

8.7a.2.2 Why use serious games?

The main reasons offered for using games in education are to:

- improve students' motivation to learn,
- engage learners more deeply in the learning process,
- improve learning outcomes,
- improve attendance and participation.

However, an extensive review of the literature conducted by Dichev and Dicheva in 2017 found that research remains inconclusive on these assumptions. They also found that:

- the practice of gamifying learning has outpaced researchers' understanding of its mechanisms and methods;
- insufficient high quality evidence exists to support the long-term benefits of serious games in an educational context;
- a limited understanding that how to gamify an activity depends on the specifics of the educational context.

Dichev and Dicheva do conclude though that their study does not mean that gamification *cannot* be used successfully in a learning context; rather better designs and more research are needed.

Other research tends to be more positive. Hamari et al. (2016) and Clark et al. (2016) found sufficient evidence that, when well designed, and under the right conditions, serious games significantly enhanced student learning relative to nongame conditions.

Zhonggen (2019) found among the ' *huge number of findings in serious game assisted learning, most …are supportive, coupled with a few negative results*.' However, the main benefits tended to be in the affective domain (student 'happiness' and improved social learning and communication) rather than in immediately improved cognitive learning outcomes, except in science (improved retention and holistic understanding), architecture and medicine/health. In the latter, games helped children with autism to learn. Zhonggen reports:

'*Generally, … medical science has recently witnessed clearly more studies on serious game assisted learning compared with other fields and most of studies in medical science supported use of serious games*.'

8.7a.2.3 Examples of serious games

The Digital Education Strategies team (DES) at Ryerson University has participated in the development of several virtual games simulations including:

Games-based learning: Ryerson University's Academic Integrity office, in collaboration with DES, developed a digital learning game called Academic Integrity in Space to motivate students to complete self-study training and to learn about the academic integrity, values and behaviours expected of students. The game development team's objectives were to create a well-designed digital game to meet the learning objectives of making choices, learning by doing, and experiencing situations first-hand, through role-playing.

Figure 8.7a.2 Academic Integrity game, Ryerson University. Click on image to play game

Video Game Simulation: A Home Visit game promotes the application of knowledge and skills related to establishing a therapeutic nurse-client relationship and completing a mental health assessment. Students assume the role of a community health nurse assigned to complete a home visit. Video is used to create an authentic experience, and students have to respond to particularly challenging situations, based on procedures taught elsewhere in the course. Depending on the student response, further video segments are used to provide feedback and to continue to scenarios to test the next appropriate procedure. Professors from Centennial College, Ryerson University and George Brown College are developing a series of open access video game simulations through a virtual healthcare experience portal.

Figure 8.7a.3 Home visit video game, Ryerson University. Click on image to see video.

Gamification: Kyle Geske, an instructor at Red River College, Winnipeg, has developed a games-based approach to teaching web design. In his elective course on Full Stack Development of web sites, students have to design a project according to principles provided by the instructor. At each stage of the design process within the project students gain marks, and compete throughout the course with other students, who can see the marks at each stage for all the other students. A student can 'level up' their mark by going back and improving on each of the steps of the design. This approach has resulted in an increase in the average end of course grade compared to the more traditional classroom methods. Note this course involves elements of gaming, such as competition, and 'levelling up', without using games themselves.

8.7a.2.4 Designing serious games

Zhonggen's review of the literature (2018) highlighted the importance of the following in effective games design:

- backstory and production,
- realism,
- artificial intelligence and adaptivity,
- interaction,
- feedback and debriefing,

- ease of use,
- surprises.

As a result of this prior research, and under the leadership of Naza Djafarova, the Digital Education Strategies team (DES) at the G. Raymond Chang School for Continuing Education at Ryerson University in Toronto developed a practical design guide (2018) for serious game-based learning, based on a games research process. This guide is an open educational resource and is designed to serve three purposes:

- provide a conceptual framework to guide game design within multidisciplinary teams in higher education;
- offer a methodological guide to running a participatory workshop focused on the pre-production phase of the game development process;
- share resources by making the guide and the design of the workshop available as open educational resources.

The games design methodology is an adaptation of the Design, Play, and Experience (DPE) Framework, developed by Winn (2009). The game development process consists of three phases:

- the **pre-production phase**, during which brainstorming among team members takes place, leading to the design of a paper prototype of the game;
- the **production phase**, when the game is developed; and
- the **post-production phase**, during which the game is tested and refined before being offered to learners.

The Digital Education Strategies team utilized the Design, Play and Experience model to identify four essential educational game elements:

- **Learning** refers to the content to be learned by players through the game with specific and measurable learning outcomes;
- **Storytelling** refers to the background story of the game and includes a description of the character(s), the setting, and the ultimate goal of the game;
- **Gameplay** refers to the way in which the player interacts with the game, or with other players (if a multiplayer game). It encapsulates the type of activity (e.g., puzzle, trivia, etc.) found in the game;
- **User Experience** refers to the player's emotions and attitudes while playing the game, as well as how the player interacts with the game.

Figure 8.7a.4 provides a more detailed representation of the various components of the Ryerson serious game design methodology.

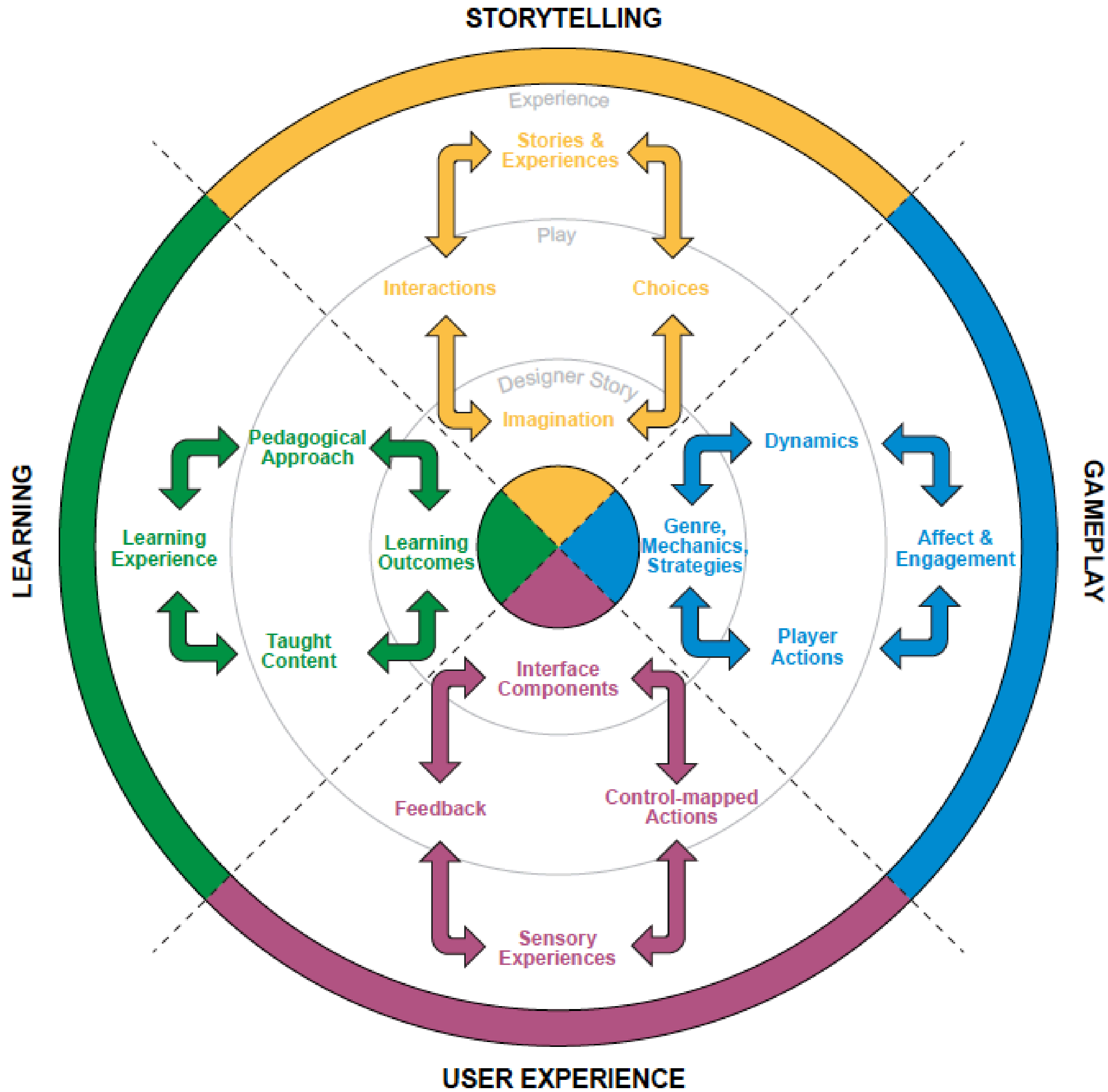


Figure 8.7a.4 Serious game design methodology, from Djafarova er al., 2018

The Digital Education Strategies' report suggests a workshop approach to serious games design, in which all the key stakeholders (content experts, instructional designers, media producers, and so forth) are involved. Brainstorming in the early stages of design is considered essential. Also built into the design is testing and user feedback before releasing the game.

There are probably other effective design approaches, but the above approach highlights the essential multi-disciplinary approach of serious games design.

8.7a.2.5 Unique educational characteristics of serious games

These still need to be clearly identified and validated, but two rather different claims are made for serious games:

- the first is that they can increase student motivation and engagement;

- the second is that games can be particularly useful for developing the following skills:
    - problem solving
    - communication skills
    - decision-making

within specific contexts that approximate to the real world.

8.7a.2.6 Strengths and weaknesses

In terms of the hype cycle, serious games are somewhere along the slope of enlightenment. There is not the research yet to move them into the plateau of productivity, but there is enough evidence from practice that they are gaining traction in education.

However, there are a number of reasons why serious games have not become more prevalent in education. The first is philosophical. There is resistance to the idea of games because some see serious games as an oxymoron. How can a game be serious? Many instructors fear that learning could easily be trivialised through games or that games can cover only a very limited part of what learning should be about – it can't all be fun; that is not the purpose of education. Similarly, many professional game designers are not interested in developing serious games because they fear that if the primary goal is learning and not enjoyment, a focus on education risks killing the main element of a game: being fun to play.

A more pragmatic reason is cost and quality. The assumed high cost of video games has so far acted as a deterrent in education. There is no obvious business plan to justify the investment. The best selling video games for entertainment for instance cost millions of dollars to produce, on a scale similar to mainstream movies. If games are produced cheaply, won't the quality – in terms of production standards, narrative/plot, visuals, and learner engagement – suffer, thus making them unattractive for learners?

However, probably the main reason serious games are not more prevalent in education is that most educators simply do not know enough about serious games: what exists, how they can be used, nor how to design them. Experience suggests that there are many possible and realistic applications for serious games in education. There is some evidence (see for instance, Arnab, 2014) that effective serious games can be developed at very little cost.

Nevertheless, there is always a high degree of risk in serious games design. There is no sure way of predicting in advance that a new game will be successful. Some low-cost simple games can work well; some expensively produced games can easily flop. This means careful testing and feedback during development. So serious games should be more seriously considered for teaching in a digital age – but their application needs to be done carefully and professionally.

Thus serious games are a relatively high risk, high return activity for teaching in a digital age. Success in serious games means building on best practices in games design, both within and outside education, sharing costs and experience, and collaboration between institutions and games development teams. However, as teaching in a digital age moves more and more towards high-level skills development, experiential learning, and problem-solving in real world contexts, serious games are bound to play an increasingly important role.

References

Anastasiadis, T. et al. (2018) *Digital Game-based Learning and Serious Games in Education* International Journal of Advances in Scientific Research and Engineering, Vol. 4, No. 12

Arnab, S. et al. (2014) Mapping learning and game mechanics for serious games analysis. *British Journal of Educational Technology*, Vol. 46, No. 2, pp 391–411

Deterding, S. et al. (2011) Gamification: Using Game Design Elements in Non-Gaming Contexts in *PART 2-Proceedings of the 2011 annual conference extended abstracts on Human Factors in Computing Systems* Vancouver BC: CHI

Dichev, C. and Dicheva, D. (2017) Gamifying education: what is known, what is believed and what remains uncertain: a critical review *International Journal of Educational Technology in Higher Education*, Vol. 14, No. 9

Djafarov, N. et el. (2018) *The Art of Serious Game Design* Toronto ON: Chang School of Continuing Studies, Ryerson University

Hunicke, R., LeBlanc, M., & Zubek, R. (2004). MDA: A formal approach to game design and game research, in *Proceedings of the Challenges in Game AI Workshop*, San Jose CA: Nineteenth National Conference on Artificial Intelligence

Winn, B. (2009) 'The design, play and experience framework', in R. Ferdig (Ed.), *Handbook of research on effective electronic gaming in education.* Hershey, PA: IGI Global (pp. 388–401).

Zhonggen, Y. (2019) A Meta-Analysis of Use of Serious Games in Education over a Decade, *International Journal of Computer Games Technology*, vol. 2019, Article ID 4797032

Activity 8.7a Using and designing seriou games

1. What are your views on serious games and gamification? Do you think they are useful approaches to teaching in a digital age, or are they just a gimmick that avoids the real challenges of learning, especially at a higher education level?
2. Take a look at the Ryerson University's 'Art of Serious Games Design'. Is this a model that could be used at your institution? Who would lead this effort? With what learning goals or outcomes could this process help in your program? What would be the main barrier to doing this?
3. What other approaches could be taken to getting serious games used in your teaching?

Click on the podcast below for feedback on this activity.

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=1313

8.7.b. Emerging technologies: virtual and augmented reality

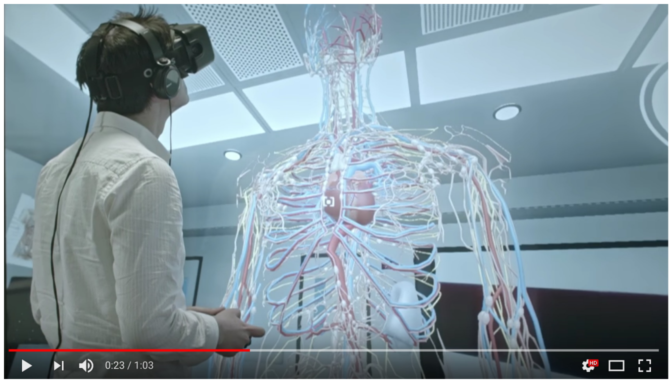


Figure 8.7.b.1 Video by Atelier 101. Click on image to see video

As with serious games, virtual and augmented reality are technologies that have been around for some time while making a relatively small impact on education in their earlier development. However more recent technological developments that have moved virtual worlds from two-dimensions (such as Second Life) into three-dimensional, deeply immersive environments have brought more attention to their potential in education (for a good overview of the history and potential of augmented and virtual reality in education, see Elmqadden, 2019).

8.7b.1 What are virtual/augmented/mixed reality?

A simple definition of these technologies is '*human immersion in a synthetic world*' (Seidel and Chatelier, 1997). The Franklin Institute provides the following more detailed definitions that attempt to distinguish between the different types of 'synthetic' worlds:

> ***Augmented reality (AR)*** *adds digital elements to a live view often by using the camera on a smartphone. Examples of augmented reality experiences include Snapchat lenses and the game Pokémon Go.*
>
> ***Virtual reality (VR)*** *implies a complete immersion experience that shuts out the physical world. Using VR devices such as HTC Vive, Oculus Rift or Google Cardboard, users can be transported into a number of real-world and imagined environments such as the middle of a squawking penguin colony or even the back of a dragon.*
>
> *In a* ***mixed reality (MR)*** *experience, which combines elements of both AR and VR, real-world and*

> *digital objects interact. Mixed reality technology is just now starting to take off, with Microsoft's HoloLens one of the most notable early mixed reality apparatuses.*

I will use the term 'immersive technologies' for all these technologies. However, verbal descriptions will always be somewhat inadequate in describing what are essentially multi-sensory experiences, combining vision, hearing and movement. These technologies are something that need to be experienced rather than explained if they are to be better understood.

8.7b.2 Why use immersive technologies?

There are several reasons why these technologies are beginning to be used more in education:

- the recent development of relatively low cost and easily wearable end-user technology (headsets in particular);
- deep immersion into three-dimensional, highly realistic learning environments that are strongly compelling/motivating for the end user;
- the ability for end users to manipulate objects within the three dimensional environment;
- more powerful cloud computing technology that allows for the development of more complex and more realistic learning environments, combined with more advanced developments in mobile technologies and high-speed wireless networks;
- the potential for developing a range of skills and knowledge that would be difficult, impossible or dangerous in real-world environments.

8.7b.3 Examples of immersive environments in education

Looking at the challenges above, it may be wondered why anyone would bother with immersive technologies in education. However, the potential benefits have barely been explored. I provide examples here that demonstrate both the potential benefits and how some immersive environments can be developed relatively easily.

8.7b.3.1 Virtual reality

In the Department of Chemistry at the University of Bristol in England, Dr. David Glowacki and his team in their VR laboratory created an interactive molecular dynamics modelling tool in the form of Nano Simbox VR, which allowed anyone to visit and play within the invisible molecular world (O'Connor et al., 2018). The main aim of this particular project was to provide an intuitive feeling of the way molecules operate in multiple dimensions to enable researchers and students to have a better understanding of how nano worlds operate, leading to better hypotheses for testing within this particular domain.

As the authors state in the article:

> *From a modeling perspective, the nanoscale represents an interesting domain, because the objects of study (for example, molecules) are invisible to the naked eye, and their behavior is governed by physical forces and interactions significantly different from those forces and interactions that we encounter during our day-to-day phenomenological experience. In domains like this, which are imperceptible to the naked*

> *eye, effective models are vital to provide the insight required to make research progress….molecular systems typically have thousands of degrees of freedom. As a result, their motion is characterized by a complicated, highly correlated, and elegant many-body dynamical choreography, which is nonintuitive compared to the more familiar mechanics of objects that we encounter in the everyday physical world. Their combined complexity, unfamiliarity, and importance make molecules particularly interesting candidates for investigating the potential of new digital modeling paradigms.*

Glowacki and his team in Science Advances (O'Connor et al., 2018) describe how the VR app enabled researchers to:

- easily "grab" individual C_{60} atoms and manipulate their real-time dynamics to pass the C_{60} back and forth between each other.
- take hold of a fully solvated benzylpenicillin ligand and interactively guide it to dock it within the active site of the TEM-1 β-lactamase enzyme (with both molecules fully flexible and dynamic) and generate the correct binding mode (33), a process that is important to understanding antimicrobial resistance
- guide a methane molecule (CH_4) through a carbon nanotube, changing the screw sense of an organic helicene molecule,
- tie a knot in a small polypeptide [17-alanine (17-ALA)

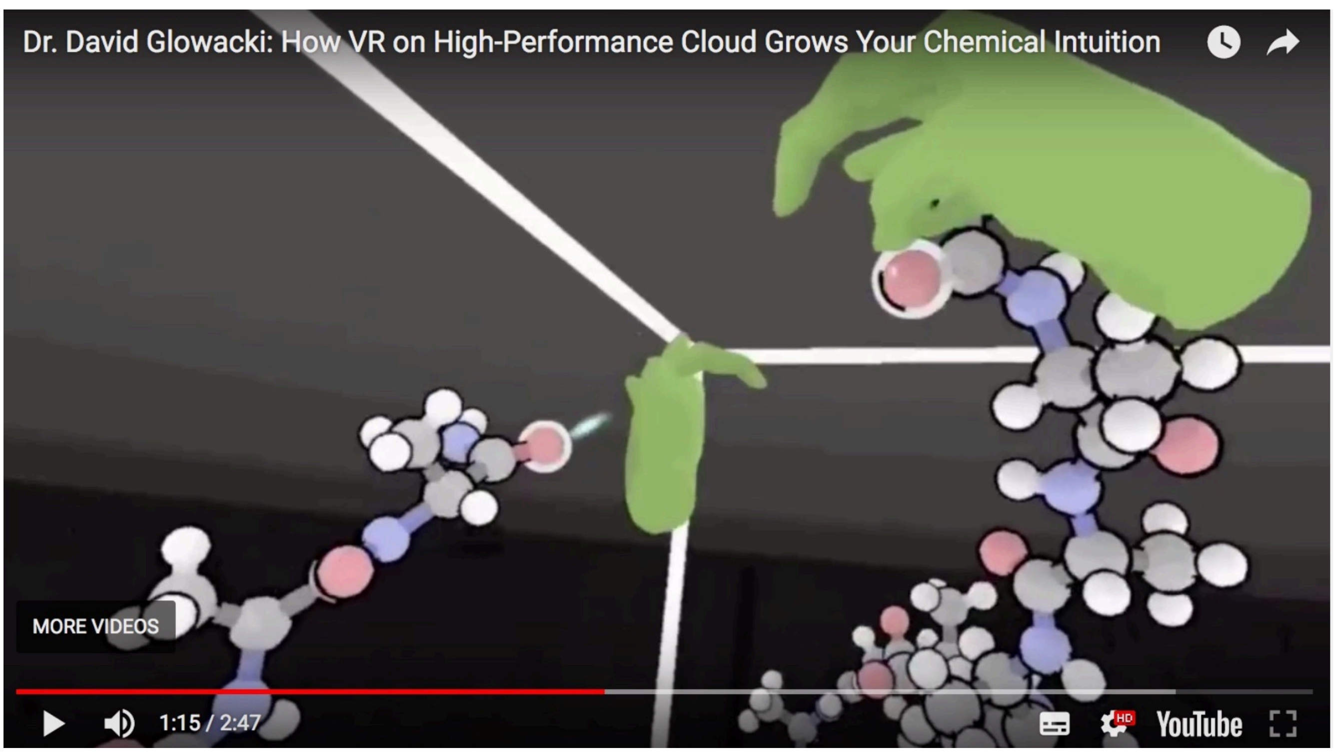


Figure 8.7b.2 The use of virtual reality to foster chemical intuition Dr. David Glowacki, University of Bristol. Click on the image to see the video.

Building dynamic models that operate not only in real time but also in three dimensions can require not only specialized virtual reality equipment, but more importantly massive amounts of computing power to handle the visual representation and modelling of highly complex, interactive dynamic molecular processes. However, through the use of cloud computing and faster networks, building such models has now become a reality, enabling not only such models to be represented but allowing some degree of real-time manipulation by researchers in different locations but within the same time-frame. The main advantage of the use of a cloud platform is to allow the scaling up of modelling from simple to much more complex dynamic nano interactions and the synchronous sharing of the virtual reality experience with multiple users.

Not all applications of VR though need massive computing power. Other exploratory uses of virtual reality are

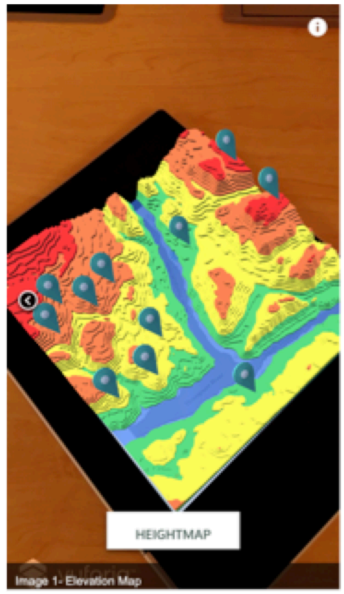
- for students to find their way round a complex campus
- in architecture/space planning, allowing clients to understand in three dimensions the final 'look' of a building design by virtually walking through it (Brandaõ et al., 2018), Google Blocks, a free software program for developing 3D models, is one tool that can support this kind of application.
- in music: at the University of British Columbia, Dr. Jonathon Girard is exploring the use of VR for learning how to conduct an orchestra (the virtual orchestra 'responds' to the hand gestures of the conductor)
- in medicine and health: researchers at UBC are exploring the use of VR for pain management

8.7b.3.2 Augmented reality

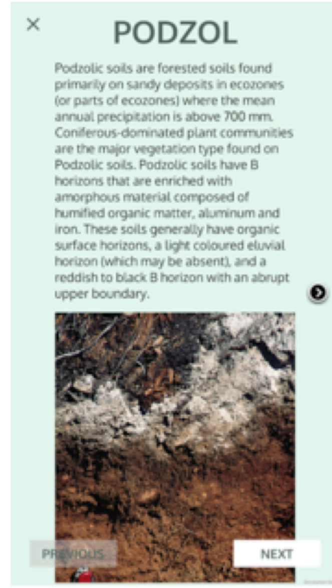
Augmented reality is a simpler immersive technology than virtual reality, often based on apps for mobile phones. For instance, students in the University of British Columbia's APBI 200 Introduction to Soil Science learn about the effects of topography on the formation of different soil types. The department has developed the Soil TopARgraphy app, which allows viewing and manipulating a terrain model in the Kamloops region of British Columbia. Students learn how topography impacts the distribution of soil orders through its effects on microclimate (i.e. temperature and water). Students are able to view the terrain model with a color-coded elevation map or a satellite image on their mobile phones. Furthermore, students can tap on flags to read about different soil orders, view images, and take a self-study quiz to reinforce their understanding.

For this project, UBC's Emerging Media Lab built two mobile apps, an AR viewer for students (Android and iOS) and an editor for the instructor (Android). The AR viewer is the app described above to view a predefined terrain. The instructor can customize contents with the supplementary editor app. They can update soil location on terrain, description, image, and quizzes

Target map



Height map



Information box

Figure 8.7.c.3 Screen images from Soil TopARgraphy

Other examples of AR applications from UBC:

- Dr. Patrick Walls is developing a mobile phone-based app that helps students visualise multivariable functions, in order to learn the underlying concepts at a deeper level much more quickly.
- in GEOG 498: Geographies in the Middle East, students learn about the history of the Syrian Civil War and its ongoing developments. The instructor, Dr. Siobhán McPhee, has developed a mobile app that follows the stories of five Syrian refugees who eventually reached Vancouver. Students are forced to make choices (or given a lack of choice), wait, and run/walk with the app to be able to progress the narrative of the experience. The purpose of this project is to evoke empathy and help students understand the emotional consequences of the Syrian Civil War. This app also applies some gamification principles as well.

8.7b.4 Designing immersive educational environments

This technology is so recent that there are few or no accepted best practices developed yet for educational use. Most educational applications to date have been deliberately exploratory in nature. However, there are several stages of development required that will apply to all educational applications of these technologies:

- identify start-up costs and possible sources of funding: this is not likely to be a cheap exercise, at least initially; for this reason, several universities, such as the University of British Columbia, and Drexel University, have set up their own emerging technologies research labs to experiment with educational applications;

- define learning outcomes/objectives: what is the learner expected to learn? In the early stages of development this may be both a brainstorming exercise (preferably including students/end-users) and an iterative process, because the full potential of the technology is not always clear in first applications. In particular, the instructor needs to have a clear vision of what might be possible using an immersive technology. Thus some familiarity with the technology is essential before starting design;
- determine where the use of this technology fits within the overall design of a course/program: in other words, what knowledge and skills will be developed within the immersive environment, and how does this integrate with what is being taught in the rest of the course/program?
- decide between using an existing immersive design/learning environment that can be applied or adapted relatively easily for 'local' use; or designing a new immersive environment from scratch. The latter is obviously more expensive and time-consuming and will require a high level of expertise; as a result the pay-off from design from scratch (improved learning outcomes/return on investment) needs to be worth the effort;
- choice of appropriate/affordable technology. Headsets or mobile apps are the least expensive part of the use of immersive technologies. The main cost will be in developing or adapting the 'augmented' or 'virtual' world. However, as with serious games, there can be an intermediary step, where an existing 'world' can be licensed and adapted for local use (see for instance, Lightwave). In some cases, open access immersive worlds are available for use or adaptation, although they are not common (see OpenSimulator, Art of Illusion, or MayaVerse, for examples.). Often students can be used to help with programming and design of the environment, as part of their studies, but they will need direction as well as the opportunity to offer creative ideas. Truly interactive virtual worlds where learners/users make decisions and the consequences are 'programmed' into the learning environment may require large amounts of computing capacity, such as cloud computing;
- to be effective, the VR environment has to be as authentic or realistic as possible. This means paying as much attention to creating the specific learning context. It will be necessary to decide what parts of the learning will best be done outside the VR/AR experience, and which inside. For instance, the procedures for monitoring the state of a nuclear reactor, for identifying critical incidents, for deciding whether or not or when to shut down the reactor, and for actually shutting down the reactor must also be built in to the learning process. Most of this may be taught outside the VR context, but VR can be used to test or develop the skills of applying this knowledge in a realistic, challenging context. In other words, the VR experience needs to be embedded within a broader learning context or environment;
- testing and adaptation: design, at least initially, needs to be an iterative process, where ideas are developed and tried, and feedback received and incorporated into the design;
- assessment: this can be a particular challenge, particularly if new learning outcomes result from the experience. How can assessment best capture what students have learned? Will assessment take place within the 'virtual' world, in the real world, or in some other way (and if so, how authentic will such an assessment be)?

- in what ways could the new immersive environment be scaled up to enable costs to be recovered?
- evaluation: what is the best way to evaluate the success or limitations of the design and application of the immersive world? How best to disseminate the knowledge and experience gained?

These may appear formidable challenges, but the potential benefits could be considerable.

8.7b.5 The unique characteristics of immersive technologies

The development of fully immersive technologies is so recent that it is premature to try to identify all the educational affordances that are unique to this medium. New applications are being explored all the time. Most of the evidence is qualitative, based on people's personal experience of using the technology. Empirical evidence that validates specific educational affordances of VR/AR in terms of improved learning outcomes is currently lacking. However, the *potential* of VR/AR in terms of assisting learning can be identified.

First of all, many of the affordances or educational characteristics of other media, and in particular video, will apply to VR and AR, but often more intensely, because of the immersive experience.

Virtual and augmented reality applications can provide students with a deep, intuitive understanding of phenomena that are otherwise difficult if not impossible to achieve in other ways. This enables students who often struggle with the abstract nature of an academic subject to understand in more concrete terms what the abstractions mean or represent. This intuitive understanding is critical not only for deeper understanding but also for breakthroughs in research and applications of science.

Educational applications where the cost of alternative or traditional ways of learning are too expensive or too dangerous, will be particularly suitable for virtual reality applications. Examples might be emergency management, such as shutting down an out-of-control nuclear reactor, or defusing a bomb, or managing a fire on an oil tanker, or exploring inside the physical structure of a human brain. In particular, VR would be appropriate for learning in contexts where real environments are not easily accessible, or where learners need to cope with strong emotions when making decisions or operating under pressure in real time.

AR, which is often easier to design and implement, enables learners to practice applications of knowledge in semi-realistic contexts.

However, at the time of writing we are just beginning to understand the potential of this medium. Over time, the educational affordances of this medium will become much clearer.

8.7b.6 Strengths and weaknesses

VR is not just a fad that will disappear. There are already a large number of commercial applications, mainly in entertainment and public relations, but also increasingly for specific areas of education and training. There is already a lot of excellent, off-the-shelf software for creating VR environments, and the cost of hardware is dropping rapidly (although good quality headsets and other equipment are still probably too expensive for required use by large numbers of students).

The fields of application of this technology are unlimited: training in the use of complex equipment, simulation of surgical procedures, architectural design testing, the reconstruction of sites in archeology, virtual museum visits, treatment of pain and phobias, and many other possibilities.

To enable the more emotional aspects of decision making to be handled, the immersive experience needs to be realistic. This will probably require high quality media production. Thus VR may often need to be combined with simulation design, quality media production and powerful computing to be educationally effective, again pushing up the cost. For these reasons, medicine is a particularly likely area for development, where traditional training costs are really high or where training is difficult to provide with real patients.

Once again, though, applications will tend to be very specific to the needs of a particular subject area. This means designers must include subject specialists with a deep understanding of the field who can combine the power of the technology with the needs of learners in a particular learning context. VR in particular requires instructors with imagination and creativity, working with other professionals such as media producers, learners themselves, as well as specialists in VR design.

What has inhibited widespread educational use of earlier two-dimensional VR developments such as Second Life has been the high cost and difficulty of creating the graphics and contexts for learning. Thus even if the hardware and software costs for VR are low enough for individual student use, the high production costs of creating realistic educational contexts and scenarios are likely to inhibit its general use.

Some caution is also needed in assuming that people will behave the same in real life as they do in VR environments. Gallup et al. (2019) found a major difference in the influence of social factors within real-world and virtual environments: social cues in actual reality appear to dominate and supersede those in VR. One of the authors, Alan Kingstone, concluded:

> *"Using VR to examine how people think and behave in real life may very well lead to conclusions that are fundamentally wrong. This has profound implications for people who hope to use VR to make accurate projections regarding future behaviours. For example, predicting how pedestrians will behave when walking amongst driverless cars, or the decisions that pilots will make in an emergency situation. Experiences in VR may be a poor proxy for real life."*
>
> Rolfsen, 2019

This means we need more experimentation. This is still a relatively new technology, and there may be very simple ways to use it in education that are not costly and meet needs that cannot be easily met in traditional teaching or with other existing technology. For this to happen, though, educators, software developers, and media producers need to come together to play, experiment, test and evaluate.

Nevertheless, VR and AR are exciting technologies with the potential to change radically conventional learning processes.

References

Brandaõ, G. et al. (2018) Virtual Reality as a Tool for Teaching Architecture in *Design, User Experience, and Usability: Designing Interactions* Las Vegas NV: Proceedings of 7th International Conference, DUXU 2018, held as Part of HCI International 2018,

Connolly, B. (2018) How virtual reality is transforming learning at the University of Newcastle, CIO, 8 March

Elmqadden, N. (2019) Augmented Reality and Virtual Reality in Education: Myth or Reality? *International Journal of Emerging Technologies in Learning*, Vol. 14, No. 3

Gallup, A. et al. (2019) Contagious yawning in virtual reality is affected by actual, but not simulated, social presence Nature: Scientific Reports, 22 January

O'Connor, M. et al. (2018) Sampling molecular conformations and dynamics in a multiuser virtual reality framework, *Science Advances*, Vol. 4, No.6, 29 June

Rolfson, E. (2019) People think and behave differently in virtual reality than they do in real life *UBC News, 24 January*

Seidel, R. and Chatelier, P. (1997) *Virtual Reality, Training's Future?: Perspectives on Virtual Reality and Related Emerging Technologies* Berlin: Springer Science & Business Media

Activity 8.7.b Using and designing VR and AR

- Go to YouTube and type in Virtual Reality in the search box (I found about 20 examples). Do any of these videos suggest a way in which VR could be used in the area in which you are teaching (assuming that the resources were available)?
- What are the advantages of VR over video? What can it do educationally that would be more difficult to do using video?
- Your head of department has just come back from a conference and has seen a demonstration of VR. He is very excited and wants the department to 'become the leader in the state in the use of VR for teaching.' What questions would you ask of him? (Assume you will still keep your job afterwards!)

Click on the podcast below for my feedback and my personal views on VR for teaching and learning.

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=1544

8.7c Emerging technologies: artificial intelligence

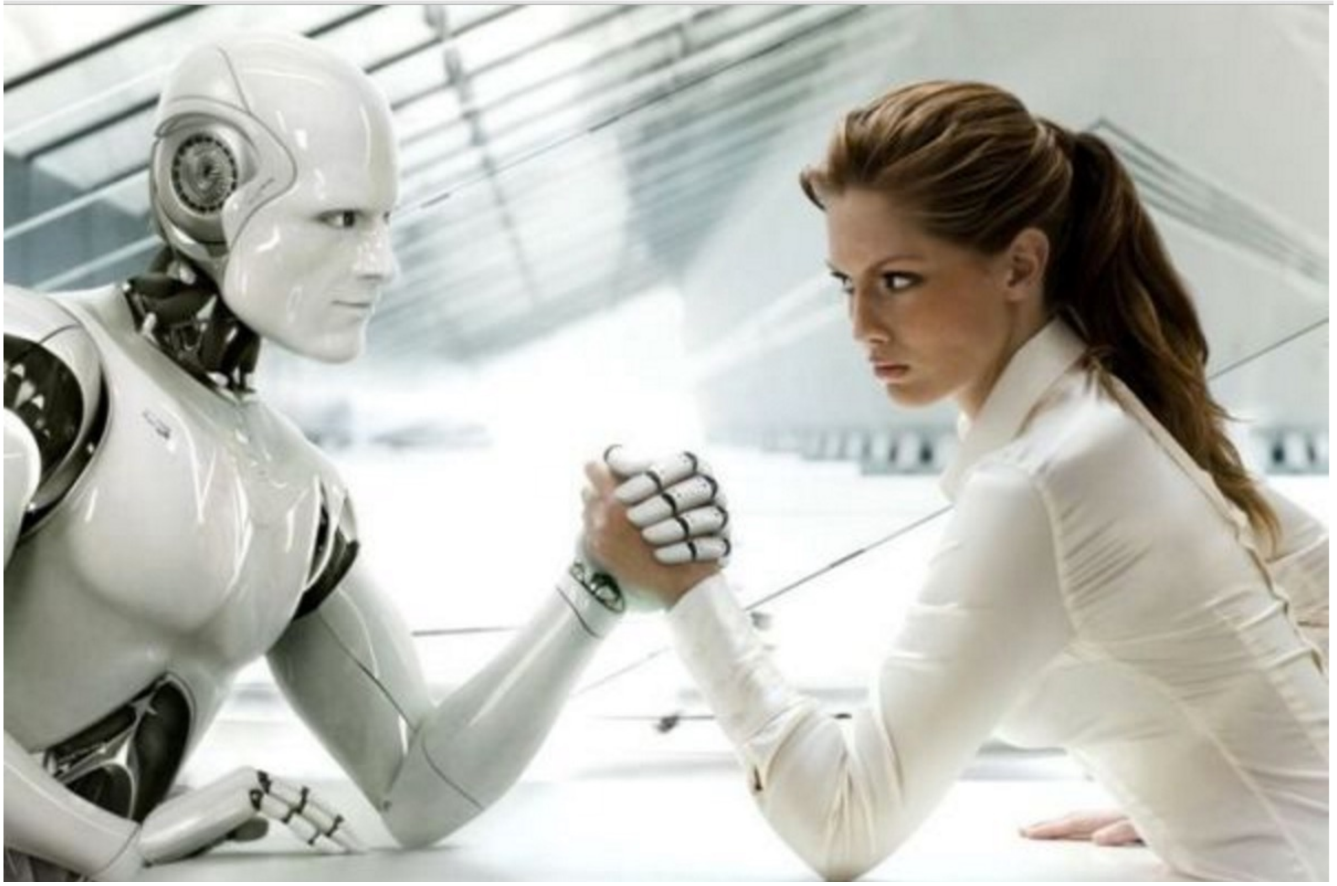


Figure 8.7c.1 Image: Applift

8.7c.1 Focusing on AI's affordances for teaching and learning

Artificial intelligence (AI) is a daunting topic as there are so many issues with respect to its use in education. AI is also currently going through yet another period of extreme hype as a panacea for education, currently being at the top of the peak of inflated expectations, but this hype is driven mainly by successful applications outside the field of education, such as in finance and marketing. Furthermore the term 'AI' is increasingly being used (incorrectly) as a general term for any computational activity.

Even in education, there are very different possible areas of application of AI. Zeide (2019) makes a very useful distinction between institutional, student support and instructional applications (Figure 8.7.c.2 below).

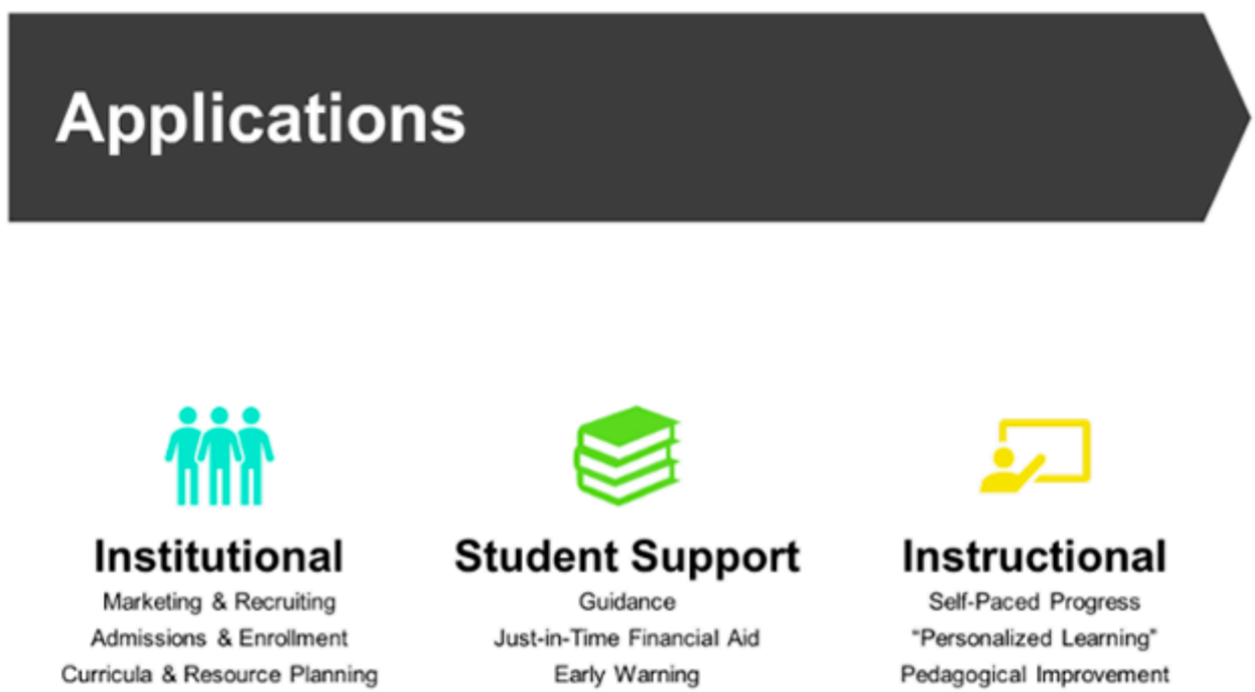


Figure 8.7c.2 AI applications in education Image: © Zeide, 2019

Although AI applications for institutional or student support purposes are very important, this chapter is focused on the pedagogical affordances of different media and technologies (what Zeide calls 'instructional' applications). In particular, the focus in this section will be on the role of AI as a form of media or technology for teaching and learning, its pedagogical affordances, and its strengths and weaknesses in this area.

Moreover, AI is really a sub-set of computing. Thus all the general affordances of computing in education set out in Section 5 of this chapter will apply to AI. This section aims to tease out the extra potential that AI can offer in teaching and learning. This will mean particularly focusing on its role as a medium rather than a general technology in teaching, which means looking at a wider context than just the computational aspects of AI, in particular its pedagogical role.

8.7c.2 What is artificial intelligence?

The original definition of artificial intelligence by McCarthy (1956, cited in Russell & Norvig, 2010) is:

> *every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves.*

Zawacki-Richter et al. (2019), in a review of the literature on AI in higher education, report that those authors that defined artificial intelligence tended to describe it as:

> *intelligent computer systems or intelligent agents with human features, such as the ability to memorise knowledge, to perceive and manipulate their environment in a similar way as humans, and to understand human natural language.*

Klutka et al. (2018) also define AI in terms of what it can do in higher education (Figure 8.7.c.3 below):

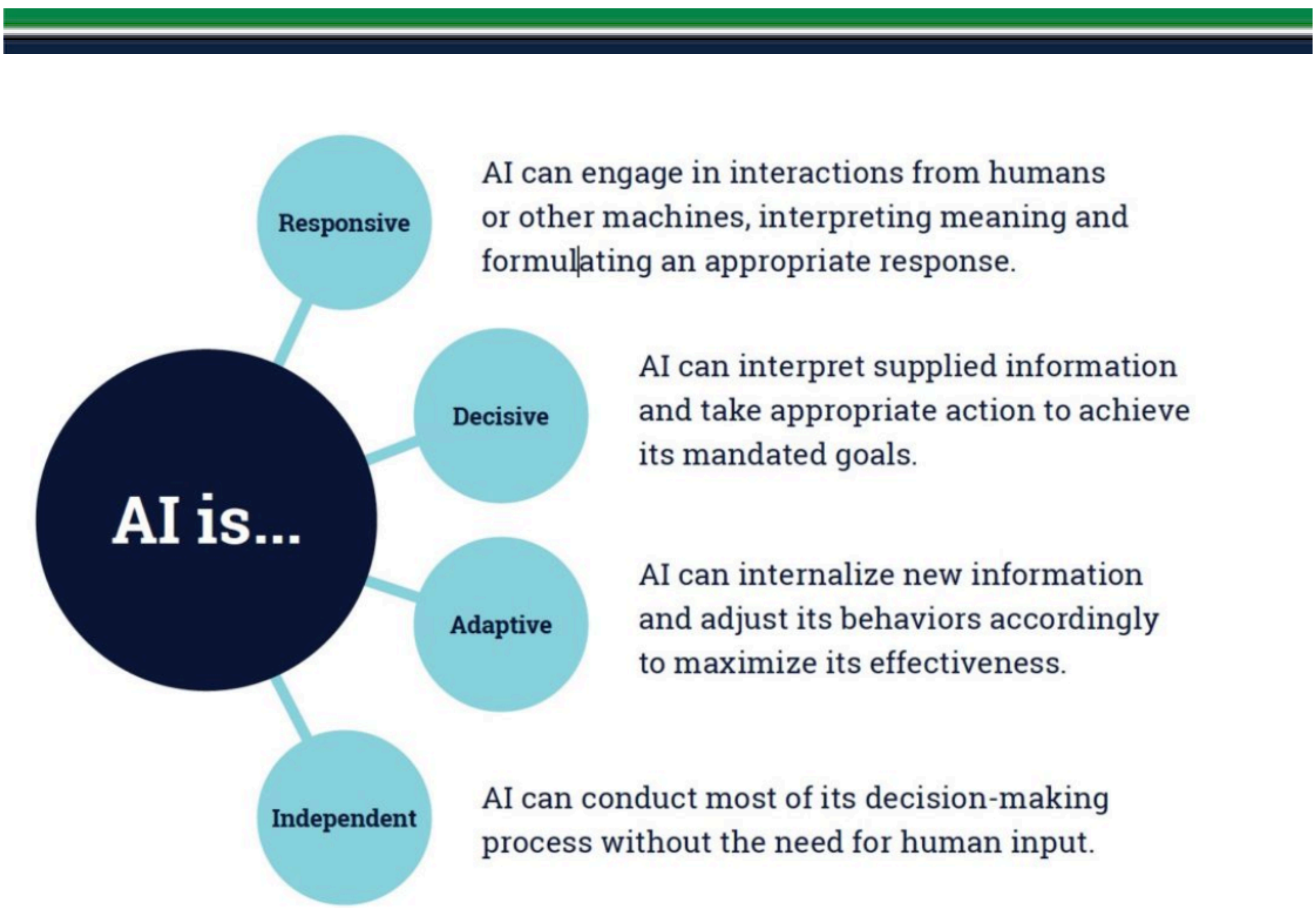


Figure 8.7.c. 3 What AI can do in education Image: Klutka et al. (2018)

There are three basic computing requirements that set 'modern' AI apart from other computing applications:

- access to massive amounts of data;
- computational power on a large scale to manage and analyze the data;
- powerful and relevant algorithms for the data analysis.

8.7c.3 Why use artificial intelligence for teaching and learning?

There are two somewhat different goals for the general use of artificial intelligence. The first is to increase the efficiency of a system or organization, primarily by reducing the high costs of labour, namely by replacing relatively expensive human workers with relatively less costly machines (automation). In education in particular, the main cost is that of teachers and instructors. Politicians, entrepreneurs and policy makers increasingly see a move to automation as a way of reducing the costs of education.

The second is to increase the effectiveness of teaching and learning, in economic terms to increase outputs: better learning outcomes and greater benefits for the same or more cost. With this goal, AI would be used alongside or supporting teachers and instructors.

Klutka et al. (2018) provide a general statement of the potential of AI in higher education 'instruction' through Figure 8.7c.4:

Figure 8.7c.4 Goals for AI in higher education instruction Image: Klutka et al. (2018)

These are understandable goals, but we shall see later in this section that such goals to date are mainly aspirational rather than real.

In terms of this book, a key focus is on developing the knowledge and skills required by learners in a digital age. The key test then for artificial intelligence is to what extent it can assist in the development of these higher level skills.

8.7c.4 Affordances and examples of AI use in teaching and learning

Zawacki-Richter et al. (2019) in a review of the literature on AI in education initially identified 2,656 research papers in English or Spanish, then narrowed the list down by eliminating duplicates, limiting publication to articles in peer-reviewed journals published between 2007 and 2018, and eliminating articles that turned out in the end not to be about the use of AI in education. This resulted in a final 145 articles which were then analysed. Zawacki-Richter et al. then classified these 145 papers into different uses of AI in education. This section draws heavily on this classification. (It should be noted that within the 145 articles, only 92 were focused on instruction/student support. The rest were on institutional uses such as identifying at risk students before admission).

The Zawacki-Richter study offers one insight into the main ways that AI has been used in education for teaching and learning over the ten years between 2007 and 2018, the closest we can come to ‘affordances’. First, three main general ‘instructional’ categories (with considerable overlap) from the study are provided below, followed by some specific examples. (I have omitted Zawacki-Richter et al.’s category of profiling and prediction concerned with administrative issues such as admissions, course scheduling, and early warning systems for students at risk.)

8.7c.4.1 Intelligent tutoring systems (29 out of 92 articles reviewed by Zawacki-Richter et al.)

Intelligent tutoring systems:

- provide teaching content to students and, at the same time, support them by giving adaptive feedback and hints to solve questions related to the content, as well as detecting students’ difficulties/errors when working with the content or the exercises;
- curate learning materials based on student needs, such as by providing specific recommendations regarding the type of reading material and exercises done, as well as personalised courses of action;
- facilitate collaboration between learners, for instance, by providing automated feedback, generating automatic questions for discussion, and the analysis of the process.

8.7c.4.2 Assessment and evaluation (36 out of 92)

AI supports assessment and evaluation through:

- automated grading;
- feedback, including a range of student-facing tools, such as intelligent agents that provide students with prompts or guidance when they are confused or stalled in their work;
- evaluation of student understanding, engagement and academic integrity.

8.7c.4.3 Adaptive systems and personalization (27 out of 92)

AI enables adaptive systems and the personalization of learning by:

- teaching course content then diagnosing strengths or gaps in student knowledge, and

providing automated feedback;
- recommending personalized content;
- supporting teachers in learning design by recommending appropriate teaching strategies based on student performance;
- supporting representation of knowledge in concept maps.

Klutka et al. (2018) identified several uses of AI for teaching and learning in universities in the USA. ECoach, developed at the University of Michigan, provides formative feedback for a variety of mainly large classes in the STEM field. It tracks students progress through a course and directs them to appropriate actions and activities on a personalized basis. Other applications listed in the report include sentiment analysis (using students' facial expressions to measure their level of engagement in studying), an application to monitor student engagement in discussion forums, and organizing commonly shared mistakes in exams into groups for the instructor to respond once to the group rather than individually.

8.7c.4.4 Chatbots

A chatbot is programming that simulates the conversation or 'chatter' of a human being through text or voice interactions (Rouse, 2018). Chatbots in particular are a tool used to automate communications with students. Bayne (2014) describes one such application in a MOOC with 90,000 subscribers. Much of the student activity took place outside the Coursera platform within social media. The five academics teaching the MOOC were all active on Twitter, each with large networks, and Twitter activity around the MOOC hashtag (#edcmooc) was high across all instances of the course (for example, a total of around 180,000 tweets were exchanged on the first offering of the MOOC). A 'Teacherbot' was designed to roam the tweets using the course Twitter hashtag, using keywords to identify 'issues' then choosing pre-designed responses to these issues, which often entailed directing students to more specific research on a topic. For a review of research on chatbots in education, see Winkler and Söllner (2018).

8.7c.4.5 Automated essay grading

Natural language processing (NLP) artificial intelligence systems – often called automated essay scoring engines – are now either the primary or secondary grader on standardized tests in at least 21 states in the USA (Feathers, 2019). According to Feathers:

> *Essay-scoring engines don't actually analyze the quality of writing. They're trained on sets of hundreds of example essays to recognize patterns that correlate with higher or lower human-assigned grades. They then predict what score a human would assign an essay, based on those patterns.*

Feathers though claims that research from psychometricians and AI experts show that these tools are susceptible to a common flaw in AI: bias against certain demographic groups (see Ongweso, 2019).

Lazendic et al. (2018) offer a detailed account of the plan for machine grading in Australian high schools. They state:

> *It is …crucially important to acknowledge that the human scoring models, which are developed for each NAPLAN writing prompt, and their consistent application, ensure and maintain the validity of*

> *NAPLAN writing assessments. Consequently, the statistical reliability of human scoring outcomes is fundamentally related to and is the key evidence for the validity of NAPLAN writing marking.*

In other words, the marking must be based on consistent human criteria. However, it was announced later (Hendry, 2018) that Australian education ministers agreed not to introduce automated essay marking for NAPLAN writing tests, heeding calls from teachers' groups to reject the proposal.

Perelman (2013) developed a computer program called the BABEL generator that patched together strings of sophisticated words and sentences into meaningless gibberish essays. The nonsense essays consistently received high, sometimes perfect, scores when run through several different scoring engines. See also Mayfield, 2013, and Parachuri, 2013, for thoughtful analyses of the issues in the automated marking of writing.

At the time of writing, despite considerable pressure to use automated essay grading for standardized exams, the technology still has many questions lingering over it.

8.7c.5 Strengths and weaknesses

There are several ways to assess the value of the teaching and learning affordances of particular applications of AI in teaching and learning:

- is the application based on the three core features of 'modern' AI: massive data sets, massive computing power; powerful and relevant algorithms?
- does the application have clear benefits in terms of affordances over other media, and particularly general computing applications?
- does the application facilitate the development of the skills and knowledge needed in a digital age?
- is there unintended bias built into the algorithms? Does it appear to discriminate against certain categories of people?
- is the application ethical in terms of student and teacher/instructor privacy and their rights in an open and democratic society?
- are the results of the application 'explainable'? For example, can a teacher or instructor or those responsible for the application understand and explain to students how the results or decisions made by the AI application were reached?

These issues are addressed below.

8.7c.5.1 Is it really a 'modern' AI application in teaching and learning?

Looking at the Zawacki-Richter et al. study and many other research papers published in peer-reviewed journals, very few so-called AI applications in teaching and learning meet the criteria of massive data, massive computing power and powerful and relevant algorithms. Much of the intelligent tutoring within conventional education is what might be termed 'old' AI: there is not a lot of processing going on, and the data points are relatively small. Many so-called AI papers focused on intelligent tutoring and adaptive learning are really just general computing applications.

Indeed, so-called intelligent tutoring systems, automated multiple-choice test marking, and automated feedback on such tests have been around since the early 1980s. The closest to modern AI applications appear to be automated essay grading of standardised tests administered across an entire education system. However there are major problems with the latter. More development is clearly needed to make automated essay grading a valid exercise.

The main advantage that Klutka et al. (2018) identify for AI is that it opens up the possibility for higher education services to become scalable at an unprecedented rate, both inside and outside the classroom. However, it is difficult to see how 'modern' AI could be used within the current education system, where class sizes or even whole academic departments, and hence data points, are relatively small, in terms of the numbers needed for 'modern' AI. It cannot be said to date that modern AI has been tried, and failed, in teaching and learning; it's not really even been tried.

Applications outside the current formal system are more realistic, for MOOCs, for instance, or for corporate training on an international scale, or for distance teaching universities with very large numbers of students. The requirement for massive data does suggest that the whole education system could be massively disrupted if the necessary scale could be reached by offering modern AI-based education outside the existing education systems, for instance by large Internet corporations that could tap their massive markets of consumers.

However, there is still a long way to go before AI makes that feasible. This is not to say that there could not be such applications of modern AI in the future, but at the moment, in the words of the old English bobby, 'Move along, now, there's nothing to see here.'

However, for the sake of argument, let's assume that the definition of AI offered here is too strict and that most of the applications discussed in this section are examples of AI. How do these applications of AI meet the other criteria above?

8.7c.5.2 Do the applications facilitate the development of the skills and knowledge needed in a digital age?

This does not seem to be the case in most so-called AI applications for teaching and learning today. They are heavily focused on content presentation and testing for understanding and comprehension. In particular, Zawacki-Richter et al. make the point that most AI developments for teaching and learning – or at least the research papers – are by computer scientists, not educators. Since AI tends to be developed by computer scientists, they tend to use models of learning based on how computers or computer networks work (since of course it will be a computer that has to operate the AI). As a result, such AI applications tend to adopt a very behaviourist model of learning: present/test/feedback. Lynch (2017) argues that:

> *If AI is going to benefit education, it will require strengthening the connection between AI developers and experts in the learning sciences. Otherwise, AI will simply 'discover' new ways to teach poorly and perpetuate erroneous ideas about teaching and learning.*

Comprehension and understanding are indeed important foundational skills, but AI so far is not helping with the development of higher order skills in learners of critical thinking, problem-solving, creativity and knowledge-management. Indeed, Klutka et al. (2018) claim that that AI can handle many of the routine functions currently done by instructors and administrators, freeing them up to solve more complex problems and connect with students on deeper levels. This reinforces the view that the role of the instructor or teacher needs to move away from content presentation, content management and testing of content comprehension – all of which can be done by computing – towards skills development. The good news is that AI used in this way supports teachers and instructors, but does not replace them.

The bad news is that many teachers and instructors will need to change the way they teach or they will become redundant.

8.7c.5.3 Is there unintended bias in the algorithms?

It could be argued that all AI does is to encapsulate the existing biases in the system. The problem though is that this bias is often hard to detect in any specific algorithm, and that AI tends to scale up or magnify such biases. These are issues more for institutional uses of AI, but machine-based bias can discriminate against students also in a teaching and learning context as well, and especially in automated assessment.

8.7c.5.4 Is the application ethical?

There are many potential ethical issues arising from the use of AI in teaching and learning, mainly due to the lack of transparency in the AI software, and particularly the assumptions embedded in the algorithms. The literature review by Zawacki-Richter et al. (2019) concluded:

> *…a stunning result of this review is the dramatic lack of critical reflection of the pedagogical and ethical implications as well as risks of implementing AI applications in higher education*.

What data are being collected, who owns or controls it, how is it being interpreted, how will it be used? Policies will need to be put in place to protect students and teachers/instructors (see for instance the U.S. Department of Education's student data policies for schools), and students and teachers/ instructors need to be involved in such policy development.

8.7c.5.5 Are the results explainable?

The biggest problem with AI generally, and in teaching and learning in particular, is the lack of transparency. How did it give me this grade? Why I am directed to this reading rather than that one? Why isn't my answer acceptable? Lynch (2017) argues that most data collected about student learning is indirect, inauthentic, lacking demonstrable reliability or validity, and reflecting unrealistic time horizons to demonstrate learning.

> '*current examples of AIEd often rely on …. poor proxies for learning, using data that is easily collectable rather than educationally meaningful*.'

8.7c.6 Conclusions

8.7c.6.1. Dream on, AI enthusiasts

In terms of what AI is actually doing now for teaching and learning, the dream is way beyond the reality. What works well in finance or marketing or astronomy does not necessarily translate to teaching and learning contexts. In doing the research for this section, it proved very difficult to find any compelling examples of AI for teaching and learning, compared with serious games or virtual reality. It is always hard to prove a negative, but the results to date of applying AI to teaching and learning are extremely limited and disappointing.

This is mainly due to the difficulty of applying 'modern' AI at scale in a very fragmented system that relies heavily on relatively small class sizes, programs, and institutions. Probably for modern AI to 'work', a totally different organizational structure for teaching and learning would be needed. But be careful what you wish for.

There is a strong affective or emotional influence in learning. Students often learn better when they feel that the instructor or teacher cares. In particular, students want to be treated as individuals, with their own interests, ways of learning, and some sense of control over their learning. Although at a mass level human behaviour is predictable and to some extent controllable, each student is an individual and will respond slightly differently from other students in the same context. Because of these emotional and personal aspects of learning, students need to relate in some way to their teacher or instructor. Learning is a complex activity where only a relatively minor part of the process can be effectively automated. Learning is an intensely human activity, that benefits enormously from personal relationships and social interaction. This relational aspect of learning can be handled equally well online as face-to-face, but it means using computing to support communication as well as delivering and testing content acquisition.

8.7c.6.2 Not fit for purpose

Above all, AI has not progressed to the point yet where it can support the higher levels of learning required in a digital age or the teaching methods needed to do this, although other forms of computing or technology, such as simulations, games and virtual reality, can.

In particular AI developers have been largely unaware that learning is developmental and constructed, and instead have imposed an old and less appropriate method of teaching based on behaviourism and an objectivist epistemology. However, to develop the skills and knowledge needed in a digital age, a more constructivist approach to learning is needed. There has been no evidence to date that AI can support such an approach to teaching, although it may be possible.

8.7c.6.3 AI's real agenda

AI advocates often argue that they are not trying to replace teachers but to make their life easier or more efficient. This should be taken with a pinch of salt. The key driver of AI applications is cost-reduction, which means reducing the number of teachers, as this is the main cost in education. In contrast, the key lesson from all AI developments is that we will need to pay increased attention to the affective and emotional aspects of life in a robotic-heavy society, so teachers will become even more important.

Another problem with artificial intelligence is that the same old hype keeps going round and round. The same arguments for using artificial intelligence in education go back to the 1980s. Millions of dollars went into AI research at the time, including into educational applications, with absolutely no payoff.

There have been some significant developments in AI since then, in particular pattern recognition, access to and analysis of big data sets, powerful algorithms, leading to formalized decision-making within limited boundaries. The trick though is to recognise exactly what kind of applications these new AI developments are good for, and what they cannot do well. In other words, the context in which AI is used matters, and needs to be taken account of. Teaching and learning is a particularly difficult environment then for AI applications.

8.7c.6.4 Defining AI's role in teaching and learning

Nevertheless, there is plenty of scope for useful applications of AI in education, but only if there is continuing dialogue between AI developers and educators as new developments in AI become available.

But that will require being very clear about the purpose of AI applications in education and being wide awake to the unintended consequences.

In education, AI is still a sleeping giant. 'Breakthrough' applications of AI for teaching and learning are probably not going to come from the mainstream universities and colleges, but from outside the formal post-secondary system, through organizations such as LinkedIn, lynda.com, Amazon or Coursera, that have access to large data sets that make the applications of AI scalable and worthwhile (to them). However, this would pose an existential threat to public schools, colleges and universities. The issue then becomes: what system is best to protect and sustain the individual in a digital age: multinational corporations using AI for teaching and learning; or a public education system with human teachers using AI as a support for learners?

The key question then is whether technology should aim to replace teachers and instructors through automation, or whether technology should be used to empower not only teachers but also learners. Above all, who should control AI in education: educators, students, computer scientists, or large corporations? These are indeed existential questions if AI does become immensely successful in reducing the costs of teaching and learning: but at what cost to us as humans? Fortunately AI is not yet in a position to provide such a threat; but it may well do so soon.

References

Bayne, S. (2014) Teacherbot: interventions in automated teaching *Teaching in Higher Education*, Vol. 20. No.4

Feathers, T. (2019) Flawed Algorithms Are Grading Millions of Students' Essays, *Motherboard: Tech by Vice*, 20 August

Hendry, J. (2018) Govts dump NAPLAN robo marking plans *itnews*, 30 January

Klutka, J. et al. (2018) Artificial Intelligence in Higher Education: Current Uses and Future Applications Louisville Ky: Learning House

Lazandic, G., Justus, J.-A., and Rabinowitz, S. (2018) *NAPLAN Online Automated Scoring Research Program: Research Report*, Canberra, Australia: Australian Curriculum, Assessment and Reporting Authority

Lynch, J. (2017) How AI will destroy education, *buZZrobot*, 13 November

Mayfield, E. (2013) Six ways the edX Announcement Gets Automated Essay Grading Wrong, e-Literate, April 8

Ongweso jr. E. (2019) Racial Bias in AI Isn't Getting Better and Neither Are Researchers' Excuses *Motherboard: Tech by Vice, July 29*

Parachuri, V. (2013) On the automated scoring of essays and the lessons learned along the way, vicparachuri.com, July 31

Perelman. L. (2013) Critique of Mark D. Shermis & Ben Hamner, Contrasting State-of-the-Art Automated Scoring of Essays: Analysis, *Journal of Writing Assessment*, Vol. 6, No.1

Rouse, M. (2019) What is chatbot? *Techtarget Network Customer Experience*, 5 January

Russell, S. and Norvig, P. (2010) *Artificial Intelligence – A Modern Approach* New Jersey: Pearson Education

Winkler, R. & Söllner, M. (2018): Unleashing the Potential of Chatbots in Education: A State-Of-The-Art Analysis. *Academy of Management Annual Meeting (AOM)* Chicago: Illinois

Zawacki-Richter, O. er al. (2019) Systematic review of research on artificial intelligence applications in higher education – where are the educators? International Journal of Technology in Higher Education (in press – details to be added)

Zeide, E. (2019) Artificial Intelligence in Higher Education: Applications, Promise and Perils, and Ethical Questions *EDUCAUSE Review*, Vol. 54, No. 3, August 26

Activity 8.7.c Artificial intelligence

- what do you think about AI for teaching and learning? Is it so esoteric that you can safely not worry about it? Or do you feel you need to be better informed about that it can and cannot do?
- do you agree with the three minimum requirements for modern AI: large data sets, powerful computing capacity, and powerful algorithms? Are there other possible applications of AI that do not need to meet these three criteria?
- can you think of areas of teaching and learning that could generate large data sets even in a class of 30?
- what other skills beside comprehension could AI facilitate? How would it do this?

Click on the podcast below to get some feedback on these questions, plus some of my personal thoughts on AI and teaching and learning:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=1597

8.7.d Emerging technologies: conclusion and summary

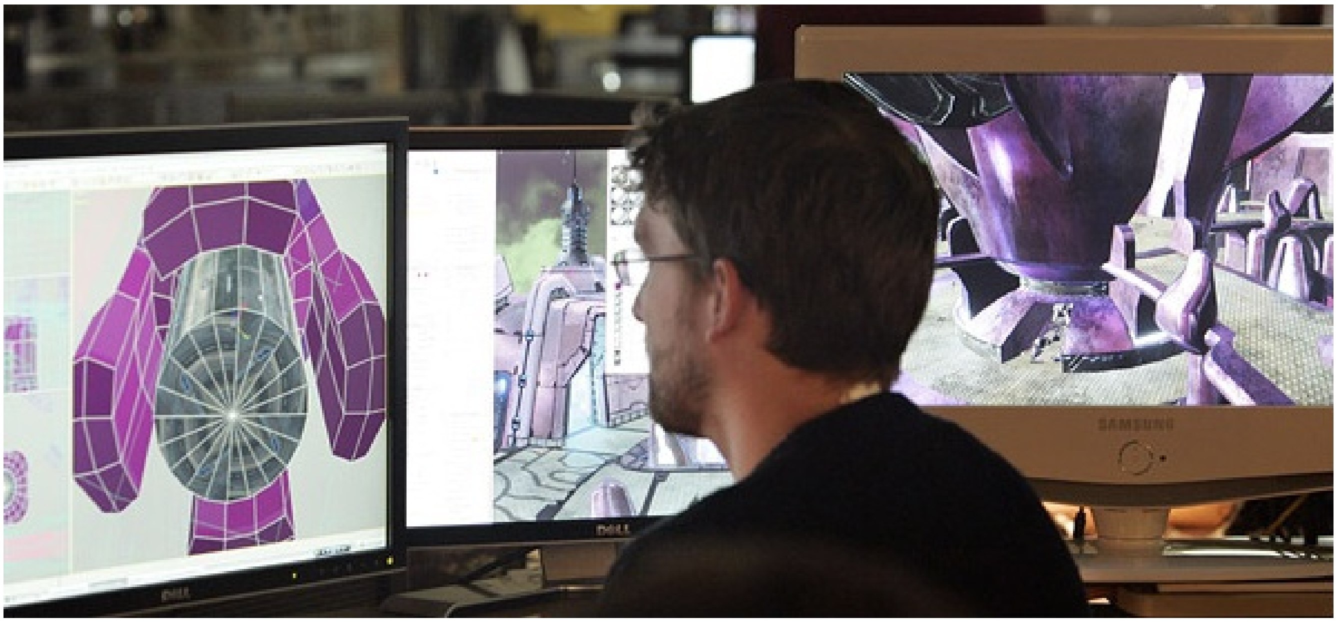


Figure 8.7.d.1 Games designer at work

8.7d.1 Comparing the three emerging technologies

Section 8.7 has looked at three very different emerging technologies: serious games; immersive technologies; and artificial intelligence. Each has the potential to influence profoundly teaching and learning in a digital age.

Both serious games and immersive technologies such as virtual and augmented reality will be extremely valuable in ‘niche’ areas of teaching and learning. They both have the potential to develop some of the higher order learning skills of problem solving, analysis, intuitive thinking, and creative thinking, and also can be used to develop affective skills, such as empathy.

However, neither is likely to be a ‘core’ technology that will be extensively used across all forms of teaching. Also both need significant investment of time and possibly money if they are to be of good quality for teaching purposes. In particular, they will need a multi-disciplinary team approach to design and development.

Therefore it will be essential to choose the right kind of project, such as topics that are difficult to teach using other methods, or projects aimed at learners who struggle with more conventional teaching methods. Above all, it will be necessary to identify and exploit the optimum educational affordances of these two technologies.

Artificial intelligence is somewhat different to the other two emerging technologies. Artificial intelligence to date manages well the presentation and testing of content acquisition, comprehension and understanding, but so far has not shown much promise in supporting the development or assessment of the higher level cognitive skills needed in a digital age. However, by focusing on supporting learners' comprehension and understanding, AI can free up human teachers and instructors to focus their time on the development of these higher order skills. Again, this emphasises the importance of teachers and instructors moving their focus away from content delivery – which AI can increasingly manage well – and focusing more on teaching methods that support higher order skills development.

Furthermore these three technologies are not really separate and unrelated but will become increasingly integrated. AI applications could improve the power and range of both serious games and virtual reality. Games can be designed within a virtual reality. The extent to which these technologies become feasible in education will depend heavily on applications outside education which can then be carried over and adapted for educational purposes.

Again though we come back to three critical issues:

- what are the educational goals of the application?
- to what extent does the application help with the development of higher order cognitive and/ or affective skills?
- what are the costs and organizational implications of such applications within education?

8.7d.2 Lessons to be learned from the use of emerging technologies

New technology developments show no sign of slowing down. Over time, other new technologies will emerge beside the three technologies discussed in this section. Educators will continue to be challenged to incorporate these new technologies as they emerge. In responding to this challenge, the following needs to be considered:

1. New technologies are not necessarily better than existing technologies for teaching. They may however offer new opportunities for teaching differently, and may enable new or better learning outcomes, as well as improving on existing learning outcomes.
2. Old technologies rarely disappear completely as a result of popular new technologies. Older technologies become more focused and find a niche that they serve best.
3. Most educators will be best served by not jumping on the latest technology bandwagon, but should wait a couple of years for a particular technology to reach at least the Gartner 'slope of enlightenment' before experimenting with the new technology.
4. More important than the general characteristics of a new technology is its design and application in education; in other words, how does it perform as an educational medium? Being a big success in the financial sector for instance does not mean a technology will be automatically appropriate for education. Indeed, the technology may need to be heavily adapted or modified to be useful in the educational sector.
5. Given the rate of change and the number of new technologies entering the market, educators need a strong framework or set of criteria for selecting and evaluating technologies, not just emerging technologies but also existing technology. This will be discussing in the following final section of this chapter.

Activity 8.7.d Assessing and developing applications of emerging technologies

- Are there other emerging technologies that you would have chosen over these three?
- How do you think teachers/instructors should react to emerging technologies? Ignore them? Wait for others in education to try them first? Or should they jump in and try a new technology as soon as possible?
- Some institutions such as UBC and Drexel University have set up emerging media labs to encourage faculty to experiment with new technologies. What other methods could be used to encourage teachers and instructors to experiment with new technologies?

For feedback on this activity, and my personal observations on these three emerging technologies, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=1638

8.8 A framework for analysing the pedagogical characteristics of educational media

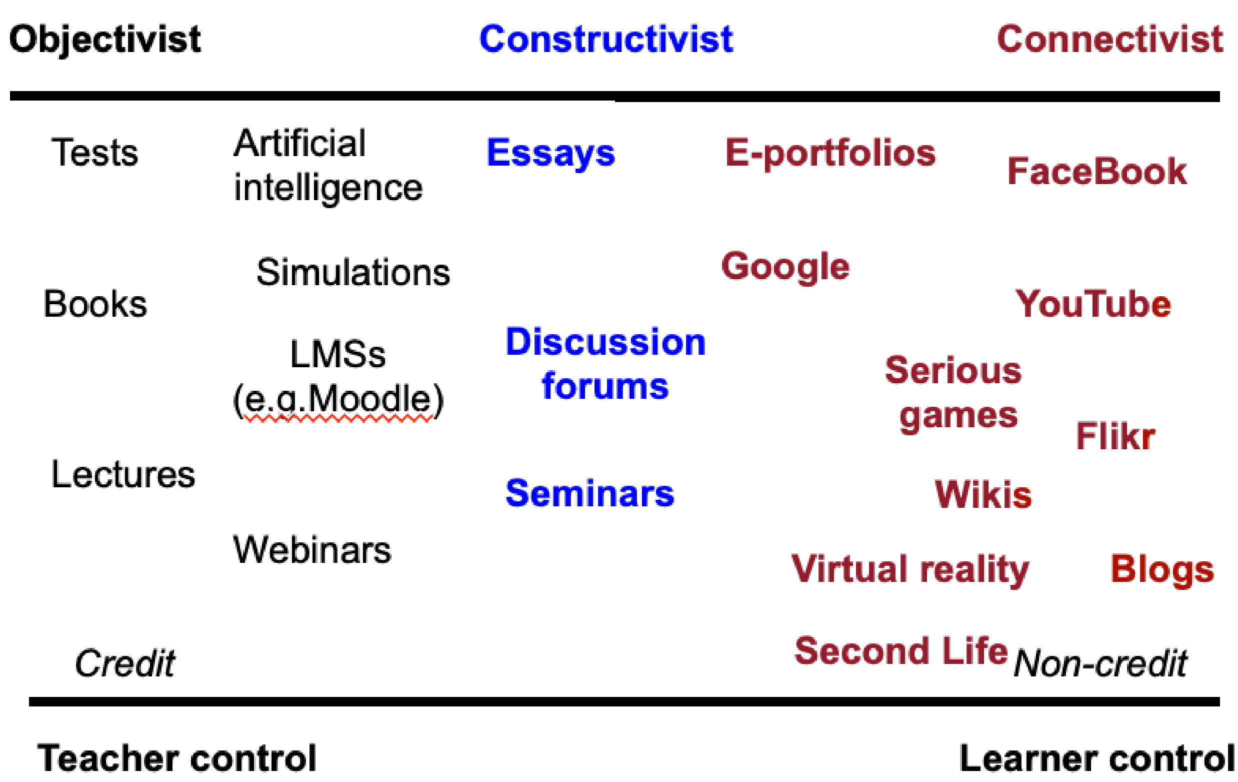


Figure 8.8.1 Analysis of different media by pedagogical criteria (adapted from Bates, 2011)

8.8.1 Brief summary of pedagogical differences in media

I will now summarise the unique pedagogical characteristics of the different media discussed in this chapter.

Figure 8.8.1 presents a diagrammatic analysis of various learning media. I have arranged them primarily by where they fit along an epistemological continuum of objectivist (black), constructivist (blue) and connectivist (red), but also I have used two other dimensions, teacher control/learner control, and credit/non-credit. Note that this figure also enables traditional teaching modes, such as lectures and seminars, to be included and compared. Figure 8.8.1 represents my personal interpretation of these media, and other teachers or instructors may well re-arrange the diagram differently, depending on their particular applications of these tools.

Not all tools or media are represented here (for example, audio and video or MOOCs). The position of any particular tool in the diagram will depend on its actual use. Learning management systems can be used in a constructivist way, and blogs can be very teacher-controlled, if the teacher is the only one permitted to use a blog on a course. Badia et al (2011) have shown that educational design and the situational use of technology very much influence whether specific affordances or unique characteristics of a medium are successfully exploited. Student preferences or pre-dispositions can inhibit or support the successful implementation of specific affordances of different media (for instance, computer science students' preferences for adaptive learning rather than the communication and discussion affordances of ICT – Arenas, 2015).

However, the aim here is not to provide a cast-iron categorization of the affordances of different educational media, but to provide a framework for teachers in deciding which tools and media are most likely to suit a particular teaching approach. Indeed, other teachers may prefer a different set of pedagogical values as a framework for analysis of the different media and technologies.

However, to give an example from Figure 8.8.1, a teacher may use an LMS to organize a set of resources, guidelines, procedures and deadlines for students, who then may use several of the social media, such as photos from mobile phones to collect data. The teacher provides a space and structure on the LMS for students' learning materials in the form of an e-portfolio, to which students can load their work. Students in small groups can use discussion forums or FaceBook to work on projects together.

The example above is in the framework of a course for credit, but the framework would also fit the non-institutional or informal approach to the use of social media for learning, with a focus on tools such as FaceBook, blogs and YouTube. These applications would be much more learner driven, with the learner deciding on the tools and their uses. The most powerful examples are connectivist or cMOOCs, as we saw in Chapter 5.

8.8.2 Key takeaways

Chapter 8: Key Takeaways

There is a very wide range of media available for teaching and learning. In particular:

- text, audio, video, computing, social media and emerging technologies all have unique characteristics that make them useful for teaching and learning;
- the choice or combination of media will need to be determined by:
  - the overall teaching philosophy behind the teaching;
  - the presentational and structural requirements of the subject matter or content;
  - the skills that need to be developed in learners;
  - and not least by the imagination of the teacher or instructor (and increasingly learners themselves) in identifying possible roles for different media;

- learners now have powerful tools through social media for creating their own learning materials or for demonstrating their knowledge;
- courses can be structured around individual students' interests, allowing them to seek appropriate content and resources to support the development of negotiated competencies or learning outcomes;.
- content is now increasingly open and freely available over the Internet; as a result learners can seek, use and apply information beyond the bounds of what a professor or teacher may dictate;
- students can create their own online personal learning environments;
- many students will still need a structured approach that guides their learning;
- teacher presence and guidance is likely to be necessary to ensure high quality learning via social media;
- teachers need to find the middle ground between complete learner freedom and over-direction to enable learners to develop the key skills needed in a digital age.

References

Arenas, E. (2015) Affordances of Learning Technologies in Higher Education Multicultural Environments *The Electronic Journal of e-Learning* Volume 13 No. 4 (pp 217-227)

Badia, A., Barberà, E., Guasch, T., Espasa, A. (2011). Technology educational affordance: Bridging the gap between patterns of interaction and technology usage in: *Digital Education Review*, Vol.19, pp 20-35

Bates, A. (2011) Understanding Web 2.0 and its implications for e-learning, in Lee, M. and McCoughlin, C. (eds.) *Web 2.0-based E-learning: applying social informatics for tertiary teaching* Hershey PA: Information Science

Activity 8.8 Choosing media for a teaching module

1. Take a module or main topic of a course you are teaching. Identify the key learning outcomes, in terms of skills to be taught, then the content area to be covered.
2. Then look through the key characteristics of each of the media in this chapter, and think how each medium might be used to teach your module. Use your analysis from Activities 8.2 to 8.7 Make a list of the functions you have chosen and their relationship to content and skills in the module.
3. Using Figure 8.8.1, allocate a range of tools and media that you might consider using and place them on the continuum.
4. Are you still happy with your choice?

Don't worry – we haven't finished yet. The next chapter will provide a way to make decisions on a more realistic basis. The main purpose here is to get you thinking about possible uses of different media in your subject area.

There is no feedback offered for this activity. Chapter 9 should give some guidance as to the appropriateness of your answers.

Chapter 9: Choosing and using media in education: the SECTIONS model

Purpose of the chapter

The main purpose of this chapter is to provide a framework for making effective decisions about the choice and use of media for teaching and learning. The framework used is the SECTIONS model, which stands for:

- S tudents
- E ase of use
- C osts
- T eaching functions
- I nteraction
- O rganisational issues
- N etworking
- S ecurity and privacy

On completion of this chapter, you should be able to choose appropriate media and technology for any subject that you may be teaching, and be able to justify your decision.

What is covered in this chapter

Also in this chapter you will find the following activities:

- Activity 9.1 Making a preliminary decision
- Activity 9.2 Knowing your students
- Activity 9.3 Ease of use
- Activity 9.4 How will cost affect your decision about what media to use?
- Activity 9.5 Multimedia design principles
- Activity 9.6 Using media to promote student activity
- Activity 9.7 Organisational issues (no activity)
- Activity 9.8 Networking (and novelty)
- Activity 9.9 Security and privacy
- Activity 9.10 Choosing media and technologies

Chapter 9 Key Takeaways

1. Selecting media and technologies is a complex process, involving a very wide range of interacting variables.

2. There is currently no generally accepted theory or process for media selection. The SECTIONS model however provides a set of criteria or questions the result of which can help inform an instructor when making decisions about which media or technologies to use.

3. Because of the wide range of factors influencing media selection and use, an inductive or intuitive approach to decision-making, informed by a careful analysis of all the criteria in the SECTIONS framework, is one practical way to approach decision-making about media and technologies for teaching and learning.

4. However, media selection needs to be integrated within the broader framework of course design.

9.1 Models for media selection

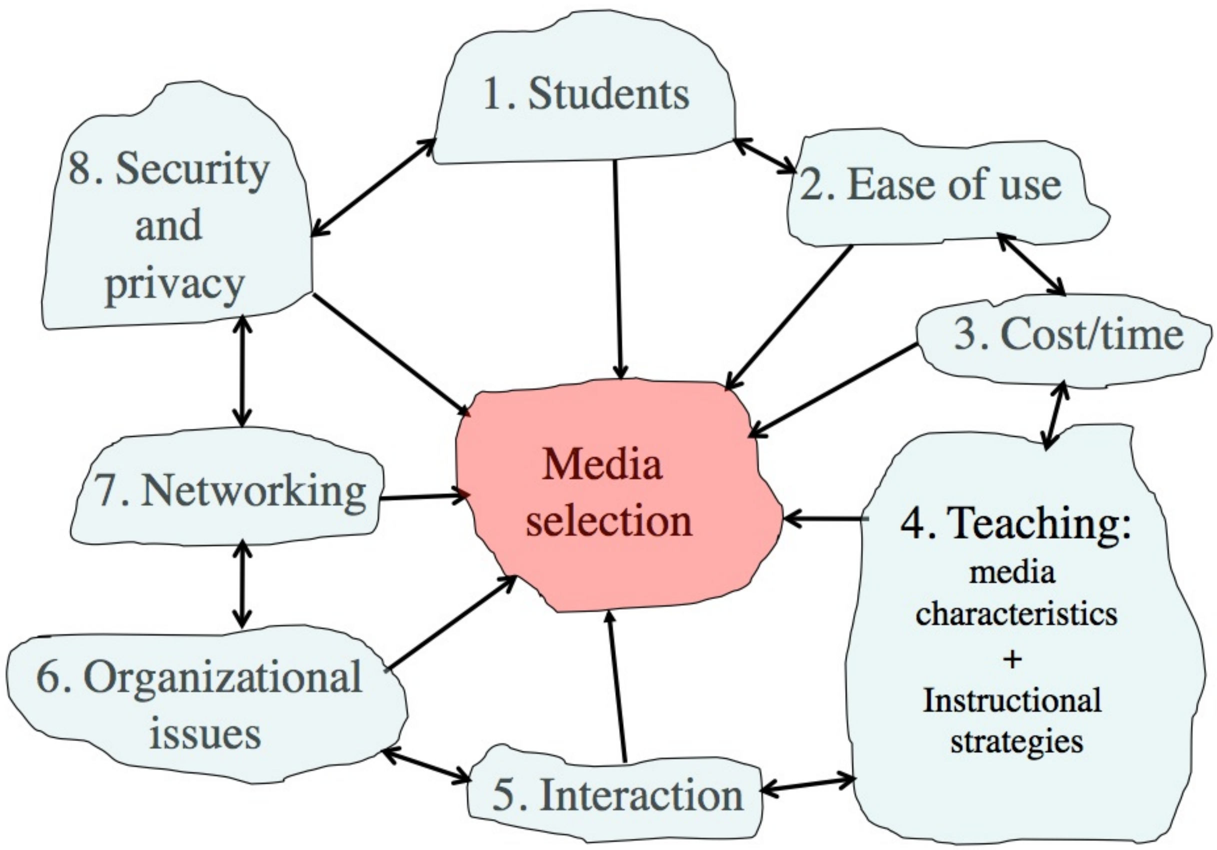


Figure 9.1.1 The SECTIONS model

9.1.1 What the literature tells us

Given the importance of the topic, there is relatively little literature on how to choose appropriate media or technologies for teaching. There was a flurry of not very helpful publications on this topic in the 1970s and 1980s, but relatively little since (Baytak, undated). Indeed, Koumi (1994) stated that:

> there does not exist a sufficiently practicable theory for selecting media appropriate to given topics, learning tasks and target populations . . . the most common practice is not to use a model at all. In which case, it is no

> wonder that allocation of media has been controlled more by practical economic and human/political factors than by pedagogic considerations (p. 56).

Mackenzie (2002) comments in a similar vein:

> When I am discussing the current state of technology with teachers around the country, it becomes clear that they feel bound by their access to technology, regardless of their situation. If a teacher has a television-computer setup, then that is what he or she will use in the classroom. On the other hand, if there is an LCD projector hooked up to a teacher demonstration station in a fully equipped lab, he or she will be more apt to use that set up. Teachers have always made the best of whatever they've got at hand, but it's what we have to work with. Teachers make due.

Mackenzie (2002) has suggested building technology selection around Howard Gardner's multiple intelligences theory (Gardner, 1983, 2006), following the following sequence of decisions:

learner → teaching objective → intelligences → media choice.

Mackenzie then allocates different media to support the development of each of Gardner's intelligences. Gardner's theory of multiple intelligences has been widely tested and adopted, and Mackenzie's allocations of media to intelligences make sense intuitively, but of course it is dependent on teachers and instructors applying Gardner's theory to their teaching.

A review of more recent publications on media selection suggests that despite the rapid developments in media and technology over the last 20 years, my ACTIONS model (Bates, 1995) is one of the major models still being applied, although with further amendments and additions (see for instance, Baytak, undated; Lambert and Williams, 1999; Koumi, 2006). Indeed, I myself modified the ACTIONS model, which was developed for distance education, to the SECTIONS model to cover the use of media in campus-based as well as distance education (Bates and Poole, 2003).

Patsula (2002) developed a model called CASCOIME which includes some of the criteria in the Bates models, but also adds additional and valuable criteria such as socio-political suitability, cultural friendliness, and openness/flexibility, to take into account international perspectives. Zaied (2007) conducted an empirical study to test what criteria for media selection were considered important by faculty, IT specialists and students, and identified seven criteria. Four of these matched or were similar to Bates' criteria. The other three were student satisfaction, student self-motivation and professional development, which are more like conditions for success and are not really easy to identify before making a decision.

Koumi (2006) and Mayer (2009) have come closest to to developing models of media selection. Mayer has developed twelve principles of multimedia design based on extensive research, resulting in what Mayer calls a cognitive theory of multimedia learning. (For an excellent application of Mayer's theory, see UBC Wikis.) Koumi (2015) more recently has developed a model for deciding on the best mix and use of video and print to guide the design of xMOOCs.

Mayer's approach is valuable at a more micro-level when it comes to designing specific multimedia educational materials, as is Koumi's work. Mayer's cognitive theory of multimedia design suggests the best combination of words and images, and rules to follow such as ensuring coherence and avoiding cognitive overload. When deciding to use a specific application of multimedia, it provides very strong guidelines. It is nevertheless more difficult to apply at a macro level. Because Mayer's focus is on cognitive processing, his theory does not deal directly with the unique pedagogical affordances or characteristics of different media. Neither Mayer nor Koumi address non-pedagogical issues in media selection, such as cost or access. Mayer and Koumi's work is not so much competing as complementary to what I am proposing. I am trying to identify which media (or combinations of media) to use in the first place. Mayer's theory then would guide the actual design of the application. I will discuss Mayer's twelve principles further in Section 5 of this chapter, which deals with teaching functions.

Puentedura's SAMR model (2014), discussed in Chapter 7, Section 4, is valuable for assessing the choice of a particular medium, but it focuses solely on pedagogical issues, particularly in terms of whether the choice augments or transforms learning. Although this is a powerful criterion for media selection, the SAMR model does not take into account other essential factors in media selection, such as cost or ease of use.

It is not surprising that there are not many models for media selection. The models developed in the 1970s and 1980s took a very reductionist, behaviourist approach to media selection, resulting in often several pages of decision-trees, which are completely impractical to apply, given the realities of teaching, and yet these models still included no recognition of the unique affordances of different media. More importantly, technology is subject to rapid change, there are competing views on appropriate pedagogical approaches to teaching, and the context of learning varies so much. Finding a practical, manageable model founded on research and experience that can be widely applied has proved to be challenging.

9.1.2 Why we need a model

At the same time, every teacher, instructor, and increasingly learner, needs to make decisions in this area, often on a daily basis. A model for technology selection and application is needed therefore that has the following characteristics:

- it will work in a wide variety of learning contexts;
- it allows decisions to be taken at both a strategic, institution-wide level, and at a tactical, instructional, level;
- it gives equal attention to educational and operational issues;
- it will identify critical differences between different media and technologies, thus enabling an appropriate mix to be chosen for any given context;
- it is easily understood, pragmatic and cost-effective;
- it will accommodate new developments in technology.

For these reasons, then, I will continue to use the Bates' SECTIONS model, with some modifications to take account of recent developments in technology, research and theory. The SECTIONS model is based on research, has stood the test of time, and has been found to be practical. SECTIONS stands for:

- **S** tudents
- **E** ase of use
- **C** ost
- **T** eaching functions, including pedagogical affordances of media
- **I** nteraction
- **O** rganizational issues
- **N** etworking

- **S** ecurity and privacy

I will discuss each of these criteria in the following sections, and will then suggest how to apply the model.

References

Bates, A. (1995) *Teaching, Open Learning and Distance Education* London/New York: Routledge

Bates, A. and Poole, G. (2003) *Effective Teaching with Technology in Higher Education* San Francisco: Jossey-Bass/John Wiley and Son

Baytak, A.(undated) Media selection and design: a case in distance education *Academia.edu*

Gardner, H. (1983) *Frames of Mind: The Theory of Multiple Intelligences* New York: Basic Books

Gardner, H. (2006) *Multiple Intelligences: New Horizons and Theory in Practice* New York: Basic Books

Koumi, J. (1994). Media comparisons and deployment: A practitioner's view *British Journal of Educational Technology*, Vol. 25, No. 1

Koumi, J. (2006). *Designing video and multimedia for open and flexible learning* London: Routledge

Koumi, J. (2015) Learning outcomes afforded by self-assessed, segmented video–print combinations *Cogent Education*, Vol. 2, No.1

Lambert, S. and Williams R. (1999) *A model for selecting educational technologies to improve student learning* Melbourne, Australia: HERDSA Annual International Conference, July

Mackenzie, W. (2002) *Multiple Intelligences and Instructional Technology: A Manual for Every Mind* Eugene, Oregon: ISTE

Mayer, R. E. (2009). *Multimedia Learning* (2nd ed). New York: Cambridge University Press.

Patsula, P. (2002) Practical guidelines for selecting media: An international perspective *The Useableword Monitor*, February 1

Puentedura, R. (2014) SAMR and Bloom's Taxonomy: Assembling the Puzzle *common sense education*, September 24

UBC Wikis (2014)*Documentation: Design Principles for Multimedia* Vancouver BC: University of British Columbia

Zaied, A. (2007) A Framework for Evaluating and Selecting Learning Technologies *The International Arab Journal of Information Technology*, Vol. 4, No. 2

Activity 9.1 Making a preliminary decision on media selection

1. Choose a course that you are teaching or may be teaching. Identify what media or technologies you might be interested in using. Keep a note of your decision and your reasons for your choice of media/technologies.

When you have finished reading this chapter you will be asked to do a final activity (Activity 9.10) and then you can compare your answers to both this activity and Activity 9.10 after reading the whole chapter.

There is no feedback provided for this activity.

9.2 Students

The Malaysian Ministry of Education announced in 2012 that it will enable students to bring handphones to schools under strict guidelines
Image: © NewStraightsTimes, 2012

The first criterion in the SECTIONS model is students. At least three issues related to students need to be considered when choosing media and technology:

- student demographics;
- access; and
- differences in how students learn.

9.2.1 Student demographics

One of the fundamental changes resulting from mass higher education is that university and college teachers must now teach an increasingly diverse range of students. This increasing diversity of students presents major challenges for all teachers, not just post-secondary teachers. However, it has been less common for instructors at a post-secondary level to vary their approach within a single course to accommodate to learner differences, but the increasing diversity of students now requires that all courses should be developed with a wide variety of approaches and ways to learn if all students in the course are to be taught well.

In particular, it is important to be clear about the needs of the target group. First and second year students straight from high school are likely to require more support and help studying at a university or college level. They are likely to be less independent as learners, and therefore it may be a mistake to expect them to be able to study entirely through the use of technology. However, technology may be useful as a support for classroom teaching, especially if it provides an alternative approach to learning from the face-to-face teaching, and is gradually introduced, to prepare them for more independent study later in a program.

On the other hand, for students who have already been through higher education as a campus student, but are now in the workforce, a program delivered entirely by technology at a distance is likely to be attractive. Such students will have already developed successful study skills, will have their own community and family life, and will welcome the flexibility of studying this way.

Third and fourth year undergraduate students may appreciate a mix of classroom-based and online study or even one or two fully online courses, especially if some of their face-to-face classes are closed to further enrolments, or if students are working part-time to help cover some of the costs of being at college.

Lastly, within any single class or group of learners, there will be a wide range of differences in prior knowledge, language skills, and preferred study styles.The intelligent use of media and technology can help accommodate these differences. In particular, if you are trying to reach students in remote areas, or homeless or poor people, or students with physical disabilities, then this too should influence your choice of technology. Indeed, for most courses, there is likely to be a mix of different student needs, which suggests that a multi-media approach will be necessary to accommodate all student needs.

So, once again, it is important to know your students, and to keep this in mind when making decisions about what media or technology to use. This will be discussed further in Chapter 10.

9.2.2 Access

Of all the criteria in determining choice of technology, this is perhaps the most discriminating. No matter how powerful in educational terms a particular medium or technology may be, if students cannot access it in a convenient and affordable manner they cannot learn from it. Thus video streaming may be considered a great way to get lectures to students off campus, but if they do not have Internet access at home, or if it takes four hours or a day's wages to download, then forget it. Difficulty of access is a particular restriction on using xMOOCs in developing countries. Even if potential learners have Internet or mobile phone access, which 3.8 billion globally still do not (ITU, 2018), it often costs a day's wages to download a single YouTube video – see Marron, Missen and Greenberg, 2014.

Any teacher or instructor intending to use computers, tablets or mobile phones for teaching purposes needs answers to a number of questions:

- what is the institutional policy with regard to students' access to a computer, tablets or mobile phones?
- can students use any device or is there a limited list of devices that the institution will support?
- is the medium or software chosen for teaching compatible with all makes of devices students might use?
- is the network adequate to support any extra students that this initiative will add?
- who else in the institution needs to know that you are requiring students to use particular devices?

If students are expected to provide their own devices (which increasingly makes sense):

- what kind of device do they need: one at home with Internet access or a portable that they can bring on to campus – or one that can be used both at home and on campus?
- what kind of applications will they need to run on their device(s) for study purposes?
- will they be able to use the same device(s) across all courses, or will they need different software/apps and devices for different courses?
- what skills will students need in operating the devices and the apps that will be run on them?
- if students do not have the skills, would it still be worth their learning them, and will there be time set aside in the course for them to learn these skills?

Students (as well as the instructor) need to know the answers to these questions before they enrol in a course or program. In order to answer these questions, you and your department must know what students will use their devices for. There is no point in requiring students to go to the expense of purchasing a laptop computer if the work they are required to do on it is optional or trivial. This means some advance planning on your part:

- what are the educational advantages that you see in student use of a particular device?
- what will students need to do on the device in your course?
- is it really essential for them to use a device in these ways, or could they easily manage without the device? In particular, how will assessment be linked to the use of the device?

It will really help if your institution has good policies in place for student technology access (see Section 9.7). If the institution does not have clear policies or infrastructure for supporting the technologies you want to use, then your job is going to be a lot harder.

The answer to the question of access and the choice of technology will also depend somewhat on the mandate of the institution and your personal educational goals. For instance, highly selective universities can require students to use particular devices, and can help the relatively few students who have financial difficulties in purchasing and using specified devices. If though the mandate of the institution is to reach learners denied access to conventional institutions, equity groups, the unemployed, the working poor, or workers needing up-grading or more advanced education and training, then it becomes critical to find out what technology they have access to or are willing to use. If an institution's policy is open access to anyone who wants to take its courses, the availability of equipment already in the *home* (usually purchased for entertainment purposes) becomes of paramount importance.

Another important factor to consider is access for student with disabilities. This may mean providing textual or audio options for deaf and visually impaired students respectively. Fortunately there are now well established practices and standards under the general heading of Universal Design standards. Universal Design is defined as follows:

> *Universal Design for Learning, or UDL, refers to the deliberate design of instruction to meet the needs of a diverse mix of learners. Universally designed courses attempt to meet all learners' needs by incorporating multiple means of imparting information and flexible methods of assessing learning. UDL also includes multiple means of engaging or tapping into learners' interests. Universally designed courses are not designed with any one particular group of students with a disability in mind, but rather are designed to address the learning needs of a wide-ranging group.*
>
> Brokop, F. (2008)

Most institutions with a centre for supporting teaching and learning will be able to provide assistance to faculty to ensure the course meets universal design standards. For instance, BCcampus has produced an accessibility toolkit (Coolidge et l., 2018) and Norquest College, Alberta, has published a detailed guide to ensuring online materials are accessible for persons with disabilities.

9.2.3 Student differences with respect to learning with technologies

It may seem obvious that different students will have different preferences for different kinds of technology or media. The design of teaching would cater for these differences. Thus if students are 'visual' learners, they would be provided with diagrams and illustrations. If they are auditory learners, they will prefer lectures and podcasts. It might appear then that identifying dominant learning styles should then provide strong criteria for media and technology selection. However, it is not as simple as that.

McLoughlin (1999), in a thoughtful review of the implications of the research literature on learning styles for the design of instructional material, concluded that instruction could be designed to accommodate differences in both cognitive-perceptual learning styles and Kolb's (1984) experiential learning cycle. In a study of new intakes conducted over several years at the University of Missouri-Columbia, using the Myers-Briggs inventory, Schroeder (1993) found that new students think concretely, and are uncomfortable with abstract ideas and ambiguity.

However, a major function of a university education is to develop skills of abstract thinking, and to help students deal with complexity and uncertainty. Perry (1970) found that learning in higher education is a developmental process. It is not surprising then that many students enter college or university without such 'academic' skills. Indeed, there are major problems in trying to apply learning styles and other methods of classifying learner differences to media and technology selection and use. Laurillard (2001) makes the point that looking at learning styles in the abstract is not helpful. Learning has to be looked at in context. Thinking skills in one subject area do not necessarily transfer well to another subject area. There are ways of thinking that are specific to different subject areas. Thus logical-rational thinkers in science do not necessarily make thoughtful husbands, or good literary critics.

Part of a university education is to understand and possibly challenge predominant modes of thinking in a subject area. While learner-centered teaching is important, students need to understand the inherent logic, standards, and values of a subject area. They also need to be challenged, and encouraged to think outside the box. In particular, at a university level we need strategies to gradually move students from concrete learning based on personal experience to abstract, reflective learning that can then be applied to new contexts and situations. Technology can be particularly helpful for that, as we saw in Chapter 8.

Thus when designing courses, it is important to offer a range of options for student learning within the same course. One way to do this is to make sure that a course is well structured, with relevant 'core' information easily available to all students, but also to make sure that there are opportunities for students to seek out new or different content. This content should be available in a variety of media such as text, diagrams, and video, with concrete examples explicitly related to underlying principles. The increasing availability of open educational resources (discussed in Chapter 11.2) makes the provision of this 'richness' of possible content much more viable.

Similarly, technology enables a range of learner activities to be made available, such as researching readings on the Web, online discussion forums, synchronous presentations, assessment through e-portfolios, and online group work. The range of activities increases the likelihood that a variety of learner preferences are being met, and also encourages learners to involve themselves in activities and approaches to learning where they may initially feel less comfortable. Thus it is important to ensure that students have a wide range of media (text, audio, video, computing) within a course or program.

Lastly, one should be careful in the assumptions made about student preferences for learning through digital technologies. On the one hand, technology 'boosters' such as Mark Prensky (2001) and Don Tapscott (2008) have argued that today's 'digital natives' are different from previous generations of students. They argue that today's students live within a networked digital universe and therefore expect their learning also to be all digitally networked. It is also true that professors in particular tend to underestimate students' access to advanced technologies (professors are often late adopters of new technology), so you should always try to find up-to-date information on what devices and technologies students are currently using, if you can.

On the other hand, it is also dangerous to assume that all students are highly 'digital literate' and are demanding that new technologies should be used in teaching. Jones and Shao (2011) conducted a thorough review of the literature on 'digital natives', with over 200 appropriate references, including surveys of relevant publications from countries in Europe, Asia, North America, Australia and South Africa. They concluded that:

- students vary widely in their use and knowledge of digital media;
- the gap between students and their teachers in terms of digital literacy is not fixed, nor is the gulf so large that it cannot be bridged;
- there is little evidence that students enter university with demands for new technologies that teachers and universities cannot meet;
- students will respond positively to changes in teaching and learning strategies that include the use of new technologies that are well conceived, well explained and properly embedded in courses and degree programmes. However there is no evidence of a pent-up demand amongst students for changes in pedagogy or of a demand for greater collaboration;
- the development of university infrastructure, technology policies and teaching objectives should be choices about the kinds of provision that the university wishes to make and not a response to general statements about what a new generation of students are demanding;
- the evidence indicates that young students do not form a generational cohort and they do not express consistent or generationally organised demands, thus challenging general assumptions about the differences between post-millennials, millennials, Generation X and

boomers in the way that they learn.

Graduating students that have been interviewed about learning technologies at the University of British Columbia made it clear that they will be happy to use technology for learning so long as it contributes to their success (in the words of one student, 'if it will get me better grades') but the students also made it clear that it was the instructor's responsibility to decide what technology was best for their studies.

It is also important to pay attention to what Jones and Shao are *not* saying. They are not saying that social media, personal learning environments, or collaborative learning are inappropriate, nor that the needs of students and the workforce are unchanging or unimportant, but the use of these tools or approaches should be driven by a holistic look at the needs of all students, the needs of the subject area, and the learning goals relevant to a digital age, and not by an erroneous view of what a particular generation of students are demanding.

In summary, one great advantage of the intelligent application of technology to teaching is that it provides opportunities for students to learn in a variety of ways, thus adapting the teaching more easily to student differences. Thus, the first step in media selection is to know your students, their similarities and differences, what technologies they already have access to, and what digital skills they already possess or lack that may be relevant for your courses. This is likely to require the use of a wide range of media within the teaching to accommodate these differences.

9.2.4 The information you need about your students

It is critical to know your students. In particular, you need the following information to provide an appropriate context for decisions about media and technology:

1. What is the mandate or policy of your institution, department or program with respect to student access in general (selective vs open; accommodation of disabilities, etc.)? How will students who do not have access to a chosen technology be supported?
2. What are the likely demographics of the students you will be teaching? How appropriate is the technology you are thinking of using for these students?
3. If your students are to be taught at least partly off campus, to which technologies are they likely to have convenient and regular access at home or work?
4. If students are to be taught at least partly on campus, what is – or should be – your or your department's policy with regard to students' access to devices in class?
5. What digital skills do you expect your students to have before they start the program?
6. If students are expected to provide their own access to technology, will you be able to provide unique teaching experiences that will justify the purchase or use of such technology?
7. What prior approaches to learning are the students likely to bring to your program? How suitable are such prior approaches to learning likely to be to the way you need to teach the course? How could technology be used to cater for student differences in learning?

There are many different ways to get the information needed to answer these questions. In many cases, you will still have to make decisions on insufficient evidence, but the more accurate information you have about your potential students, the better your likely choice of media and technology. Almost certainly, though, you will have a variety and diversity of students, so the design of your teaching will need to accommodate this.

Activity 9.2: Knowing your students

- How many of the questions in Section 9.2.4 can you answer off the top of your head?
- What additional information do you need, and where can you find it?

There is no feedback provided on these questions.

References

Brokop, F. (2008) *Accessibility to E-Learning for Persons With Disabilities: Strategies, Guidelines, and Standards* Edmonton AB: NorQuest College

Coolidge, A. et al (2018) B.C. Open Textbook Accessibility Toolkit Victoria BC: BCcampus.

Dziuban, C. et al. (2000) Reactive behavior patterns go online *The Journal of Staff, Program and Organizational Development*, Vol. 17, No.3

International Telecommunications Union (2018) UN Broadband Commission sets global broadband targets to bring online the world's 3.8 billion not connected to the Internet Davos: United Nations Broadband Commission

Jones, C. and Shao, B. (2011) *The Net Generation and Digital Natives: Implications for Higher Education* Milton Keynes: Open University/Higher Education Academy

Kolb. D. (1984) *Experiential Learning: Experience as the source of learning and development* Englewood Cliffs NJ: Prentice Hall

Laurillard, D. (2001) *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies* New York/London: Routledge

Marron, D. Missen, C. and Greenberg, J. (2014) "*Lo-Fi to Hi-Fi": A New Way of Conceptualizing Metadata in Underserved Areas with the eGranary Digital Library* Austin TX: International Conference on Dublin Core and Metadata Applications

McCoughlin, C. (1999) The implications of the research literature on learning styles for the design of instructional material *Australian Journal of Educational Technology*, Vol. 15, No. 3

Norquest College (2008) Accessibility to E-Learning for Persons With Disabilities: Strategies, Guidelines, and Standards Edmonton AB: Norquest College

Perry, W. (1970) *Forms of intellectual development and ethical development in the college years: a scheme* New York: Holt, Rinehart and Winston

Prensky, M. (2001) '*Digital natives, Digital Immigrants*' On the Horizon Vol. 9, No. 5

Schroeder, C. (1993) New students – new learning styles, *Change*, Sept.-Oct

Tapscott, D. (2008) *Grown Up Digital* New York: McGraw Hill

9.3 Ease of Use

Figure 9.3.1 Technology reliability is important!
Image: © pixgood.com

9.3.1 Keep it simple

In most cases, the use of technology in teaching is a means, not an end. Therefore it is important that students and teachers do not have to spend a great deal of time on learning how to use educational technologies, or on making the technologies work. The exceptions of course are where technology is the area of study, such as computer science or engineering, or where learning the use of software tools is critical for some aspects of the curriculum, for instance computer-aided design in architecture, spreadsheets in business studies, and geographical information systems in geology. In most cases, though, the aim of the study is not to learn how to use a particular piece of educational technology, but the study of history, mathematics, or biology.

One advantage of face-to-face teaching is that it needs relatively little advance preparation time compared with for instance developing a fully online course. Media and technologies vary in their capacity for speed of implementation and flexibility in up-dating. For instance, blogs are much quicker and easier to develop and distribute than virtual reality. Teachers and instructors then are much more likely to use technology that is quick and easy to use, and students likewise will expect such features in technology they are to use for studying. However, what's 'easy' for instructors and students to use will depend on their digital literacy.

9.3.2 Computer and information literacy

If a great deal of time has to be spent by the students and teachers in learning how to use for instance software for the development or delivery of course material, this distracts from the learning and teaching. Of course, there is a basic set of literacy skills that will be required, such as the ability to read and write, to use a keyboard, to use word processing software, to navigate the Internet and use Internet software, and increasingly to use mobile devices. These generic skills though could be considered pre-requisites. If students have not adequately developed these skills in school, then an institution might provide preparatory courses for students on these topics.

It will make life a lot easier for both teachers and students if an institution has strategies for supporting students' use of digital media. For instance, at the University of British Columbia, the Digital Tattoo project prepares students for learning online in a number of ways:

- introducing students to a range of technologies that could be used for their learning, such as learning management systems, open educational resources, MOOCs and e-portfolios;
- explaining what's involved in studying online or at a distance;
- setting out the opportunities and risks of social media;
- advice on how to protect their privacy;
- how to make the most of connecting, networking and online searching;
- how to prevent cyber-bullying;
- maintaining a professional online presence.

If your institution does not have something similar, then you could direct your students to the Digital Tattoo site, which is fully open.

It is not only students though who may need prior preparation. Technology can be too seductive. You can start using it without fully understanding its structure or how it works. Even a short period of training – an hour of less – on how to use common technologies such as a learning management system or lecture capture could save you a lot of time and more importantly, enable you to see the potential value of all features and not just those that you stumble across.

9.3.3 Orientation

A useful standard or criterion for the selection of course media or software is that 'novice' students (students who have never used the software before) should be studying within 20 minutes of logging on. This 20 minutes may be needed to work out some of the key functions of the software that may be unfamiliar, or to work out how the course Web site is organized and navigated. This is more of an orientation period though than learning new skills of computing. If there is a need to introduce new software that may take a little time to learn, for instance, a synchronous 'chat' facility, or video streaming, it should be introduced at the point where it is needed. It is important though to provide time within the course for the students to learn how to do this.

9.3.4 Interface design

The critical factor in making technology transparent is the design of the interface between the user and the machine. Thus an educational program or indeed any Web site should be well structured, intuitive for the user to use, and easy to navigate.

Interface design is a highly skilled profession, and is based on a combination of scientific research into how humans learn, an understanding of how operating software works, and good training in graphic design. This is one reason why it is often wise to use software or tools that have been well established in education, because these have been tested and been found to work well.

The traditional generic interface of computers – a keyboard, mouse, and graphic user interface of windows and pull-down menus and pop-up instructions – is still extremely crude, and not isomorphic with most people's preferences for processing information. It places very heavy emphasis on literacy skills and a preference for visual learning. This can cause major difficulties for students with certain disabilities, such as dyslexia or poor eyesight. However, in recent years, interfaces have started to become more user friendly, with touch screen and voice activated interfaces.

Nevertheless a great deal of effort often has to go into the adaptation of existing computer or mobile interfaces to make them easy to use in an educational context. The Web is just as much a prisoner of the general computer interface as any other software environment, and the educational potential of any Web site is also restricted by its algorithmic or tree-like structure. For instance, it does not always suit the inherent structure of some subject areas, or the preferred way of learning of some students.

There are several consequences of these interface limitations for teachers and instructors:

- it is really important to choose teaching software or other technologies that are intuitively easy to use, both by the students in particular, but also for the teacher/instructor in creating materials and interacting with students;

- when creating materials for teaching, the teacher needs to be aware of the issues concerning navigation of the materials and screen lay-out and graphics. While it is possible to add stimulating features such as audio and animated graphics, this comes at the cost of bandwidth. Such features should be added only where they serve a useful educational function, as slow delivery of materials is extremely frustrating for learners, who will normally have slower Internet access that the teacher creating the materials. Furthermore, web-based layout on desktop or laptop computers does not automatically transfer to the same dimensions or configurations on mobile devices, and mobile devices have a wide range of standards, depending on the device. Given that the design of Web-based materials requires a high level of specialized interface design skill, it is preferable to seek specialist help, especially if you want to use software or media that are not standard institutionally supported tools. This is particularly important when thinking of using new mobile apps, for instance;

- third, we can expect in the next few years some significant changes in the general computer interface with the development of speech recognition technology, adaptive responses based on artificial intelligence, and the use of haptics (e.g. hand-movement) to control devices. Changes in basic computer interface design could have as profound an impact on the use of technology in teaching as the Internet has.

9.3.5 Reliability

The reliability and robustness of the technology is also critical. Most of us will have had the frustration of losing work when our word programming software crashes or working 'in the cloud' and being logged off in the middle of a piece of writing. The last thing you want as a teacher or instructor is lots of calls from students saying they cannot get online access, or that their computer keeps crashing. (If the software locks up one machine, it will probably lock up all the others!) Technical support can be a huge cost, not just in paying technical staff to deal with service calls, but also in lost time of students and teachers.

'Innovation in teaching' will certainly bring rewards these days as institutions jostle for position as innovative institutions. It is often easier to get funding for new uses of technology than funding to sustain older but successful technologies. Although podcasts combined with a learning management system can be a very low-cost but highly effective teaching medium if good design is used, they are not sexy. It will usually be easier to get support for much more costly and spectacular technologies such as xMOOCs or virtual reality.

On the other hand, there is much risk in being too early into a new technology. Software may not be fully tested and reliable, or the company supporting the new technology may go out of business. Students are not guinea pigs, and reliable and sustainable service is more important to them than the glitz and glamour of untried technology. It is best to wait for at least a year for new apps or software to be fully tested in general applications before adopting them for teaching. It is wise then not to rush in and buy the latest software update or new product – wait for the bugs to be ironed out. Also if you plan to use a new app or technology that is not generally supported by the institution, check first with IT services to ensure there are not security, privacy or institutional bandwidth issues. Thus it is better to be at the leading edge, just behind the first wave of innovation, rather than at the bleeding edge.

A feature of online learning is that peak use tends to fall outside normal office hours. Thus it is really important that your course materials sit on a reliable server with high-speed access and 24 hour, seven days a week reliability, with automatic back-up on a separate, independent server located in a different building. Ideally, the servers should be in a secure area (with for instance emergency electricity supply) with 24 hour technical support, which probably means locating your servers with a central IT service or 'in the cloud', which means it is all the more important to ensure that materials are safely and independently backed up.

However, the good news is that most commercial educational software products such as learning management systems and lecture capture, as well as servers, are very reliable. Open source software too is usually reliable but probably slightly more at risk of technical failure or security breaches. If you have good IT support, you should receive very few calls from students on technical matters. The main technical issue that faculty face these days appears to be software up-grades to learning management systems. This often means moving course materials from one version of the software to the new version. This can be costly and time-consuming, particularly if the new version is substantially different from the previous version. Overall, though, reliability should not be an issue.

In summary, ease of use requires professionally designed commercial or open source course software, specialized help in graphics, navigation and screen design for your course materials, and strong technical support for server and software management and maintenance. Certainly in North America, most institutions now provide IT and other services focused specifically on supporting technology-based teaching. However, without such professional support, a great deal of your time as a teacher will be spent on technical issues, and to be blunt, if you do not have easy and convenient access to such support, you would be wise not to get heavily committed to technology-based teaching until that support is available.

9.3.6 Questions for consideration

Ease of use is another critical factor in the successful use of technology for teaching. Some of the questions then that you need to consider are:

1. How intuitively easy to use, both by students and by yourself, is the technology you are considering?
2. How reliable is the technology?
3. How easy is it to maintain and upgrade the technology?
4. The company that is providing the critical hardware or software you are using: is it a stable company that is not likely to go out of business in the next year or two, or is it a new start-up? What strategies are in place to secure any digital teaching materials you create should the organisation providing the software or service cease to exist?
5. Do you have adequate technical and professional support, both in terms of the technology and with respect to the design of materials?
6. How fast developing is this subject area? How important is it to regularly change the teaching materials? Which technology will best support this?
7. To what extent can the changes be handed over to someone else to do, and/or how essential is it for you to do them yourself?
8. What rewards am I likely to get for using new technology in my teaching? Will use of a new technology be the only innovation, or can I also change my way of teaching with this technology to get better results?
9. What are the risks in using this technology?

Activity 9.3 Ease of use

1. what would be the main challenges of just putting a web cam in the lecture hall and recording your lecture on your computer for streaming later for students who can’t get to a lecture?

2. how would you rank these technologies for ease of use (a) by you as a teacher/instructor (b) by students?:
    - a learning management system
    - live video (e.g. a streamed, live lecture using video-conferencing software such as Zoom, GoToMeeting, Microsoft Team)
    - books
    - virtual reality
    - a podcast (a digital audio recording)

Click on the podcast below for my feedback on this activity:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=226

9.4 Cost

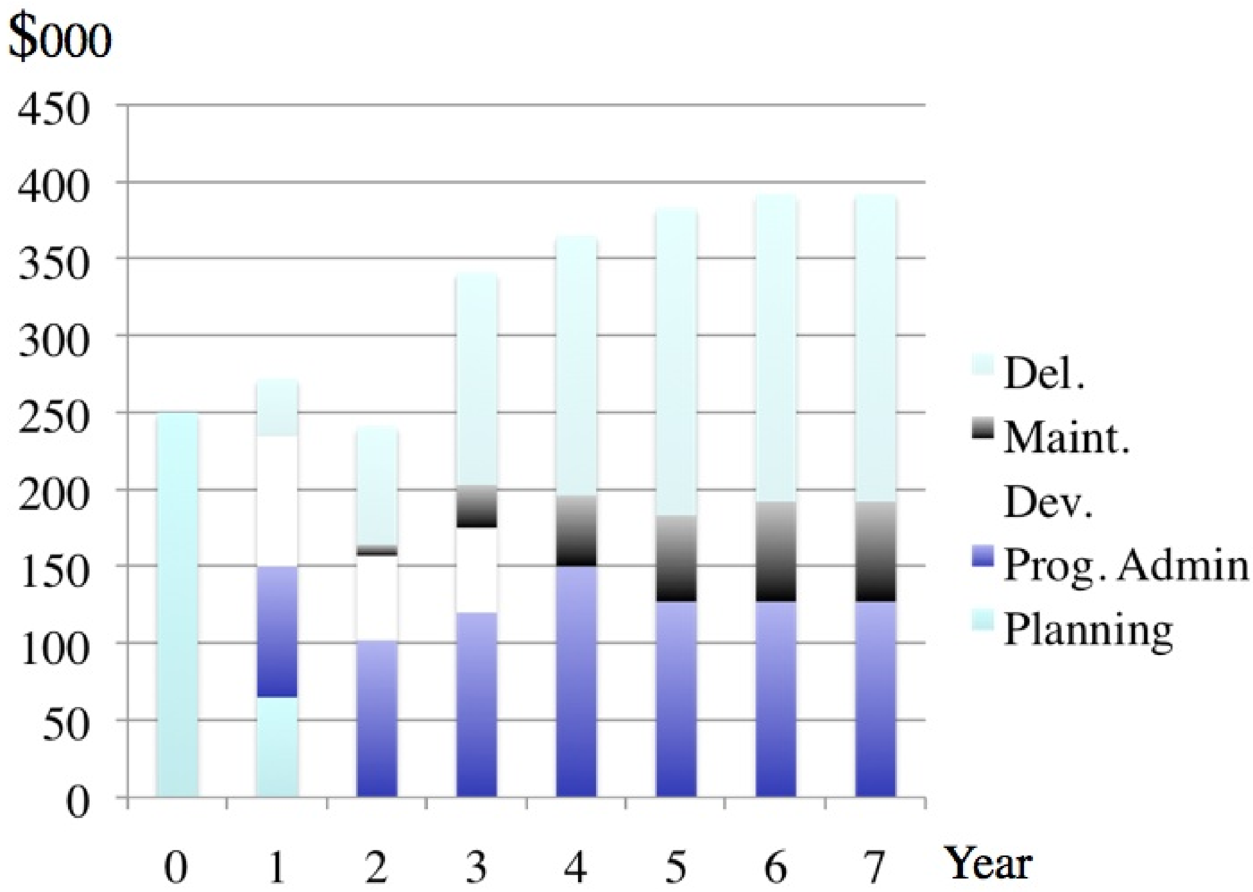


Figure 9.4.1 Total cost of a fully online masters' course over 7 years (from Bates and Sangrà, 2011). For an explanation of this graph, click on the podcast below

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=230

9.4.1 A revolution in media

Until as recently as ten years ago, cost was a major discriminator affecting the choice of technology (Hülsmann, 2000, 2003; Rumble, 2001; Bates, 2005). For instance, for educational purposes, audio (lectures, radio, audio-cassettes) was far cheaper than print, which in turn was far cheaper than most forms of computer-based learning, which in turn was far cheaper than video (television, cassettes or video-conferencing). All these media were usually seen as either added costs to regular teaching, or too expensive to use to replace face-to-face teaching, except for purely distance education on a fairly large scale.

However, there have been dramatic reductions in the cost of developing and distributing all kinds of media (except face-to-face teaching) in the last ten years, due to several factors:

- rapid developments in consumer technologies such as smartphones that enable text, audio and video to be both created and transmitted by end users at low cost;
- compression of digital media, enabling even high bandwidth video or television to be carried over wireless, landlines and the Internet at an economic cost (at least in economically advanced countries);
- improvements in media software, making it relatively easy for non-professional users to create and distribute all kinds of media;
- increasing amounts of media-based open educational resources, which are already developed learning materials that are free for teachers and students alike to use.

The good news then is that in general, and in principle, *cost should no longer be an automatic discriminator in the choice of media*. If you are happy to accept this statement at face value, than you can skip the rest of this chapter. *Choose the mix of media that best meets your teaching needs, and don't worry about which medium is likely to cost more*. Indeed, a good case could be made that it would now be cheaper to replace face-to-face teaching with purely online learning, if cost was the only consideration.

In practice however costs can vary enormously both between and within media, depending once again on context and design. Since the main cost from a teacher's perspective is their time, it is important to know what are the 'drivers' of cost, that is, what factors are associated with increased costs, depending on the context and the medium being used. These factors are less influenced by new technological developments, and can therefore be seen as 'foundational' principles when considering the costs of educational media.

Unfortunately there are many different factors that can influence the actual cost of using media in education, which makes a detailed discussion of costs very complex (for a more detailed treatment, see Bates and Sangrà, 2011). As a result, I will try to identify the main cost drivers, then provide a table that provides a simplified guide to how these factors influence the costs of different media, including face-to-face teaching. This guide again should be considered as a heuristic device, so see this section as Media Costs 101.

9.4.2 Cost categories

The main cost categories to be considered in using educational media and technologies, and especially blended or online learning, are as follows:

9.4.2.1 Development

These are the costs needed to pull together or create learning materials using particular media or technologies. There are several sub-categories of development costs:

- *production costs*: making a video or building a course section in a learning management system, or creating a virtual world. Included in these costs will be the time of specialist staff, such as web designers or media or computer specialists, as well as any costs in web design or video production;
- *your time as an instructor*: the work you have to do as part of developing or producing materials. This will include planning/course design as well as development. Your time is money, and probably the largest single cost in using educational technologies, but more importantly, if you are developing learning materials you are not doing other things, such as research or interacting with students, so there is a real cost, even if it is not expressed in dollar terms;
- *copyright clearance* if you are using third party materials such as photos or video clips. Again, this is more likely to be thought of as time in finding and clearing copyright more than money;
- probably the cost of an *instructional designer* in terms of their time.

Development costs are usually *fixed* or 'once only' and are independent of the number of students. Once media are developed, they are usually scalable, in that once produced, they can be used by any number of learners without increased development costs. Using open educational resources can greatly reduce media development costs.

9.4.2.2 Delivery

This includes the cost of the educational activities needed during offering the course and would include instructional time spent interacting with students, instructional time spent on marking assignments, and would include the time of other staff supporting delivery, such as teaching assistants, adjuncts for additional sections and instructional designers and technical support staff.

Because of the cost of human factors such as instructional time and technical support needed in media-based teaching, delivery costs tend to increase as student numbers increase, and also have to be repeated each time the course is on offer. In other words, they are *recurrent*. However, increasingly with Internet-based delivery, there is usually a zero direct *technology* cost in delivery.

9.4.2.3 Maintenance costs

Once materials for a course are created, they need to be maintained. Urls go dead, set readings may go out of print or expire, and more importantly new developments in the subject area may need to be accommodated. Thus once a course is offered, there are ongoing maintenance costs.

Instructional designers and/or media professionals can manage some of the maintenance, but nevertheless teachers or instructors will need to be involved with decisions about content replacement or updating. Maintenance is not usually a major time consumer for a single course, but if an instructor is involved in the design and production of several online courses, maintenance time can build to a significant amount.

Maintenance costs are usually independent of the number of students, but are dependent on the number of courses an instructor is responsible for, and are recurrent each year.

9.4.2.4 Overheads

These include infrastructure or overhead costs, such as the cost of licensing a learning management system, lecture capture technology and servers for video streaming. These are real costs but not ones that can be allocated to a single course but will be shared across a number of courses. Overheads are usually considered to be institutional costs and, although important, probably will not influence a teacher's decision about which media to use, provided these services are already in place and the institution does not directly charge for such services.

However, if a new online program is to be offered on a full cost-recovery basis, then other institutional overheads will also need to be added. Some will be the same as for on-campus courses (for example, a contribution towards the President's Office), but other overheads applied to on-campus students, such as building maintenance, will not apply to a fully online program (which is the main reason that the net cost of an online program is usually less than that of a campus-based program).

8.4.3 Cost drivers

The primary factors that drive cost are:

- the development/production of materials;
- the delivery of materials;
- number of students/scalability;
- the experience of an instructor working with the medium;
- whether the instructor develops materials alone (self-development) or works with professionals.

Production of technology-based materials such as a video program, or a Web site, is a fixed cost, in that it is not influenced by how many students take the course. However, production costs can vary depending on the design of the course. Engle (2014) showed that depending on the method of video production, the development costs for a MOOC could vary by a factor of six (the most expensive production method – full studio production – being six times that of an instructor self-recording on a laptop).

Nevertheless, once produced, the cost is independent of the number of students. Thus the more expensive the course to develop, the greater the need to increase student numbers to reduce the average cost per student. (Or put another way, the greater the number of students, the more reason to ensure that high quality production is used, whatever the medium). In the case of MOOCs (which tend to be almost twice as expensive to develop as an online course for credit using a learning management system – University of Ottawa, 2013) the number of learners is so great that the average cost per student is very small. Thus there are opportunities for economies of scale from the development of digital material, provided that student course enrolments can be increased (which may not always be the case). This can be described as the potential for the *scalability* of a medium.

Similarly, there are costs in teaching the course once the course is developed. These tend to be *variable* costs, in that they increase as class size increases. If student-teacher interaction, through online discussion forums and assignment marking, is to be kept to a manageable level, then the teacher-student ratio needs to be kept relatively low (for instance, between 1:25 to 1:40, depending on the subject area and the level of the course). The more students, the more time a teacher will need to spend on delivery, or additional contract instructors will need to be hired. Either way, increased student numbers generally will lead to increased costs. MOOCs are an exception. Their main value proposition is that they do not provide direct learner support, so have zero delivery costs. However, this is probably the reason why such a small proportion of participants successfully complete MOOCs.

There may be benefits then for a teacher or for an institution in spending more money up front for interactive learning materials if this leads to less demand for teacher-student interaction. For instance, a mathematics course might be able to use automated testing and feedback and simulations and diagrams, and pre-designed answers to frequently asked questions, with less or even no time spent on individual assignment marking or communication with the teacher. In this case it may be possible to manage teacher-student ratios as high as 1:200 or more, without significant loss of quality.

Also, experience in using or working with a particular medium or delivery method is also important. The first time an instructor uses a particular medium such as podcasting, it takes much longer than subsequent productions or offerings. Some media or technologies though need much more effort to learn to use than others. Thus a related cost driver is whether the instructor works alone (self-development) or works with media professionals. Self-developing materials will usually take longer for an instructor than working with professionals.

There are advantages in teachers and instructors working with media professionals when developing digital media. Media professionals will ensure the development of a quality product, and above all can save teachers or instructors considerable time, for instance through the choice of appropriate software, editing, and storage and streaming of digital materials. Instructional designers can help in suggesting appropriate applications of different media for different learning outcomes. Thus as with all educational design, a team approach is likely to be more effective, and working with other professionals will help control the time teachers and instructors spend on media development.

Lastly, design decisions are critical. Costs are driven by design decisions within a medium. For instance cost drivers are different between lectures and seminars (or lab classes) in face-to-face teaching. Similarly, video can be used just to record talking heads, as in lecture capture, or can be used to exploit the affordances of the medium (see Chapter 8), such as demonstrating processes or location shooting. Computing has a wide and increasing range of possible designs, including online collaborative learning (OCL), computer-based learning, animations, simulations or virtual worlds.

Figure 9.4.3 attempts to capture the complexity of cost factors, focusing mainly on the perspective of a teacher or instructor making decisions. Again, this should be seen as a heuristic device, a way of thinking about the issue. Other factors could be added (such as social media, or maintenance of materials). I have given my own personal ratings for each cell, based on my experience. I have taken conventional teaching as a medium or ‘average’ cost, then ranked cells as to whether there is a higher or lower cost factor for the particular medium. Other readers may well rate the cells differently.

			Cost drivers (for instructors)				
			develop-ment	***delivery***	***scal-able***	***experi-ence***	***self-dev.***
Medium	***Face-to-face***	lectures	medium	medium	partly	low	low
		semi-nars	low	high	no	medium	low
	Print	books	high	high	yes	high	high
	Audio	pod-casts	low	low	yes	low	low
	Video	talking heads	medium	low	yes	low	medium
		afford-ances	high	low	yes	high	high
	Com-puting	OCL	low	high	no	medium	low
		CBL	high	low	yes	medium	medium
		ans. or sims	high	low	yes	high	high
		virtual worlds	high	low	?	high	high

Figure 9.4.3 Cost drivers for educational media

Although the time it takes to develop and deliver learning using different technologies is likely to influence an instructor's decision about what technology to use, it is not a simple equation. For instance, developing a good quality online course using a mix of video and text materials may take much more of the instructor's time to prepare than if the course was offered through classroom teaching. However, the online course may take less time in delivery over several years, because students may be spending more time on task online, and less time in direct interaction with the instructor. Once again, we see that design is a critical factor in how costs are assessed.

In short, from an instructor perspective, time is the critical cost factor. Technologies that take a lot of time to use are less likely to be used than those that are easy to use and thus save time. But once again design decisions can greatly affect how much time teachers or instructors need to spend on any medium, and the ability of teachers and students to create their own educational media is becoming an increasingly important factor.

9.4.4 Issues for consideration

9.4.4.1 Lecture capture vs LMS: cost factors

In recent years, university faculty have generally gravitated more to lecture capture and video streaming for online course delivery, particularly in institutions where online or distance learning is relatively new, because it is 'simpler' to do than redesign and create mainly text based materials in learning management systems. Lecture capture also more closely resembles the traditional classroom method, so less change is required of the instructor.

Pedagogically though (depending on the subject area) lecture capture may be less effective than an online course using collaborative learning and online discussion forums. Also, from an institutional perspective lecture capture has a much higher technology cost than a learning management system. And, of course, lecture capture is often used in conjunction with an LMS. What different technologies tend to do though is change the spread of an instructors time between development and delivery. Media such as an LMS can have higher initial development costs but much lower annual delivery and maintenance costs than face-to-face teaching, for instance.

9.4.4.2 The student factor

Also, students themselves can now use their own devices to create multimedia materials for project work or for assessment purposes in the form of e-portfolios. Media allow instructors, if they wish, to move a lot of the hard work in teaching and learning from themselves to the students. Media allow students to spend more time on task, and low cost, consumer media such as mobile phones or tablets enable students themselves to create media artefacts, enabling them to demonstrate their learning in concrete ways. This does not mean that instructor 'presence' is no longer needed when students are studying online, but it does enable a shift in where and how a teacher or instructor can spend their time in supporting learning.

9.4.5 Conclusion

Cost is a critical factor influencing media choice. For instructors, the main cost will be their time. However it is important to look at time over the length of a course over several years, not just in the initial production or preparation of materials. Carefully produced media may take more time in production, but can save a great deal of time in delivery, especially if student activities and automated feedback can be built into the design. This is why some institutions have a special fund for innovative teaching or technology-based teaching and learning, to free up instructor time for design and development.

Media also differ considerably in the balance of costs between development, delivery, maintenance and overheads. Face-to-face teaching has minimal development costs, but heavy delivery costs in terms of instructor time; an LMS-based online course is has more of an equal balance between development and delivery costs. Serious games usually have high development costs but very low delivery costs.

Whatever the balance, cost is still a critical factor in media choice.

References

Bates, A. (2005) *Technology, e-Learning and Distance Education* London/New York: Routledge

Bates, A. and Sangrà, A. (2011) *Managing Technology in Higher Education* San Francisco: Jossey-Bass

Engle, W. (2104) *UBC MOOC Pilot: Design and Delivery* Vancouver BC: University of British Columbia

Hülsmann, T. (2000) *The Costs of Open Learning: A Handbook* Oldenburg: Bibliotheks- und Informationssytem der Universität Oldenburg

Hülsmann, T. (2003) Costs without camouflage: a cost analysis of Oldenburg University's two graduate certificate programs offered as part of the online Master of Distance Education (MDE): a case study, in Bernath, U. and Rubin, E., (eds.) *Reflections on Teaching in an Online Program: A Case Study* Oldenburg, Germany: Bibliothecks-und Informationssystem der Carl von Ossietsky Universität Oldenburg

Rumble, G. (2001) The Cost and Costing of Networked Learning *Journal of Asynchronous Learning Networks*, Volume 5, Issue 2

University of Ottawa (2013)*Report of the e-Learning Working Group* Ottawa ON: The University of Ottawa

Activity 9.4 How will cost affect your decision about what media to use?

1. Are concerns about the possible cost/demands on your time influencing your decisions on what media to use? If so in what ways? Has this section on costs changed your mind?
2. How much time do you spend preparing lectures? Could that time be better spent preparing learning materials, then using the time saved from delivering lectures on interaction with students (online and/or face-to-face)?
3. What kind of help can you get in your institution from instructional designers and media professionals for media design and development? What media decisions will the answer to this question suggest to you? For instance, if you are in a k-12 school with little or no chance for

professional support, what kind of media and design decisions are you likely to make?

4. If you were filling in the cells for Figure 9.4.3, what differences would there be with my entries? Why?
5. In Figure 9.4.3, add the following media: e-portfolios (in computing) and add another section under computing: social media. Add blogs, wikis and cMOOCs. How would you fill in the cells for each of these for development, delivery, etc.? Are there other media you would also add?
6. Do you agree with the statement: *It would now be cheaper to replace face-to-face teaching with purely online learning, if cost was the only consideration*? What are the implications for your teaching if this is really true? What considerations would still justify face-to-face teaching?

For my feedback on some of these questions, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=230

9.5 Teaching and media selection

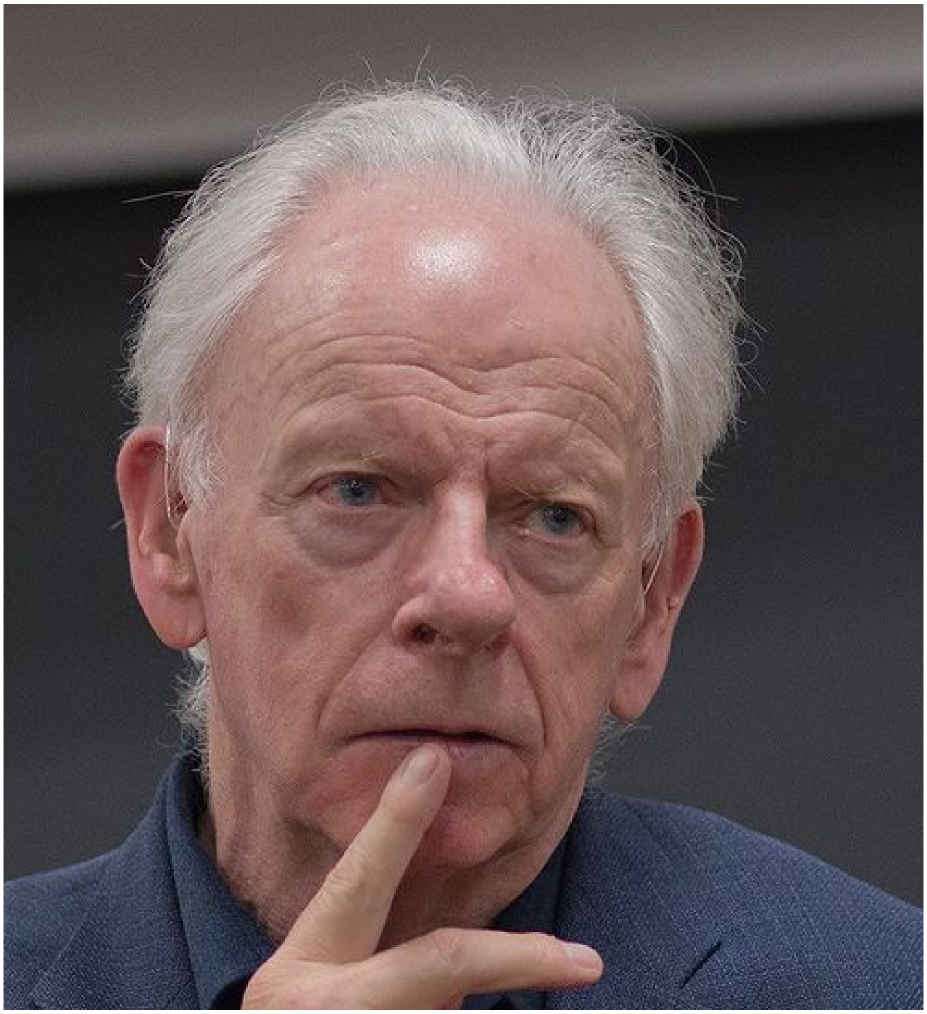


Figure 9.5.1 People do not necessarily learn better … when the speaker's image is added to the screen (Mayer, 2009).

9.5.1 The importance of design in multimedia teaching

Chapter 8 discussed the various pedagogical differences between media. Identifying appropriate uses of media is both an increasingly important requirement of teachers and instructors in a digital age, and a very complex challenge. This is one reason for working closely with instructional designers and media professionals whenever possible. Teachers working with instructional designers will need to decide which media they intend to use on pedagogical as well as operational grounds, which was the purpose of Chapter 8.

However, once the choice of media has been made, by focusing on design issues we can provide further guidelines for making appropriate use of media. In particular, having gone through the process suggested in Chapter 8 of identifying possible teaching roles or functions for different media, we can then draw on the work of Mayer (2012) and Koumi (2006, 2015) to ensure that whatever choice or mix of media we have decided on, the design leads to effective teaching.

Mayer's research focused heavily on cognitive overload in rich, multimedia teaching. From all his research over many years, Mayer identified 12 principles of multimedia design, based on how learners cognitively process multimedia:

9.5.1.1 Coherence

People learn better when extraneous words, pictures and sounds are excluded rather than included. Basically, keep it simple in media terms.

9.5.1.2 Signalling

People learn better when cues that highlight the organization of the essential material are added. This replicates earlier findings by Bates and Gallagher (1977). Students need to know what to look for in multimedia materials.

9.5.1.3 [Avoid] Redundancy

People learn better from graphics + narration, than from graphics, narration and on-screen text.

9.5.1.4 Spatial contiguity

People learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen

9.5.1.5 Temporal contiguity

People learn better when corresponding words and pictures are presented simultaneously rather than successively.

9.5.1.6 Segmenting

People learn better when a multimedia lesson is presented in user-paced segments rather than as a continuous lesson. Thus several 'YouTube' length videos are more likely to work better than a 50 minute video.

9.5.1.7 Pre-training

People learn better from a multimedia lesson when they know the names and the characteristics of the main concepts. This suggests a design feature for flipped classrooms, for instance. It may be better to use a lecture or readings that provide a summary of key concepts and principles before showing more detailed examples or applications of such principles in a video.

9.5.1.8 Modality

People learn better from graphics and narration than from animation and on-screen text. This reflects the importance of learners being able to combine both hearing and viewing at the same time to reinforce each other in specific ways.

9.5.1.9 Multimedia

People learn better from words and pictures than from words alone. This also reinforces what I wrote in 1995: *Make all four media available to teachers and learners* (Bates, 1995, p.13).

9.5.1.10 Personalization

People learn better from multimedia lessons when words are in conversational style rather than formal style. I would go even further than Mayer here. Multimedia can enable learners (particularly distance learners) to relate to the instructor, as suggested by Durbridge's research (1983, 1984) on audio combined with text. Providing a 'human voice and face' to the teaching helps motivate learners, and makes multimedia teaching feel that it is directed solely at the individual learner, if a conversational style is adopted.

9.5.1.11 Voice

People learn better when the narration in multimedia lessons is spoken in a friendly human voice rather than a machine voice.

9.5.1.12 [No] image

People do not necessarily learn better from a multimedia lesson when the speaker's image is added to the screen.

In re-reading Mayer's work, I am struck by the similarities in findings, using different research methods, different multimedia technologies, and different contexts, to the research from the Audio-Visual Media Research Group at the British Open University in the 1970s and 1980s (Bates, 1984).

More recently, the University of British Columbia has done an excellent job of suggesting how Mayer's design principles could be operationalised. Staff at the University of British Columbia have combined Mayer's findings with Robert Talbert's experience from developing a series of successful screencasts on mathematics, into a set of practical design guidelines for multimedia production.

Talbert's key design principles are:

- keep it Simple: focus on one idea at a time.
- keep it Short: keep videos to a length 5-6 minutes max. to maximize attention.
- keep it Real: model the decision making and problem solving processes of expert learners.
- keep it Good: be intentional about planning the video; strive to produce the best video and audio quality possible.

Thus design decisions are critical in influencing the effectiveness of a particular technology. Well-designed lectures will teach better than a poorly designed online course, and vice versa.

9.5.2 Teaching as a weak discriminator in media selection

Chapter 8 was exclusively focused on the best uses of each medium. Section 9.5.1 above then goes on to look at effective design of multimedia. Most teachers and instructors would put the effectiveness of a medium for teaching and learning as the first criterion for media selection. If the technology is not educationally effective, why would you use it? Why do we need the other parts of the SECTIONS model?

However, if a student cannot access or use a technology, there will be no learning from that technology, no matter how useful the educational affordances or how well the medium is designed. Furthermore, motivated teachers will overcome educational weaknesses or shortcomings in a particular technology, or conversely teachers inexperienced in using media will often under-exploit the potential of a medium (such as using video for talking heads).

Similarly, students will respond differently to different technologies due to preferred learning styles or differences in motivation. Students who work hard can overcome poor use of learning technologies. It is not surprising then that with so many variables involved, teaching and learning is a relatively weak discriminator for selecting and using technologies. Access (and ease of use) are stronger *discriminators* than teaching effectiveness in selecting media. This explains why teaching that does not really exploit the educational affordances of a medium can often still get good results. Nevertheless, ideally one should try to make best use of the pedagogical features of a medium because when it is then combined with the other SECTIONS criteria, the teaching is likely to be more effective.

9.5.3 Questions for consideration

Therefore, it is not enough to focus just on the design of multimedia materials, as important as design is, even considering just the pedagogical context. The choice and use of media need to be related to other factors (what Mayer calls 'boundary conditions'), such as individual differences between learners, the complexity of the content, and the desired learning outcomes. Thus when considering media from a strictly teaching perspective, the following questions need to be considered:

1. Who are my students?
2. What content needs to be covered?
3. What are the desired learning outcomes from the teaching in terms of skills development?
4. What instructional strategies or approaches to learning do I plan using?
5. What are the unique pedagogical characteristics of different media? How might different media help with the presentation of content and development of student skills in this course?
6. What is the best way to present the content to be covered in this course? How can media help with the presentation of content? Which media for what content?
7. What skills am I trying to develop on this course? How can media help students with the development of the requisite skills for this course? Which media for which skills?
8. What principles do I need to use when designing multimedia materials for their most

effective use?

Working through these questions is likely to be an iterative rather than a sequential process. Depending on the way you prefer to think about and make decisions, it may help to write down the answers to each of the questions, but going through the process of thinking about these questions is probably more important, leaving you with the freedom to make choices on a more intuitive basis, having first taken all these – and other – factors into consideration.

References

Bates, A. (1984) *Broadcasting in Education: An Evaluation* London: Constables

Bates, A. (1995) *Teaching, Open Learning and Distance Education* London/New York: Routledge

Bates, A. and Gallagher, M. (1977) *Improving the Effectiveness of Open University Television Case-Studies and Documentaries* Milton Keynes: The Open University, I.E.T. Papers on Broadcasting, No. 77 (out of print – copies available from tony.bates@ubc.ca)

Durbridge, N. (1983) *Design implications of audio and video cassettes* Milton Keynes: Open University Institute of Educational Technology (out of print)

Durbridge, N. (1984) Audio-cassettes, in Bates, A. (ed.) *The Role of Technology in Distance Education* London/New York: Croom Hill/St Martin's Press

Koumi, J. (2006). *Designing video and multimedia for open and flexible learning* London: Routledge

Koumi, J. (2015) Learning outcomes afforded by self-assessed, segmented video-print combinations *Cogent Education*, Vol. 2, No.1

Mayer, R. E. (2009). *Multimedia learning* (2nd ed). New York: Cambridge University Press

UBC Wikis (2014) Documentation: Design Principles for Multimedia Vancouver BC: University of British Columbia

Activity 9.5 Multimedia design principles

1. How well do you think Mayer's design principles (9.5.1 to 9.5.12) would apply to classroom teaching?

For feedback on this question, click on the podcast below.

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=233

9.6 Interaction

Figure 9.6.1 Computers enable learners to interact with learning materials (also 'inherent' interaction)

The fifth element of the SECTIONS model for selecting media is interaction. How do different media enable interaction? The extent to which a medium enables interaction – and the kind of interaction – is critically important, as there is now an overwhelming amount of research evidence to suggest that students learn best when they are 'active' in their learning. But what does this mean? And what role can or do new technologies play in supporting active learning?

9.6.1. Types of learner interaction

There are three different ways learners can interact when studying (Moore, 1989), and each of these ways requires a somewhat different mix of media and technology.

9.6.1.1 Interaction with learning materials

This is the interaction generated when students work on a particular medium, such as a printed textbook, a learning management system, or a short video clip, without direct intervention from an instructor or other students. This interaction can be 'reflective', without any overt actions, or it can be 'observable', in the form of an assessed response, such as a multiple choice test, or as notes to assist memory and comprehension.

Computer technology can greatly facilitate learners' interaction with learning resources. Self-administered online tests can provide feedback to students on their comprehension or coverage of a subject area. Such tests can also provide feedback to teachers on topic areas where students are having difficulty, and can also be used for grading of students on their comprehension. Using standard test software built into learning management systems, students can be automatically assessed and graded on their comprehension of course materials. More advanced activities might include composing music using software that converts musical notation to audio, entering data to test concepts through online simulations, or participating in games or decision-making scenarios controlled by the computer. Thus computer-managed learner interaction is particularly good for developing comprehension and understanding of concepts and procedures, but it has limitations in developing the higher order learning skills of analysis, synthesis and critical thinking, without additional human intervention of some kind.

There are other ways besides computer-managed learning to facilitate interaction between learners and learning material. *Textbooks* may include activities set by the author (as in this textbook), or instructors can set student activities around set readings. Other student activities might include reading text or watching videos embedded in a learning management system, conducting a structured approach to finding and analyzing web-based materials, or downloading and editing information from the web to create e-portfolios of work. These activities may or may not be assessed, although evidence suggests that students, and in particular students studying online, tend to focus more an assessed activities.

In other words, with good design and adequate resources, technology-based instruction can provide high levels of student interaction with the learning materials. There are strong economic advantages in exploiting the possibilities of learners' interaction with learning materials, because intense student-interaction with learning resources increases the time students spend on learning ('time-on-task'), which tends to lead to increased learning (see Means et al., 2010). Perhaps more importantly, such activity, when well designed, can reduce the time the teacher needs to spend on interacting with each student.

9.6.1.2 Interaction between students and teacher

Figure 9.6.2 Student-teacher interaction Image: © Joseph Mehling, DartmouthLife, 2007

Student-teacher interaction is often needed though in order to develop many of the higher order learning outcomes, such as analysis, synthesis, and critical thinking. This is particularly important for developing academic learning, where students are challenged to question ideas, and to acquire deep understanding. This often requires dialogue and conversation, either one-on-one between instructor and students, or between an instructor and a group of students. The role of the teacher in for instance either face-to-face seminars or online collaborative learning is therefore critical.

Some technologies, such as online discussion forums, enable or encourage such dialogue or discourse between students and instructors at a distance. The main limitation of student-teacher interaction is that it can be time-demanding for the teacher, and therefore does not scale easily.

9.6.1.3 Student – student interaction

Figure 9.6.3 A student directed seminar at UBC Image: © University of British Columbia, 2014

High quality student-student interaction can be provided equally well both in face-to-face and online learning contexts. Asynchronous online discussion forums built into learning management systems can enable this kind of interaction. Connectivist MOOCs and communities of practice also enable student-student interaction.

Again though quality depends on good design. Merely putting students together in a group, whether online or face-to-face, is not likely to lead to either high levels of participation or high quality learning without careful thought being given to the educational goals of discussion within a course, the topics for discussion and their relationship to assessment and learning outcomes, and without strong preparation of the students by the instructor for self-directed discussions (see Chapter 4, Section 4, for more on this.)

In a technologically rich learning environment, then, a key decision for a teacher or course designer is choosing the best mix of these three different kinds of interaction, taking into consideration the epistemological approach, the amount of time available for both students and instructor, and the desired learning outcomes. Technology can enable all three kinds of interaction.

9.6.2 The interactive characteristics of media and technologies

Different technologies can enhance or inhibit each of the three types of interactivity outlined above. This again means looking at the dimension of interactivity as it applies to different media and technology. This dimension has three components or points on the dimension in terms of the extent an active response from a user is required when a medium or technology is used for teaching.

9.6.2.1 Inherent interactivity

Some media are inherently 'active' in that they 'push' learners to respond. An example is adaptive learning, where students cannot progress to the next stage of learning without interacting through a test that ascertains whether they have learned sufficiently to progress to the next stage, or what ‘corrective’ learning they still need to do. Behaviourist computer-based learning is inherently interactive, as it forces learners to respond. Technologies that control how a learner responds are often associated with more behaviourist approaches to teaching and learning.

9.6.2.2 Designed interactivity

Although some media or technologies are not inherently interactive, they can be explicitly designed to encourage interaction with learners. For instance, although a web page is not inherently interactive, it can be designed to be interactive, by adding a comment box or by requiring users to enter information or make choices. In particular, teachers or instructors can add or suggest activities within a particular medium. A podcast can be designed so that students stop the podcast every few minutes to do an activity based on the content of the podcast. This approach can be applied just as much to textbooks, where activities can be included, as to web pages.

In many cases, though, a medium will require the intervention of a teacher or instructor both to set activities around the learning materials and to provide appropriate feedback, thus adding to rather than reducing the workload of instructors. Thus where instructors have to intervene either to design activities or to provide feedback, the cost or time demands on the instructor are likely to be greater than if the other two kinds of interaction are used.

9.6.2.3 User-generated interaction

Some media may not have explicit interaction built in, but end users may still voluntarily interact with the medium, either cognitively and/or through some physical response. For instance someone in an art gallery may cognitively or emotionally respond to a particular painting (while others may just glance at it or pass it by). Students may choose to make sketches or drawings from the painting. Learners may respond in similar ways to reading a novel or poem.

The creators of the work may in fact deliberately design the work to encourage reflection or analysis, but not in explicit ways, leaving the interpretation of a work to the viewer or reader. (This of course is a constructivist approach to learning.) Media that encourage learners independently to be active without the necessary intervention of a teacher or instructor also have cost advantages, although the quality of the interaction will be more difficult to monitor or assess.

9.6.2.4 Who’s in control?

Thus one dimension of interactivity is control: to what extent is interaction controlled or enabled by the technology, by the creators/instructors, or by the users/learners? It can be seen that this is a complex dimension, once again influenced by epistemological positions, and also by design decisions on the teacher’s part. These categories of interactivity are in no way ‘fixed’, with different levels or types of interaction possible within the same medium or technology. In the end, interaction needs to be linked to desired learning outcomes. What kind of interaction will best lead to a particular type of learning outcome, and what technology or medium best provides this kind of interaction?

9.6.3 Interaction and feedback

Feedback is an important aspect of interaction, and timely and appropriate feedback on learner activities is often essential for effective learning. In particular, to what extent is feedback possible within a particular medium? Although for instance a learner may respond actively to a poem in a book, feedback on that interaction is usually not available just from the reading. Some other medium will need to be used to provide that feedback, such as a face-to-face poetry class or an online discussion forum.

On the other hand, with computer-based learning, once a student has responded to a multiple-choice question, the computer can mark the question and give almost instant feedback. However, with some technologies such as print, providing appropriate or immediate feedback to learners on their activities may be difficult or impossible. Although 'model' or 'correct' answers might be provided in a text on another page, quality feedback on activities must be provided by a teacher or instructor when using a printed medium.

Thus media and technologies again differ in their capacity to provide various kinds of feedback. From a teaching perspective, it is important to be clear about what kind of feedback is likely to be most effective, and then the most effective way to provide that feedback. In particular, under what circumstances is it appropriate to automate feedback, and when should feedback be provided by a teacher/instructor, or perhaps a teaching assistant, or even by other students?

9.6.4 Analysing the interactive qualities of different media

In Figure 9.6.4 I have analysed the interactive qualities of different educational media along two different dimensions: different types of student interaction; and characteristics of the medium, in terms of whether interaction is built into the medium, or needs to be added through deliberate design, or whether it is left to the learner to decide how to interact.

		Media interaction characteristics		
		Inherent	*Designed*	*Learner-generated*
Types of student interaction	*Learner-materials*	• adaptive learning • xMOOCs • simulations • computer-marked assignments	• textbooks • LMSs • podcasts	• TV broadcasts • novels • podcasts • YouTube videos
	Learner-teacher	• face-to-face seminars	• online discussion forums (OCL) • face-to-face lectures • e-portfolios	• e-mail • e-portfolios
	Learner-learners	• cMOOCs • virtual worlds	• group work	• social media • wikis

Figure 9.6.4 Media and student interaction

I have allocated a number of different media here according to the type of learner activity they help generate. The actual location though of some of these media will be dependent on design decisions made by the instructor. For instance, a podcast could be accompanied by an activity (designed), or just be a straight broadcast, with the student left to interpret its meaning and purpose in the course (learner-generated). In some cases, an activity may be triggered by one medium (such as a podcast) but the actual activity and the feedback may take place in another medium (such as through an online assessment).

9.6.5 Summary

Thus it can be seen that media and technology are somewhat slippery when it comes to categorising them in terms of interaction, because instructors and learners often have a choice in how the medium will actually be used, and that will affect how learner interaction and feedback takes place within a single medium. Thus once again the quality of the design of the interactive experiences is as important as the medium of choice for enabling the activity, although an inappropriate choice of technology can reduce the level of activity and/or the quality of the interactions. In reality teachers and learners are likely to use a combination of media and technologies to ensure high quality interactivity. However, using a number of different media is likely to increase cost and workload for both instructors and learners.

Once again, there is no evaluative judgement on my part in terms of which media or characteristics provide the 'best' interactivity. The choice of medium should depend on the kind of activities that are judged important by a teacher or instructor within the overall context of the teaching. The purpose of this analysis is to sensitize you to the differences between educational media in generating or facilitating different types of interactivity, so that you can make informed decisions. In this case, though, there are no clear media or technology 'winners' in terms of interactivity. Design decisions are likely to be more important than technology choice. Nevertheless, technology can enable students separated from their instructors still to get quality activities and feedback, and when appropriately used, technology used to support activities can result in more time on task for students.

9.6.6 Questions for consideration

1. In terms of the skills I am trying to develop, what kinds of interaction will be most useful? What media or technology could I use to facilitate that kind of interaction?
2. In terms of the effective use of my time, what kinds of interaction will produce a good balance between on the one hand student comprehension and student skills development, and on the other the amount of time I will be interacting personally or online with students?

Activity 9.6 Using media to promote student activity

1. Go to YouTube and type in your subject area into the 'search' box.
2. Choose a YouTube video from the list that comes up that you might recommend to your students to watch.
3. What kind of interaction would the YouTube video require from your students? Does it force them to respond in some way (inherent)?
4. In what way are they likely to respond to the YouTube on their own, e.g. make notes, do an activity, think about the topic (learner-generated)?
5. What activity could you suggest that they do, after they have watched the YouTube video (designed)? What type of knowledge or skill would that activity help develop? What medium or technology would students use to do the activity?
6. How would students get feedback on the activity that you set? What medium or technology would they and/or you use for getting and giving feedback on their activity?
7. How much work for you would that activity cause? Would the work be both manageable and worthwhile? Could the activity be scaled for larger numbers of students?
8. How could the YouTube video have been designed to generate more or better activity from viewers or students?

There is no feedback from me for this activity, which requires user-generated activity (that is, you have to do the work!)

Reference

Means, B. et al. (2009) *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies* Washington, DC: US Department of Education

Moore, M.G. (1989) Three types of interaction *American Journal of Distance Education*, Vol.3, No.2

9.7 Organisational issues

Figure 9.7.1 A video production studio at University of Illinois Urbana-Champaign Image: UIUC. Just as important as the technical facilities are the media professionals who can help with the design of good quality educational videos.

9.7.1 Institutional readiness for teaching with technology

One of the critical issues that will influence the selection of media by teachers and instructors is:

- the way the institution structures teaching activities;
- the instructional and technology services already in place;
- the support for media and technology use that their institution provides.

If an institution is organised around a set number of classroom periods every day, and the use of physical classrooms, the teachers are likely to focus mainly on classroom delivery. As Mackenzie was quoted in Chapter 9 Section 1:

> ‘*Teachers have always made the best of whatever they’ve got at hand, but it’s what we have to work with. Teachers make due*.’

The reverse is equally true. If the school or university does not support a particular technology, teachers and instructors quite understandably won’t use it. Even if the technology is in place, such as a learning management system or a video production facility, if instructors are not trained or oriented to its use and potential, then it will either be under used or not used at all. Furthermore, if ‘core’ technologies’ such as learning management systems or lecture capture facilities are not properly managed or if the services are understaffed, teachers and instructors lose patience and confidence in the technology.

Because of the inertia in institutions, there is often a bias towards those technologies that can be introduced with the minimum of organisational change, although these may not be the technologies that would have maximum impact on learning. These organisational challenges are extremely difficult, and are often major reasons for the slow implementation of new technologies for teaching in education (see Marshall, 2009) for a method for assessing the readiness of institutions for online learning).

Most institutions that have successfully introduced media and technology for teaching on a large scale have recognized the need for adequate professional support for faculty, by providing instructional designers, media designers and IT support staff to support teaching and learning. Some institutions also provide funding for innovative teaching projects.

9.7.2 Work with professionals

Figure 8.7.2 Chris Crowley is an Instructional Designer/Project Manager for UBC's Centre for Teaching, Learning and Technology. He is involved in the design, development and delivery of online courses and learning resources in a number of subject areas including Soil Science.

Even those experienced in using media for teaching and learning would be wise to work with instructional designers and professional media producers when creating any of the media discussed in this chapter (with the possible exception of social media). It is important for the choice of technology to be driven by educational goals, rather than starting with a particular medium or technology in mind.

There are several reasons for working with professionals:

- they understand the technology and as a result will enable you to develop a better product more quickly than working alone;
- two heads are better than one: working collaboratively will result in new and better ideas about how you could be using the medium;
- instructional designers and professional media producers will usually be familiar with project management and budgeting for media production, enabling resources to be developed in time and on budget. This is important as it is easy for teachers or instructors to get sucked into spending far more time than necessary on producing media.

The key point here is that although it is now possible for teachers and instructors to produce reasonably good quality audio and video on their own, they will always benefit from the input of professionals in media production.

9.7.3 Questions for consideration

1. How much and what kind of help can I get from the institution in choosing and using media for teaching? Is help easily accessible? How good is the help? Do the support people have the media professionalism I will need? Are they up to date in the use of new technologies for teaching?
2. Is there possible funding available to 'buy me out' for a semester and/or to fund a teaching assistant so I can concentrate on designing a new course or revising an existing course? Is there funding for media production?
3. To what extent will I have to follow 'standard' technologies, practices and procedures, such as using a learning management system, or lecture capture system, or will I be encouraged and supported to try something new?
4. Are there already suitable media resources freely available that I can use in my teaching, rather than creating everything from scratch? Can I get help from the library for instance in identifying these resources and dealing with any copyright issues (see Chapter 11, Section 2)?

If the answers are negative for each of these questions, you would be wise to set very modest goals initially for using media and technology.

Nevertheless the good news is that it is increasingly easy to create and manage your own media such as web sites, blogs, wikis, podcasts and simple video production using a desktop computer or even a mobile phone. Furthermore students themselves are often capable and interested in participating or helping with creating learning resources, if given the chance. Getting students involved in media production is a very good way for them to get a deeper understanding of a subject. Above all, there is an increasing amount of really good educational media coming available for free use for educational purposes, as we shall see in Chapter 11, so it is not necessary always to create media from scratch.

References

Bates, A. and Sangrà, A. (2011) *Managing Technology in Higher Education* San Francisco: Jossey-Bass

Marshall, S. (2009) *E-Learning Maturity Model Version Two: New Zealand Tertiary Institution E-Learning Capability: Informing and Guiding E-Learning Architectural Change and Development* Wellington NZ: Victoria University of Wellington

Activity 9.7

There is no activity provided for this section. The issues covered here are discussed in more depth in Bates and Sangrà (2011).

9.8 Networking (and novelty)

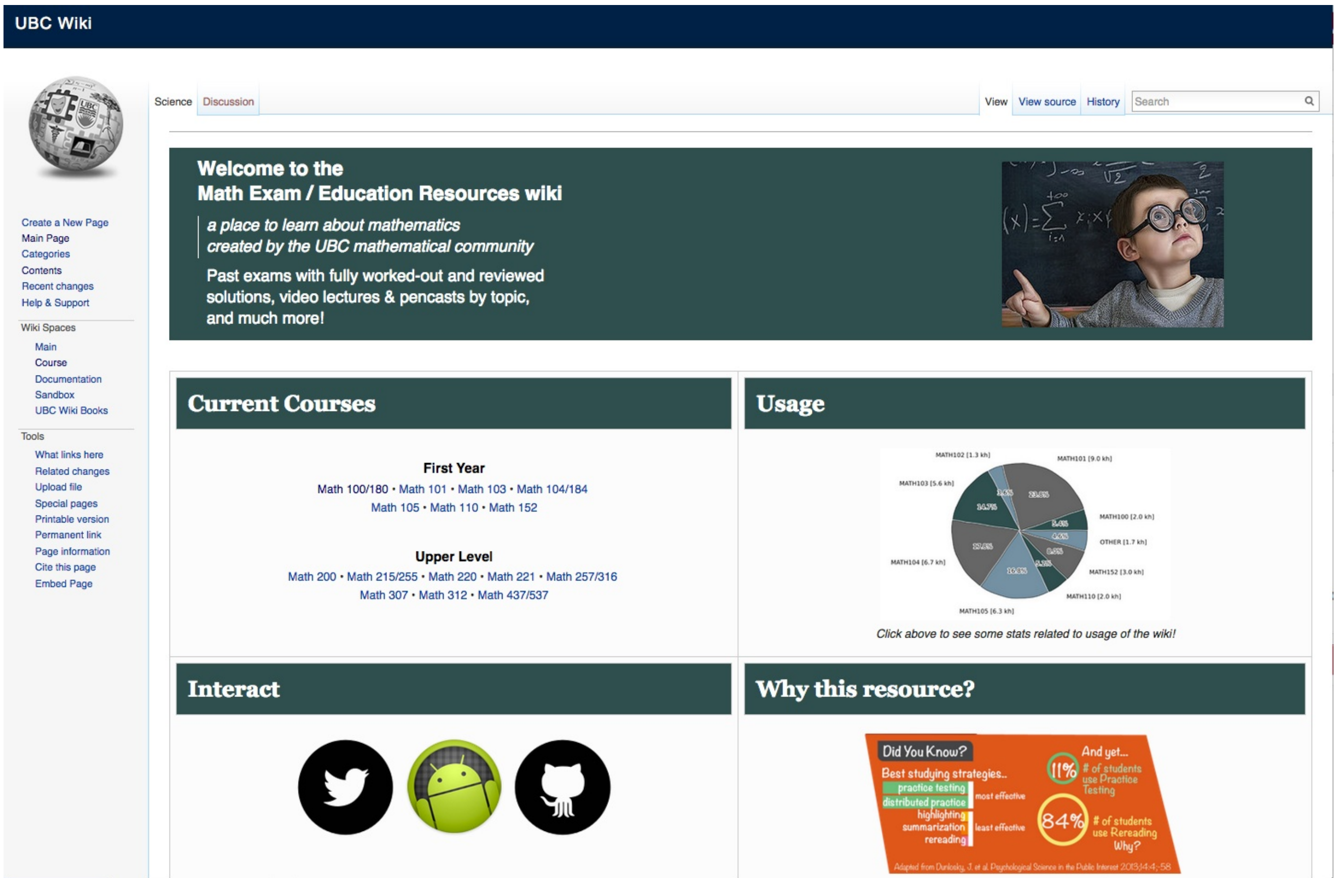


Figure 9.8.1 UBC's Math Exam Wiki (click on image to go to web page)

9.8.1 Networking and novelty in course design

In earlier versions of the SECTIONS model, 'N' stood for novelty. This was to recognise the importance of teachers and instructors trying something new to improve on their practice, in this case to try a new technology and see how well it worked for them. Also the 'hype' surrounding new developments in technology often provides a supportive environment for innovative teaching. This is still an important issue; without experiment and trying new ways of teaching and new technologies for teaching, there will be no improvement in practice.

However, more recent developments in social media raise another, increasingly important, question that needs to be asked when selecting media:

> *how important is it to enable learners to network beyond a course, with others such as subject specialists, professionals in the field, and relevant people in the community? Can the course, or student learning, benefit from such external connections?*

If the answer to this is an affirmative, then this will affect what media to use, and in particular will suggest the use of social media such as blogs, wikis, Facebook, LinkedIn, or Google Hangout.

Five different ways social media are influencing the application of networking in course design are described below.

9.8.2 Supplementing 'standard' learning technologies

Some instructors are combining social media for external networking with 'standard' institutional technologies such as a learning management system or video delivery. The LMS, which is password protected and available only to the instructor and other enrolled students, allows for 'safe' communication within the course. The use of social media allows for connections with the external world (contributions can still be screened by the course blog or wiki administrator by monitoring and approving contributions.)

For instance, a course on Middle Eastern politics could have an internal discussion forum focused on relating current events directly to the themes and issues that are the focus of the course, but students may manage their own, public wiki that encourages contributions from Middle East scholars and students, and indeed anyone from the general public. Comments may end up being moved into and out of the more closed class discussion forum as a result.

9.8.3 Exclusive use of social media for credit courses

Other instructors are moving altogether away from 'standard' institutional technology such as learning management systems and lecture capture into the use of social media for managing the whole course. For instance, UBC's course ETEC 522 uses WordPress, YouTube videos and podcasts for instructor and student contributions to the course. Indeed the choice of social media on this course changes every year, depending on the focus of the course, and new developments in social media. Jon Beasley-Murray at the University of British Columbia built a whole course around students creating a high level (featured-article) Wikipedia entry on Latin American literature (Latin American literature WikiProject – see Beasley-Murray, 2008).

9.8.4 Student generated learning resources

This is a particularly interesting development where students themselves use social media to create resources to help other students. For instance, graduate math students at UBC have created the Math Exam/Education Resources wiki, which provides '*past exams with fully worked-out and reviewed solutions, video lectures & pencasts by topic*'. Such sites are open to anyone needing help in their studying, not just UBC students. The project involves voluntary collaboration between graduate students for the benefit of undergraduate students.

9.8.5 Self-managed learning groups

cMOOCs are an obvious example of self-managed learning groups using social media such as webinars, blogs and wikis.

9.8.6 Instructor-led open educational resources

YouTube in particular is becoming increasingly popular for instructors to use their knowledge to create resources available to anyone. The best example is still the Khan Academy, but there are many other examples, such as MIT's OpenCourseWare. xMOOCs are another example. This will be discussed more in Chapter 11.

Once again, the decision to 'open up' teaching is as much a philosophical or value decision as a technology decision, but the technology is now there to encourage and enable this philosophy.

9.8.7 Questions for consideration

1. How important is it to enable learners to network beyond a course, with others such as subject specialists, professionals in the field, and relevant people in the community? Can the course, or student learning, benefit from such external connections?
2. If this is important, what's the best way to do this? Use social media exclusively? Integrate it with other standard course technology? Delegate responsibility for its design and/or administration to students or learners?

References

Beasley-Murray, J. (2008) Was introducing Wikipedia to the classroom an act of madness leading only to mayhem if not murder? *Wikipedia*, March 18

Activity 9.8 Networking (and novelty)

1. How could you use social media in one of your courses to enable students in the course to connect to the outside world? How would it improve their learning? What would be the risks as well as the benefits?

For my feedback on this, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=246

9.9 Security and privacy

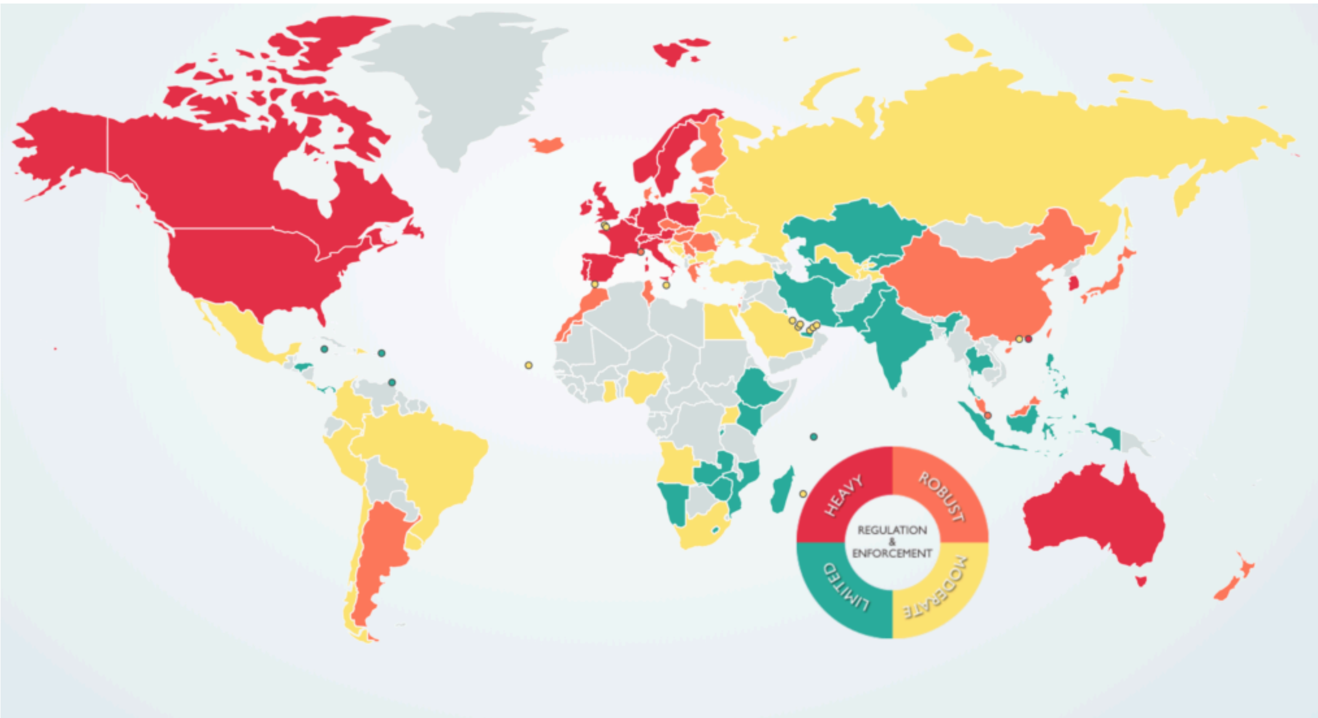


Figure 9.9.1 Strength of data protection laws. Click on image for more information.
Image: © 2019 DLA Piper

'S' too is a change from the earlier ACTIONS model, where 'S' stood for speed, in terms of how quickly a technology enabled a course to be developed. However, the issues previously raised under speed have also been included in SECTIONS 'Ease of Use' (Chapter 9, Section 2). This allows 'Speed' to be replaced with 'Security and privacy', issues which have become increasingly important for education in a digital age.

9.9.1 The need for privacy and security when teaching

Teachers, instructors and students need a private place to work online. Instructors want to be able to criticize politicians or corporations without fear of reprisal; students may want to keep rash or radical comments from going public or will want to try out perhaps controversial ideas without having them spread all over Facebook. Institutions want to protect students from personal data collection for commercial purposes by private companies, tracking of their online learning activities by government agencies, or marketing and other unrequested commercial or political interruption to their studies. In particular, institutions want to protect students, as far as possible, from online harassment or bullying. Creating a strictly controlled environment enables institutions to manage privacy and security more effectively.

Learning management systems provide password protected access to registered students and authorised instructors. Learning management systems were originally housed on servers managed by the institution itself. Password protected LMSs on secure servers have provided that protection. Institutional policies regarding appropriate online behaviour can be managed more easily if the communications are managed 'in-house.'

9.9.2 Cloud based services and privacy

However, in recent years, more and more online services have moved 'to the cloud', hosted on massive servers whose physical location is often unknown even to the institution's IT services department. Contract agreements between an educational institution and the cloud service provider are meant to ensure security and back-ups.

Nevertheless, Canadian institutions and privacy commissioners have been particularly wary of data being hosted out of country, where it may be accessed through the laws of another country. There has been concern that Canadian student information and communications held on cloud servers in the USA may be accessible via the U.S. Patriot Act. For instance, Klassen (2015) writes:

> *Social media companies are almost exclusively based in the United States, where the provisions of the Patriot Act apply no matter where the information originates. The Patriot Act allows the U.S. government to access the social media content and the personally identifying information without the end users' knowledge or consent. The government of British Columbia, concerned with both the privacy and security of personal information, enacted a stringent piece of legislation to protect the personal information of British Columbians. The Freedom of Information and Protection of Privacy Act (FIPPA) mandates that no personally identifying information of British Columbians can be collected without their knowledge and consent, and that such information not be used for anything other than the purpose for which it was originally collected.*

Concerns about student privacy have increased even more when it became known that countries were sharing intelligence information, so there remains a risk that even student data on Canadian-based servers may well be shared with foreign countries.

Perhaps of more concern though is that as instructors and students increasingly use social media, academic communication becomes public and 'exposed'. Bishop (2011) discusses the risks to institutions in using Facebook:

- privacy is different from security, in that security is primarily a technical, hence mainly an IT, issue. Privacy needs a different set of policies that involves a much wider range of stakeholders within an institution, and hence a different (and more complex) governance approach from security;
- many institutions do not have a simple, transparent set of policies for privacy, but different policies set by different parts of the institution. This will inevitably lead to confusion and difficulties in compliance;

- there is a whole range of laws and regulations that aim to protect privacy; these cover not only students but also staff; privacy policy needs to be consistent across the institution and be compliant with such laws and regulation;
- Facebook's current privacy policy (2011) leaves many institutions using Facebook at a high level of risk of infringing or violating privacy laws – merely writing some kind of disclaimer will in many cases not be sufficient to avoid breaking the law.

The controversy at Dalhousie University where dental students used Facebook for violent sexist remarks about their fellow women students is an example of the risks endemic in the use of social media.

9.9.3 The need for balance

Although there may well be some areas of teaching and learning where it is essential to operate behind closed doors, such as in some areas of medicine or areas related to public security, or in discussion of sensitive political or moral issues, in general though there have been relatively few privacy or security problems when teachers and instructors have opened up their courses, have followed institutional privacy policies, and above all where students and instructors have used common sense and behaved ethically. Nevertheless, as teaching and learning becomes more open and public, the level of risk does increase.

9.9.4 Questions for consideration

1. What student information am I obliged to keep private and secure? What are my institution's policies on this?
2. What is the risk that by using a particular technology my institution's policies concerning privacy could easily be breached? Who in my institution could advise me on this?
3. What areas of teaching and learning, if any, need I keep behind closed doors, available only to students registered in my course? Which technologies will best allow me to do this?

References

Bishop, J. (2011) Facebook Privacy Policy: Will Changes End Facebook for Colleges? *The Higher Ed CIO*, October 4

Klassen, V. (2015) *Privacy and Cloud-Based Educational Technology in British Columbia* Vancouver BC: BCCampus

See also:

Bates, T. (2011) Cloud-based educational technology and privacy: a Canadian perspective, *Online Learning and Distance Education Resources*, March 25

Activity 9.9 Security and privacy

1. Who in your institution can advise you on the institution's policy or the state law on the use of social media or indeed any network outside your institution's private internal network(s)?

Click on the podcast for my personal comments on this issue:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=249

9.10 Deciding

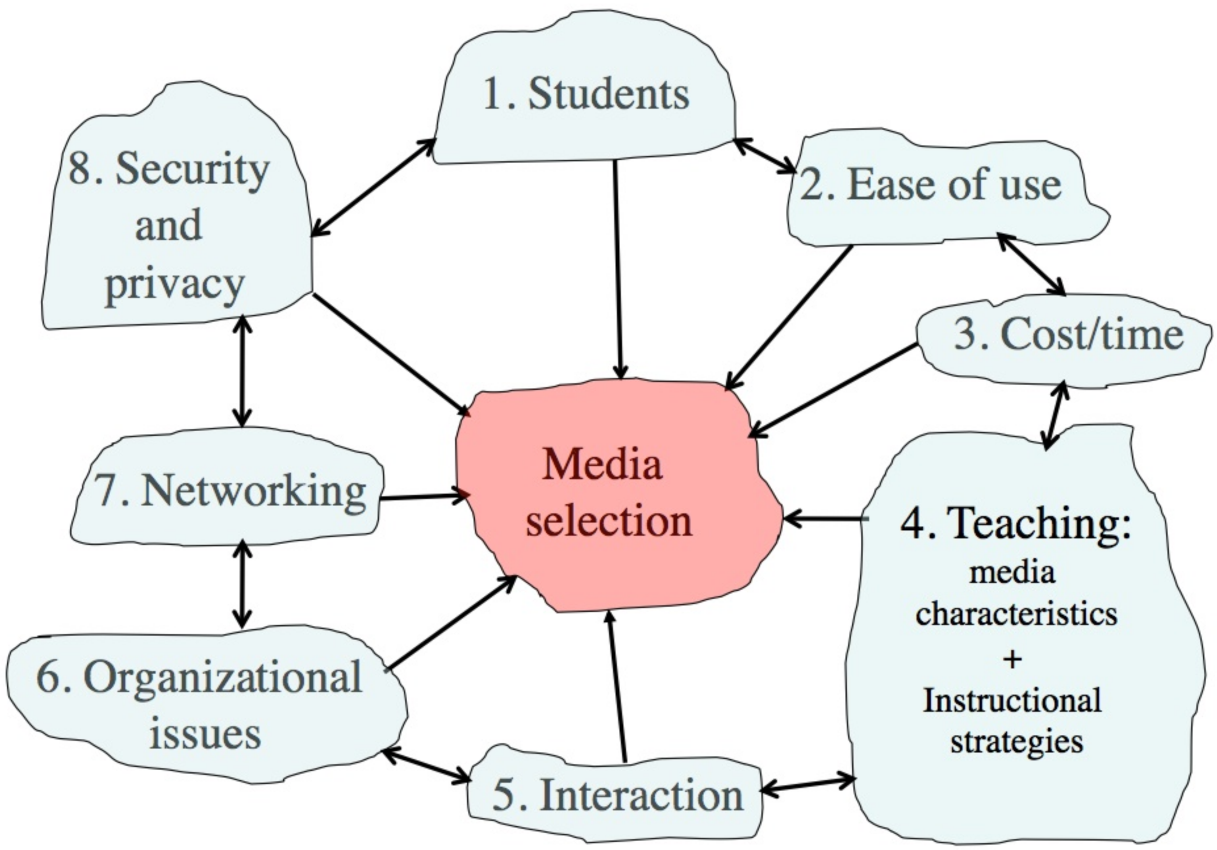


Figure 9.9 The SECTIONS model

If you've worked your way right through the last three chapters, you are probably feeling somewhat overwhelmed by all the factors to take into consideration when selecting media. It is a complex issue, but if you have read all the previous sections, you are already in a good position to make well informed decisions. Let me explain.

9.10.1 Deductive versus inductive decision-making

Many years ago, when I first developed the ACTIONS model, I was approached by a good friend who worked for a large international computer company. (This was so long ago that data were entered to computers using punched cards). We sat down over a cup of coffee, and he outlined his plan. Here's how the conversation went.

> *Pierre*. Tony. I'm very excited about your model. We could take it and apply it in every school and university in the world.
>
> *Tony*. Really? Now how would you do that?
>
> *Pierre*. Well, you have a set of questions that teachers have to ask for each of the criteria. There is probably a limited set of answers to these questions. You could either work out what those answers are, or collect answers from a representative sample of teachers. You could then give scores to each technology depending on the answers they give. So when a teacher has to make a choice of technology, they would sit down, answer the questions, then depending on their answers, the computer would calculate the best choice of technology. Voilà!
>
> *Tony*. I don't think that's going to work, Pierre.
>
> *Pierre*: But why not?
>
> *Tony*. I'm not sure, but I have a gut feeling about this.
>
> *Pierre*. A gut feeling? My English is not so good. What do you mean by a gut feeling?
>
> *Tony*. Pierre, your English is excellent. My response is not entirely logical, so let me try and think it through now, both for you and me, why I don't think this will work. First, I'm not sure there is a limited number of possible answers to each question, but even if there is, it's not going to work.
>
> *Pierre*. Well, why not?
>
> *Tony.* Because I'm not sure how a teacher would score their response to each question and in any case there's going to be interaction between the the answers to the questions. It's not the addition of each answer that will determine what technology they might use, but how those answers combine. From a computing point of view, there could be very many different combinations of answers, and I'm not sure what the significant combinations are likely to be with regard to choosing each technology.
>
> *Pierre*. But we have very big and fast computers, and we can simplify the process through algorithms.
>
> *Tony*. Yes, but you have to take into account the context in which teachers will make media selections. They are going to be making decisions about media all the time, in many different contexts. It's just not practical to sit down at a computer, answer all the questions, then wait for the computer's recommendation.
>
> *Pierre*. But won't you give this a try? We can work through all these problems.

> *Tony*. Pierre, I really appreciate your suggestion, but my gut tells me this won't work, and I really don't want to waste your time or mine on this.
>
> *Pierre*. Well, what are you going to tell teachers then? How will they make their decisions?
>
> *Tony*. I will tell them to use their gut instinct, Pierre – when they have read and applied the ACTIONS model.

This really is a true story, although the actual words spoken may have been different. The fact that we do have artificial intelligence these days that technically could do this hasn't changed my mind, because what we have in this scenario is a conflict between deductive reasoning (Pierre) and inductive reasoning (Tony).

9.10.1.1 Deductive reasoning

With deductive reasoning, you would do what Pierre suggests: start without any prior conceptions about which technology to use, answer each of the questions I posed at the end of each part of the SECTIONS model, then write down all the possible technologies that would fit the answers to each question, see what technology would best match each of the questions/criteria, and 'score' each technology on a recommended scale for each criterion. You would then try to find a way to add all those answers together, perhaps by using a very large matrix, and then end up with a decision about what technology to use.

A major problem though is that every teacher and every learning context is somewhat different each time a decision needs to be made. Experienced teachers in particular will bring a whole lot of knowledge with them – ideas about effective teaching methods, knowledge of the students, the requirement of the content and the skills they are trying to develop at the moment of decision, and above all the context in which the medium will be used (home, classroom, etc.) – before they have to make a decision.

9.10.1.2 Inductive reasoning

My solution is very different from Pierre's. Mine is a more inductive approach to decision making. The main criterion for inductive logic is as follows:

> *As evidence accumulates, the degree to which the collection of true evidence statements comes to support a hypothesis, as measured by the logic, should tend to indicate that false hypotheses are probably false and that true hypotheses are probably true.*
>
> Stanford Encyclopedia of Philosophy

In terms of selecting media, you probably start with a number of possible technologies in mind at the beginning of the process (hypotheses – or your gut feeling). My suggested process is start with your gut feeling about which technologies you're thinking of using, but keeping an open mind, then move through all the questions suggested in each of the SECTIONS criteria (that is, collecting evidence for or against your initial 'gut feeling'.) You then start building more evidence to support or reject the use of a particular medium or technology. By the end of the process you have a 'probabilistic' view of what combinations of media will work best for you and why. This is not an exercise you would have to do in detail or even consciously every time. Once you have done it just a few times, the choice of medium or technology in each 'new' situation will be quicker and easier, because the brain stores all the previous information and you have a framework (the SECTIONS model) for organising new information as it arrives and integrating it with your previous knowledge.

9.10.1.3 Rapid decision-making

Now you've read this chapter you already have a set of questions for consideration (I have listed them all together in Appendix 1 for easy reference). You are now in the same position as the king who asked the alchemist how to make gold. 'It's easy', said the alchemist, 'so long as you don't think about elephants.' Well, having read the three chapters on media in full, you now have the elephants in your head. It will be difficult to ignore them. The brain is in fact a wonderful instrument for making intuitive or inductive decisions of this kind. The trick though is to have all this information somewhere in your head, so you can pull it all out when you need it. The brain does this very quickly. Your decisions won't always be perfect, but they will be a lot better than if you hadn't already thought about all these issues, and in life, rough but ready usually beats perfect but late.

9.10.2 Grounding media selection within a course development framework

Media selection does not happen in a vacuum. There are many other factors to consider when designing teaching. In particular, embedded within any decision about the use of technology in education and training will be assumptions about the learning process. We have already seen earlier in this book how different epistemological positions and theories of learning affect the design of teaching, and these influences will also determine a teacher's or an instructor's choice of appropriate media. Media selection is just one part of the course design process. It has to fit within the broader framework of course design.

In Figure 9.10.2 below, Hibbitts and Travin's modification of the ADDIE model (see Chapter 4, Section 3) presents the following learning and technology development model that incorporates the various stages of course design:

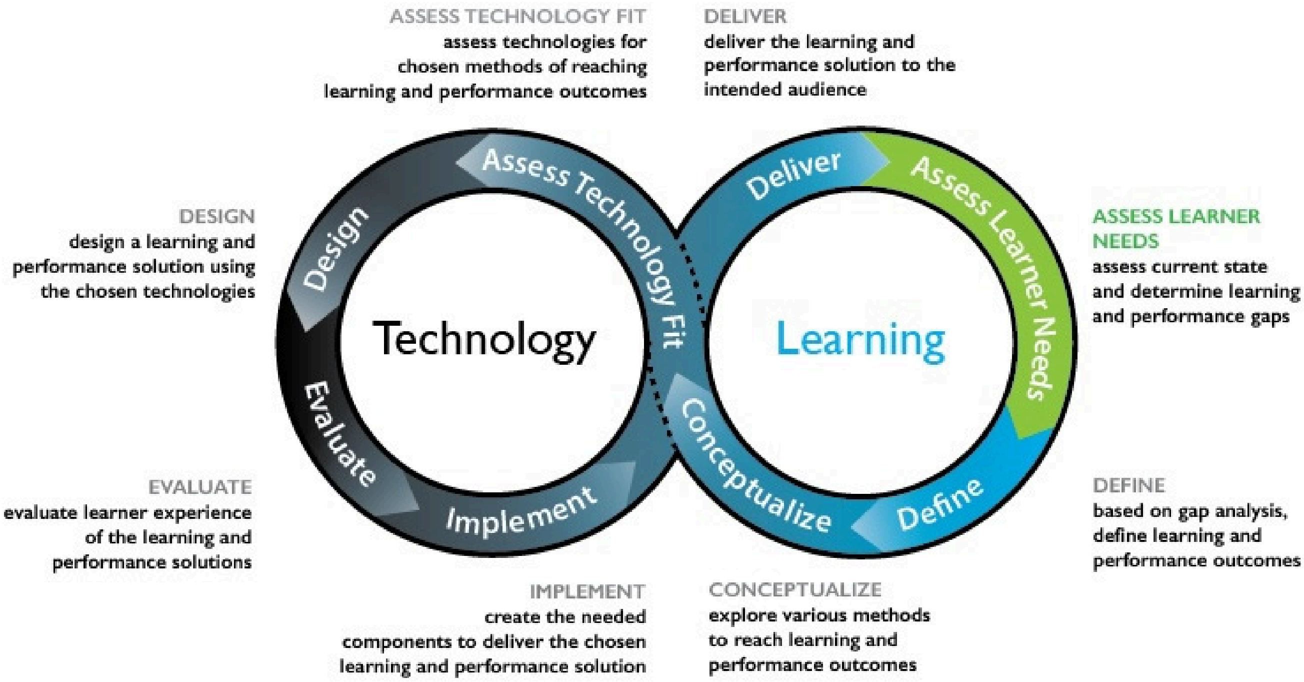


Figure 9.10.2 Hibbitts and Travin's Learning + technology development model

The SECTIONS model is strategy that could be used for assessing the technology fit within this course development process. Whether you are using ADDIE or an agile design approach, then, media selection will be influenced by the other factors in course design, adding more information to be considered. This will all be mixed in with your knowledge of the subject area and its requirements, your beliefs and values about teaching and learning, and a lot of emotion as well.

All this further reinforces the inductive approach to decision making that I have suggested. Don't underestimate the power of your brain – it's far better than a computer for this kind of decision-making. But it's important to have the necessary information, as far as possible. So if you skipped a part of this chapter, or the previous two chapters on media, you might want to go back over it!

Activity 9.10: Choosing media and technologies

1. Choose the same course that you chose for Activity 9.1.

2. Go to Appendix 1, and see how many of the questions you can answer. Use Chapter 9 to help, if necessary, including your answers to some the activities in Chapter 9.

3. When you have answered as many questions as you can from Appendix 1, what media or technologies will you now think of using. How does this differ from your original list? If there are changes, why?

Again, no feedback is provided as each context will be different.

Chapter 9 Key Takeaways

1. Selecting media and technologies is a complex process, involving a very wide range of interacting variables.

2. There is currently no generally accepted theory or process for media selection. The SECTIONS model however provides a set of criteria or questions the result of which can help inform an instructor when making decisions about which media or technologies to use.

3. Because of the wide range of factors influencing media selection and use, an inductive or intuitive approach to decision-making, informed by a careful analysis of all the criteria in the SECTIONS framework, is one practical way to approach decision-making about media and technologies for teaching and learning.

4. However, media selection needs to be integrated within the broader framework of course design.

Chapter 10: Modes of delivery

The purpose of the chapter

When you have completed this chapter you should be able to:

- determine the most appropriate mode of delivery for any course or program you wish to offer;
- determine what factors should influence this decision;
- better identify the role of classroom teaching when students can now increasingly study most things online.

What is covered in this chapter

Also in this chapter you will find the following activities:

Key Takeaways from this chapter

1. There is a continuum of technology-based learning, from 'pure' face-to-face teaching to fully online programs. Every teacher or instructor needs to decide where on the continuum a particular course or program should be.

2. We do not have good research evidence or theories to make this decision, although we do have growing

experience of the strengths and limitations of online learning. What is particularly missing is an evidence-based analysis of the strengths and limitations of face-to-face teaching when online learning is also available.

3. In the absence of good theory, I have suggested four factors to consider when deciding on mode of delivery, and in particular the different uses of face-to-face and online learning in blended courses:

- student characteristics and needs;
- your preferred teaching strategy, in terms of methods and learning outcomes;
- the pedagogical and presentational requirements of the subject matter, in terms of (a) content and (b) skills;
- the resources available to you as an instructor (including your time).

4. The move to blended or hybrid learning in particular means rethinking the use of the campus and the facilities needed fully to support learning in a hybrid mode.

10.1 The continuum of technology-based learning

Figure 10.1.1 Why get on the bus when you can study online? (UBC bus loop)

In Chapters 7, 8 and 9, the use of media incorporated into a particular course or program was explored. In this chapter, the focus is on deciding whether a whole course or program should be offered partly or wholly online. In Chapter 11 the focus is on deciding when and how to adopt an approach that incorporates 'open-ness' in its design and delivery.

10.1.1 The many faces of online learning

Online learning, blended learning, flipped learning, hybrid learning, flexible learning, open learning and distance education are all terms that are often used inter-changeably, but there are significant differences in meaning. More importantly, these forms of education, once considered somewhat esoteric and out of the mainstream of conventional education, are increasingly taking on greater significance and in some cases becoming mainstream themselves. As teachers and instructors become more familiar and confident with online learning and new technologies, there will be more innovation in integrating online and face-to-face teaching.

10.1.1.1 Variations on blended learning

At the time of writing though it is possible to identify at least the following modes of delivery:

- *classroom teaching* with no technology at all (which is very rare these days);
- *blended learning*, which encompasses a wide variety of designs, including:
    - *technology-enhanced learning*, or technology used as classroom aids; a typical example would be the use of Powerpoint slides and/or clickers in a lecture;
    - the use of *a learning management system to support classroom teaching*, for storing learning materials, providing a course schedule of topics, for online discussion, and for submitting student assignments, but teaching is still delivered mainly through classroom sessions;
    - the use of *lecture capture for flipped classrooms*, where students watch the lecture via streamed video then come to class for discussion or other work; see for instance a calculus course offered at Queen's University, Canada;
    - one semester face-to-face on campus and two semesters online (one model at Royal Roads University);
    - *hybrid* or *flexible* learning requiring the redesign of teaching so that students can do the majority of their learning online, coming to campus only for very specific face-to-face teaching, such as lab or hands-on practical work, that cannot be done satisfactorily online (for examples, see Section 10.1.1.2 below);
- *fully online learning* with no classroom or on-campus teaching, which is one form of distance education, including:
    - courses for credit, which will usually cover the same content, skills and assessment as a campus-based version, but are available only to students admitted to a program;
    - non-credit courses offered only online, such as courses for continuing professional education;
    - fully open courses, such as MOOCs.

More than one third of higher education students in the USA now take at least one fully online course, and about 15 per cent of students are taking only online courses. While overall enrolments in the US higher education system have slowly declined (by almost 4 per cent between 2012 to 2016), online enrolments have grown by about 5 per cent over the same period (Seaman et al., 2018). In Canadian post-secondary institutions in 2017, approximately 8 per cent of all credit course registrations were fully online (Donovan et. al., 2018).

10.1.1.2 Hybrid learning

There is an important development within blended learning that deserves special mention, and that is the total re-design of campus-based classes that takes greater advantage of the potential of technology, which I call *hybrid learning*, with online learning combined with focused small group face-to-face interactions or mixing online and physical lab experiences. In such designs, the amount of face-to-face contact time is usually reduced, for instance from three classes a week to one, to allow more time for students to study online.

In hybrid learning the whole learning experience is re-designed, with a transformation of teaching on campus built around the use of technology. For instance:

- Carol Twigg at the National Center for Academic Transformation has for many years worked with universities and colleges to redesign usually large lecture class programs to improve learning and reduce costs through the use of technology. This program ran very successfully between 1999 and 2018;
- Virginia Tech many years ago created a successful program for first and second year math teaching built around 24 x 7 computer-assisted learning supported by 'roving' instructors and teaching assistants (Robinson and Moore, 2006);
- The University of British Columbia launched in 2013 what it calls a flexible learning initiative focused on *developing, delivering, and evaluating learning experiences that promote effective and dramatic improvements in student achievement. Flexible learning enables pedagogical and logistical flexibility so that students have more choice in their learning opportunities, including when, where, and what they want to learn.*

Thus 'blended learning' can mean minimal rethinking or redesign of classroom teaching, such as the use of classroom aids, or complete redesign as in flexibly designed courses, which aim to identify the unique pedagogical characteristics of face-to-face teaching, with online learning providing flexible access for the rest of the learning.

Instructors in more than three quarters of Canadian post-secondary institutions in 2017 were integrating online with classroom teaching, but no more than one in five institutions had a significant number of courses in this format. However, most institutions are predicting a rapid increase in such courses over the next few years (Donovan et al., 2019)

10.1.2 The continuum of online learning

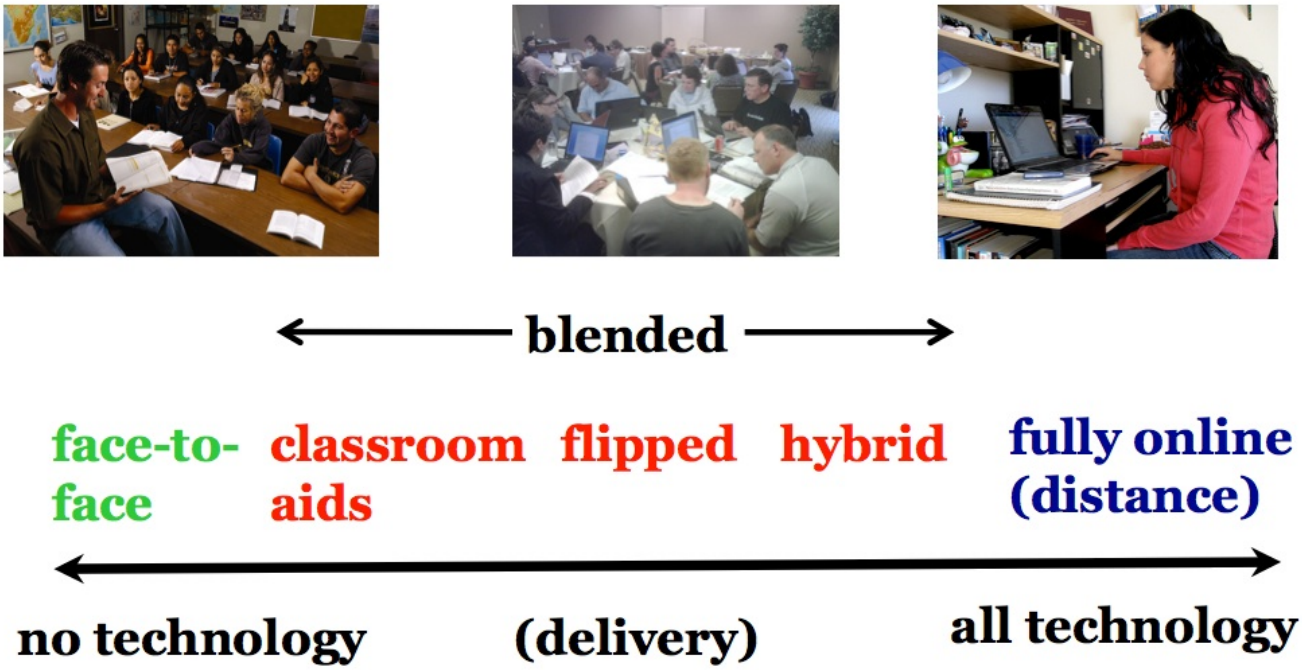


Figure 10.1.2 The continuum of technology-based learning (modes of delivery). Adapted from Bates and Poole, 2003.

Thus there is a continuum of technology-based learning, as illustrated in Figure 10.1.2 above.

10.1.3 Decisions, decisions!

These developments open up a whole new range of decisions for instructors. Every instructor now needs to decide:

- what kind of course or program should I be offering?
- what factors should influence this decision?
- what is the role of classroom teaching when students can now increasingly study most things online?
- should I open up my teaching to anyone, and if so, under what circumstances?

This chapter aims to help you answer these questions.

References

Bates, A. and Poole, G. (2003) *Effective Teaching with Technology in Higher Education: Foundations for Success* San Francisco: Jossey-Bass

Donovan, T. et al. (2019) *Tracking Online and Distance Education in Canadian Universities and Colleges: 2018* Halifax NS: Canadian Digital Learning Research Association

Robinson, B. and Moore, A. (2006) 'Virginia Tech: the Math Emporium' in Oblinger, D. (ed.) *Learning Spaces* Boulder CO: EDUCAUSE

Seaman, J., Allen, I., and Seaman, J. (2018) *Grade Increase: Tracking Distance Education in the United States* Wellesley MA: The Babson Survey Research Group

Activity 10.1 Where on the continuum are your courses?

1. If you are currently teaching, where on the continuum is each of your courses? How easy is it to decide? Are there factors that make it difficult to decide where on the continuum any of your courses should fit?

2. How was it decided what the mode of delivery would be for the courses you teach? If you decided, what were the reasons for the location of each course on the continuum?

3. Are you happy with the decision(s)?

3. What kind of students do you have in each type of course?

There is no feedback provided on this activity

10.2 Comparing modes of delivery

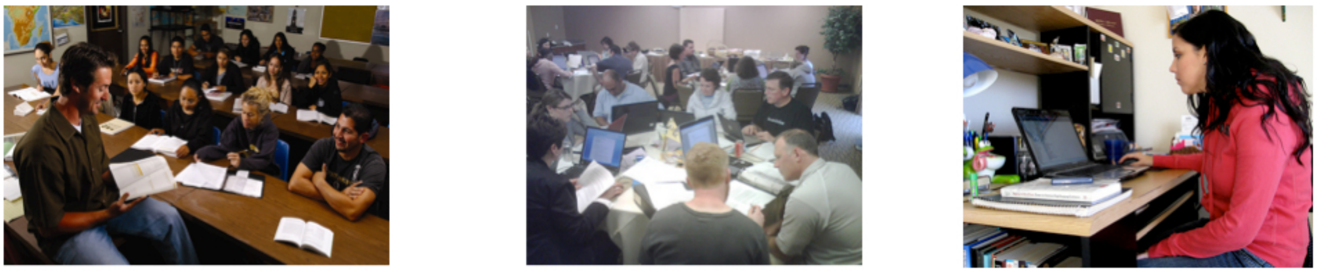


Figure 10.2.1 Which is the best?

Many surveys have found that a majority of faculty still believe that online learning or distance education is inevitably inferior in quality to classroom teaching (see for instance Jaschik and Letterman, 2014). In fact, there is no scientifically-based evidence to support this opinion. The evidence points in general to no significant differences, and if anything research suggests that blended or hybrid learning has some advantages over face-to-face teaching in terms of learning performance (see, for example, Means et al., 2010).

9.2.1 The influence of distance education on online learning

We can learn a great deal from earlier developments in distance education. Although the technology is different, fully online learning is, after all, just another version of distance education.

Much has been written about distance education (see, for instance, Wedemeyer, 1981; Peters, 1983; Holmberg, 1989; Keegan, 1990; Moore and Kearsley, 1996; Peters, 2002; Bates, 2005; Evans et al., 2008) but in concept, the idea is quite simple: students study in their own time, at the place of their choice (home, work or learning centre), and without face-to-face contact with a teacher. However, students are 'connected', today usually through the Internet, with an instructor, adjunct faculty or tutor who provides learner support and student assessment.

Distance education has been around a very long time. It could be argued that in the Christian religion, St. Paul's epistle to the Corinthians was an early form of distance education (53-57 AD). The first distance education degree was offered by correspondence by the University of London (UK) in 1858. Students were mailed a list of readings, and took the same examination as the regular on-campus students. If students could afford it, they hired a private tutor, but the Victorian novelist Charles Dickens called it the People's University, because it provided access to higher education to students from less affluent backgrounds. The program still continues to this day, but is now called the University of London (Worldwide), with more than 50,000 students in 180 countries.

In North America, historically many of the initial land-grant universities, such as Penn State University, the University of Wisconsin, and the University of New Mexico in the USA, and Memorial University, University of Saskatchewan and the University of British Columbia in Canada, had state- or province-wide responsibilities. As a result these institutions have a long history of offering distance education programs, mainly as continuing education for farmers, teachers, and health professionals scattered across the whole state or province. These programs have now been expanded to cover undergraduate and professional masters students. Australia is another country with an extensive history of both k-12 and post-secondary distance education.

Qualifications received from most of these universities carry the same recognition as degrees taken on campus. For instance, the University of British Columbia, which has been offering distance education programs since 1936, makes no distinction on student transcripts between courses taken at a distance and those taken on campus, as both kinds of students take the same examinations.

Another feature of distance education, pioneered by the British Open University in the 1970s, but later adopted and adapted by North American universities that offered distance programs, is a course design process, based on the ADDIE model, but specially adapted to serve students learning at a distance. This places a heavy emphasis on defined learning outcomes, production of high quality multimedia learning materials, planned student activities and engagement, and strong learner support, even at a distance. As a result, campus-based universities that offered distance education programs were well placed for the move into online learning in the 1990s. These universities have found that in general, students taking the online programs do almost as well as the on-campus students (course completion rates are usually within 5-10 per cent of the on-campus students – see Ontario, 2011), which is somewhat surprising as the distance students often have full-time jobs and families.

It is important to acknowledge the long and distinguished pedigree of distance education from internationally recognised, high quality institutions, because commercial diploma mills, especially in the USA, have given distance education an unjustified reputation of being of lower quality. As with all teaching, distance education can be done well or badly. However, where distance education has been professionally designed and delivered by high quality public institutions, it has proved to be very successful, meeting the needs of many working adults, students in remote areas who would otherwise be unable to access education on a full-time basis, or on-campus students wanting to fit in an extra course or with part-time jobs whose schedule clashes with their lecture schedule. However, universities, colleges and even schools have been able to do this only by meeting high quality design standards.

At the same time, there has also been a small but very influential number of campus-based teachers and instructors who quite independently of distance education have been developing best practices in online or computer-supported learning. These include Roxanne Hiltz and Murray Turoff (1978) who were experimenting with online or blended learning as early as the late 1970s at the New Jersey Institute of Technology, and Linda Harasim (2017) at Simon Fraser University, who all focused particularly on online collaborative learning and knowledge construction within a campus or school environment.

There is also plenty of evidence that teachers and instructors in many schools, colleges and universities new to online learning have not adopted these best practices, instead merely transferring lecture-based classroom practice to blended and online learning, often with poor or even disastrous results.

10.2.2 What the research tells us

There have been thousands of studies comparing face-to-face teaching to teaching with a wide range of different technologies, such as televised lectures, computer-based learning, and online learning, or comparing face-to-face teaching with distance education. With regard to online learning there have been several meta-studies. A meta-study combines the results of many 'well-conducted scientific' studies, usually studies that use the matched comparisons or quasi-experimental method (Means et al., 2010; Barnard et al., 2014). Nearly all such 'well-conducted' meta-studies find no or little significant difference between the modes of delivery, in terms of the effect on student learning or performance. For instance, Means et al. (2010), in a major meta-analysis of research on blended and online learning for the U.S. Department of Education, reported:

> *In recent experimental and quasi-experimental studies contrasting blends of online and face-to-face instruction with conventional face-to-face classes, blended instruction has been more effective, providing a rationale for the effort required to design and implement blended approaches. When used by itself, online learning appears to be as effective as conventional classroom instruction, but not more so.*

Means et al. attributed the slightly better performance of blended learning to students spending more time on task. This highlights a common finding, that where differences have been found, they are often attributed to factors other than the mode of delivery. Tamim et al. (2011) identified 'well-conducted' comparative studies covering 40 years of research. Tamim et al. found there is a slight tendency for students who study with technology to do better than students who study without technology. However, the measured difference was quite weak, and the authors state:

> *it is arguable that it is aspects of the goals of instruction, pedagogy, teacher effectiveness, subject matter, age level, fidelity of technology implementation, and possibly other factors that may represent more powerful influences on effect sizes than the nature of the technology intervention.*

Research into any kind of learning is not easy; there are just so many different variables or conditions that affect learning in any context. Indeed, it is the *variables* we should be examining, not just the technological delivery. In other words, we should be asking a question first posed by Wilbur Schramm as long ago as 1977:

> *What kinds of learning can different media best facilitate, and under what conditions?*

In terms of making decisions then about mode of delivery, we should be asking, not which is the best method overall, but:

> *What are the most appropriate conditions for using face-to-face, blended or fully online learning respectively?*

Fortunately, there is much research and best practice that provides guidance on that question, at least with respect to blended and online learning (see, for instance, Anderson, 2008; Picciano et al., 2013; Halverson et al., 2012; Zawacki-Richter and Anderson, 2014). Ironically, what we lack is good research on the unique potential of face-to-face teaching in a digital age when so much can also be done just as well online.

10.2.3 Challenging the supremacy of face-to-face teaching

Although there has been a great deal of mainly inconclusive research comparing online learning with face-to-face teaching in terms of student learning, there is very little evidence or even theory to guide decisions about what is best done online and what is best done face-to-face in a blended learning context, or about the circumstances or conditions when fully online learning is in fact a better option than classroom teaching. Generally the assumption appears to have been that face-to-face teaching is the default option by virtue of its superiority, and online learning is used only when circumstances prevent the use of face-to-face teaching, such as when students cannot get to the campus, or when classes are so large that interaction with students is at a minimum.

However, online learning has now become so prevalent and effective in so many contexts that it is time to ask:

> *what are the unique characteristics of face-to-face teaching that make it pedagogically different from online learning?*

It is possible of course that there is nothing pedagogically unique about face-to-face teaching, but given the rhetoric around 'the magic of the campus' (Sarma, 2013) and the hugely expensive fees associated with elite campus-based teaching, or indeed the high cost of publicly funded campus-based education, it is about time that we had some evidence-based theory about what makes face-to-face teaching so special. This will be discussed further in Section 5 of this chapter.

In the meantime, a method for determining which mode of delivery (face-to-face, blended or online) will be discussed in the next sections.

References

Anderson, A. (ed.) (2008) *The Theory and Practice of Online Learning* Athabasca AB: Athabasca University Press

Barnard, R. et al. (2014) Detecting bias in meta-analyses of distance education research: big pictures we can rely on *Distance Education* Vol. 35, No. 3

Bates, A.W. (2005) *Technology, e-Learning and Distance Education* London/New York: Routledge

Evans, T., Haughey, M. and Murphy, D. (2008) *International Handbook of Distance Education* Bingley UK: Emerald Publishing

Halverson, L. R., Graham, C. R., Spring, K. J., & Drysdale, J. S. (2012) An analysis of high impact scholarship and publication trends in blended learning *Distance Education*, Vol. 33, No. 3

Harasim, L. (2017) *Learning Theory and Online Technologies 2nd edition* New York/London: Taylor and Francis

Hiltz S., and Turoff M.(1978) Network Nation: Human communication via computer Reading, MA: Addison Wesley

Holmberg, B. (1989) *Theory and Practice of Distance Education* New York: Routledge

Jaschik, S. and Letterman, D. (2014) *The 2014 Inside Higher Ed Survey of Faculty Attitudes to Technology* Washington DC: Inside Higher Ed

Keegan, D. (ed.) (1990) *Theoretical Principles of Distance Education* London/New York: Routledge

Means, B. et al. (2010) *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies* Washington, DC: US Department of Education

Moore, M. and Kearsley, G. (1996) *Distance Education: A Systems View* Belmont CA: Wadsworth

Ontario (2011) *Fact Sheet Summary of Ontario eLearning Surveys of Publicly Assisted PSE Institutions* Toronto: Ministry of Training, Colleges and Universities

Peters, O. (1983) Distance education and industrial production, in Sewart et al. (eds.) *Distance Education: International Perspectives* London: Croom Helm

Peters, O. (2002) *Distance Education in Transition: New Trends and Challenges* Oldenberg FGR: Biblothecks- und Informationssystem der Universität Oldenberg

Picciano, A., Dziuban, C. and & Graham, C. (eds.), *Blended Learning: Research Perspectives, Volume 2*. New York: Routledge, 2013

Schramm, W. (1977) *Big Media, Little Media* Beverley Hills CA/London: Sage

Sarma, S. (2013) *The Magic Beyond the MOOCs* Boston MA: LINC 2013 conference (recorded presentation)

Tamim, R. et al. (2011) What Forty Years of Research Says About the Impact of Technology on Learning: A Second-Order Meta-Analysis and Validation Study *Review of Educational Research*, Vol. 81, No. 1

Wedemeyer, C. (1981) *Learning at the Back Door: Reflections on Non-traditional Learning in the Lifespan* Madison: University of Wisconsin Press

Zawacki-Richter, O. and Anderson, T. (eds.) (2014) *Online Distance Education: Towards a Research Agenda* Athabasca AB: AU Press, pp. 508

Activity 10.2 Defining the magic of the campus

1. Can you define the 'magic of the campus'? What is it about face-to-face teaching that makes it special, compared with teaching online? Write down the three things you think are the most important.

2. Could you do the same for teaching online? If not, what are the things that make the campus special?

Click on the podcast below for some feedback on these questions

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=260

10.3 Which mode? Student needs

Figure 10.3.1 Who are your students? Image: UBC Library

When making choices about mode of delivery, teachers and instructors need to ask the following four questions:

- who are – or could be – my students?
- what is my preferred teaching approach?
- what are the content and skills that I need to teach?
- what resources will I have to support my decision?

As always, start with the learners.

10.3.1 Fully online/distance learners

Research (see for instance Dabbagh, 2007) has repeatedly shown that fully online courses suit some types of student better than others:

- older, more mature students;
- students with already high levels of education;
- part-time students who are working and/or with families.

This applies not only to MOOCs (see Chapter 5) and other non-credit courses, but even more so to courses and programs for credit. There are in fact several different markets for online learning.

10.3.1.1 Undergraduate online students

Today, 'distance' is more likely to be psychological or social, rather than geographical. For instance, from survey data regularly collected from students at the University of British Columbia (UBC):

- less than 20 per cent give reasons related to distance or travel for taking an online course;
- most of the more than 10,000 or so UBC students (there are over 60,000 students in total) taking at least one fully online course are not truly distant. The majority (over 80 per cent) live in the Greater Vancouver Metropolitan Area, within 90 minutes commute time to the university, and almost half within the relatively compact City of Vancouver. Comparatively few (less than 10 per cent) live outside the province (although this proportion is slowly growing each year);
- two thirds of UBC's online students have paid work of one kind or another;
- many undergraduate students in their fourth year take an online course because the face-to-face classes are 'capped' because of their large size, or because they are short of the required number of credits to complete a degree. Taking a course online allows these students to complete their program without having to come back for another year;
- the main reason for most UBC students taking fully online courses is the flexibility they provide, given the work and family commitments of students and the difficulty caused by timetable conflicts for face-to-face classes.

In the USA, almost one in three undergraduate students are taking at least one online course (Allen and Seaman, 2017). At an undergraduate level, students are likely to take a maximum of three to four online courses as part of a regular campus-based degree program at universities and up to five online courses at two year colleges, in Canada (Donovan et al., 2018).

Until recently in North America, there were few undergraduate programs offered entirely online, except in specialist institutions such as the open universities in Canada (Athabasca, Téluq, Thompson Rivers Open Learning) and University of Phoenix, Western Governors University, and University of Maryland University College in the USA. However, in recent years a number of specialist online undergraduate programs have started to be offered, such as the Bachelor of Mining Engineering Technology for working miners at Queen's University, Canada

This suggests that fully online courses are more suitable for more experienced students with a strong motivation to take such courses because of the impact they have on their quality of life. In general, online students need more self-discipline in studying and a greater motivation to study to succeed. This does not mean that other kinds of students cannot benefit from online learning, but extra effort needs to go into the design and support of such students online.

10.3.1.2 Graduate online students

Although in the USA, the proportion of students taking distance education courses at a graduate level overall is almost the same (17 per cent) as those taking on-campus graduate courses – 15 per cent, the proportion of students taking distance education courses at a graduate level is much higher for private, not-for profit – 37 per cent, and for-profit institutions – 28 per cent (Allen and Seaman, 2017). (As in Canada – Donovan. et al., 2018 – distance education now is almost synonymous with online learning in the USA).

The most rapid area of growth in online courses is for masters programs aimed at working professionals. So far, apart from MBAs and teacher education, public universities tend to be relatively slow in recognising the importance of this market, which at worse could be self-financing, and at best could bring in much needed additional revenues. The for-profit universities, though, such as the University of Phoenix, Laureate University and Capella University, and especially some of the private, not-for-profit universities in the USA have been quicker to move into this market.

10.3.1.3 Remote learners

Often it is also assumed that isolated or remote learners are the main market for distance or fully online learners in that they are a long way away from any local school, college or university. Certainly in Canada, there are such students and the ability to study locally rather than travel great distances can be very appealing. However, in many remote rural areas, Internet access can be difficult, with either slow satellite connections or telephone-based, slow-speed modems. Remote learners will also struggle if there is no easily accessible or culturally appropriate local support for their studies.

Since the vast majority of online learners are urban, living within one hour's travel of a college or university campus, it is the flexibility rather than the distance that matters to these learners.

10.3.1.4 Lifelong learners

On the other hand, fully online courses really suit working professionals. In a digital age, the knowledge base is continually expanding, jobs change rapidly, and hence there is strong demand for on-going, continuing education, often in 'niche' areas of knowledge. Online learning is a convenient and effective way of providing such lifelong learning.

Lifelong learners are often working with families and really appreciate the flexibility of studying fully online. They often already have higher education qualifications such as a first degree, and therefore have learned how to study successfully. They may be engineers looking for training in management, or professionals wanting to keep up to date in their professional area. They are often better motivated, because they can see a direct link between the new course of study and possible improvement in their career prospects. They are therefore ideal students for online courses (even though they may be older and less tech savvy than students coming out of high school).

What is important for such learners is that the courses are technically well designed, in that learners do not need to be highly skilled in using computers to be able to study the courses.

10.3.1.5 Changing demographics

One other factor to consider is the impact of changing demographics. In the USA, overall higher education enrolments declined by 3 per cent between 2012-2015, while distance education enrolments increased by 4 per cent over the same period (Allen and Seaman, 2017).

In jurisdictions where the school-age population is starting to decline, expanding into lifelong learning markets may be essential for maintaining student enrolments. Although the rate of growth in distance education/online learning is not spectacular, it may eventually turn out to be a way to keep some academic departments alive.

10.3.1.6 New business models

However, to make lifelong learning online programs work, institutions need to make some important adjustments. In particular there must be incentives or rewards for faculty to move in this direction and there needs to be some strategic thinking about the best way to offer such programs.

The University of British Columbia has developed a series of very successful, fully online, self-financing professional masters' programs. Students can initially try one or two courses in the Graduate Certificate in Rehabilitation before applying to the master's program. The certificate can be completed in less than two years while working full-time, and paying per course rather than for a whole Master's year, providing the flexibility needed by lifelong learners. UBC also partnered with Tec de Monterrey in Mexico, with the same program being offered in English by UBC and in Spanish by Tec de Monterrey, as a means of kick-starting its very successful Master in Educational Technology program, which, when it opened, doubled the number of graduate students in UBC's Faculty of Education, and is still running now almost 20 years after its initial offering. We shall see these examples are important when we examine the development of modular programming in Section 11.5.2.

Online learning also offers the opportunity to offer programs where an institution has unique research expertise but insufficient local students to offer a full master's program. By going fully online, perhaps in partnership with another university with similar expertise but in a different jurisdiction, it may be able to attract students from across the country or even internationally, enabling the research to be more widely disseminated and to build a cadre of professionals in newly emerging areas of knowledge – again an important goal in a digital age.

10.3.2 Blended learning learners

In terms of blended learning, the 'market' is less clearly defined than for fully online learning. The benefit for students is increased flexibility, but they will still need to be relatively local in order to attend the campus-based sessions. The main advantage is for the 50 per cent or more of students, at least in Canada, who are working more than 15 hours a week (Marshall, 2010) to help with the cost of their education and to keep their student debt as low as possible. Also, blended learning provides an opportunity for the gradual development of independent learning skills, as long as this is an intentional teaching strategy.

The research also suggests that these skills of independent learning need to be developed while students are on campus. In other words, online learning, in the form of blended learning, should be deliberately introduced and gradually increased as students work through a program, so by the time they graduate, they have the skills to continue to learn independently – a critical skill for the digital age. In general, it is not a good idea to offer fully online courses in the early years of a university or college career, unless they are exceptionally well designed with a considerable amount of online learner support – and hence are likely to be expensive to mount, if they are to be successful.

As well as the benefits of more flexibility for students, especially those working part-time, the academic benefits of blended learning are being better understood. These will be discussed in more detail in the next section. At this point, there is evidence that in Canada, at least, more and more institutions are seeing a move by instructors to blended or hybrid learning, providing the advantages of both online and face-to-face teaching (Donovan et al., 2018)

10.3.3 Face-to-face learners

Many students coming straight from high school will be looking for social, sporting and cultural opportunities that a campus-based education provides. Also students lacking self-confidence or experience in studying are likely to prefer face-to-face teaching, providing that they can access it in a relatively personal way.

However, the academic reasons for preference for face-to-face teaching by freshmen and women are less clear, particularly if students are faced with very large classes and relatively little contact with professors in the first year or so of their programs. In this respect, smaller, regional institutions, which generally have smaller classes and more face-to-face contact with instructors, have an advantage. Also, blended or flipped learning is increasingly being used for very large classes, with lectures available online, and smaller groups meeting face-to-face with an instructor or teaching assistants.

We shall see later in this chapter that blended and fully online learning offer the opportunity to re-think the whole campus experience so that better support is provided to on-campus learners in their early years in post-secondary education. More importantly, as more and more studying is done online, universities and colleges will be increasingly challenged to identify the unique pedagogical advantages of coming to campus, so that it will still be worthwhile for students to get on the bus to campus every morning.

10.3.4 Know your learners

It is therefore very important to know what kind of students you will be teaching. For some students, it will be better to enrol in a face-to-face class but be gradually introduced to online study within a familiar classroom environment. For other students, the only way they will take the course will be if it is available fully online. It is also possible to mix and match face-to-face and online learning for some students who want the campus experience, but also need a certain amount of flexibility in their studying. Going online may enable you to reach a wider market (critical for departments with low or declining enrolments) or to meet strong demand from working professionals. Who are (or could be) your students? What kind of course will work best for them?

We shall see that identifying the likely student market for a course or program is the strongest factor in deciding on mode of delivery.

References

Allen, I. and Seaman, J. (2017) Digital Learning Compass: Distance Education Enrollment Report 2017 Babson Survey Research Group/eLiterate/WCET

Dabbagh, N. (2007) The online learner: characteristics and pedagogical implications *Contemporary Issues in Technology and Teacher Education*, Vol. 7, No.3

Donovan, T. et al. (2018) *Tracking Online and Distance Education in Canadian Universities and Colleges: 2018* Halifax NS: Canadian Digital Learning Research Association

Marshall, K. (2010) Employment patterns of post-secondary students Perspectives on Labour and Income Ottawa ON: Statistics Canada, September

Activity 10.3 Knowing your students

1. Choose one of your courses. Do you know the key student demographics: age, gender, working or not, single or with families, language skills? If not how could you get this information?

2. If you had this information, would it change the way you teach?

3. If you are teaching a face-to-face class, are there other kinds of students who would be interested in taking your course if it was online?

There is no feedback on this activity.

10.4 Choosing between face-to-face and online teaching on campus

Figure 10.4.1 What should students enrolled in campus courses do online? Image: UBC Library

Analysing student demographics may help to decide whether or not a course or program should be either campus-based or fully online, but we need to consider more than just student demographics to make the decision about what to do online and what to do on campus for the majority of campus-based courses and programs that will increasingly have an online component.

10.4.1 A suggested method

10.4.1.1 Finding an approach based on successful experience

It should be stated up front that there is no generally agreed theory or even best practices for making this decision. The default mode has been that face-to-face teaching must be inherently superior, and you only go online if you must. However, we have seen that online learning has over the last ten years or so demonstrated clearly that many areas of knowledge can be taught just as well or better online. I will look therefore to examples where there has been a conscious decision to identify the relative affordances of different media, including face-to-face teaching. The area where this becomes most clear is in the teaching of science.

I am going to draw on a method used initially at the U.K. Open University for designing distance education courses and programs in science in the 1970s. The challenge was to decide what was best done in print, on television, via home experiment kits, and finally in a one week residential hands-on summer school at a traditional university. Since then, Dietmar Kennepohl and Lawton Shaw, of Athabasca University, have edited an excellent book about teaching science online (Kennepohl and Shaw, 2010). Also, the Colorado Community College System has recently been using a combination of remotely operated labs for student practical work, combined with home kits, for teaching online introductory science courses (Schmidt and Shea, 2015).

Each of these initiatives has adopted a pragmatic method for making decisions about what must be done face-to-face and what can be done online. What each of these approaches had in common wais trusting the knowledge and experience of subject experts who are willing to approach this question in an open-minded way, and working with instructional designers or media producers on an equal footing.

From these experiences, I have extracted one possible process for determining when to go online and when not to, on purely pedagogical grounds, for a course that is being designed from scratch in a blended delivery mode. It is based on a five step process:

1. identify the overall instructional approach/pedagogy required
2. identify the main content to be covered
3. identify the main skills to be taught
4. analyse the resources available
5. analyse the most appropriate mode of delivery for each of the learning objectives identified above

I will choose a subject area at random: haematology (the study of blood), in which I am not an expert. But here's what I would suggest if I was working with a subject specialist in this area.

Figure 10.4.2 Can the study of haematology be done online?
Image: CC Wikimedia Commons: National Cancer Institute, USA

10.4.1.2 **Step 1**: identify the main instructional approach.

This is discussed in some detail in Chapters 2 to 4, but here are the kinds of decision to be considered:

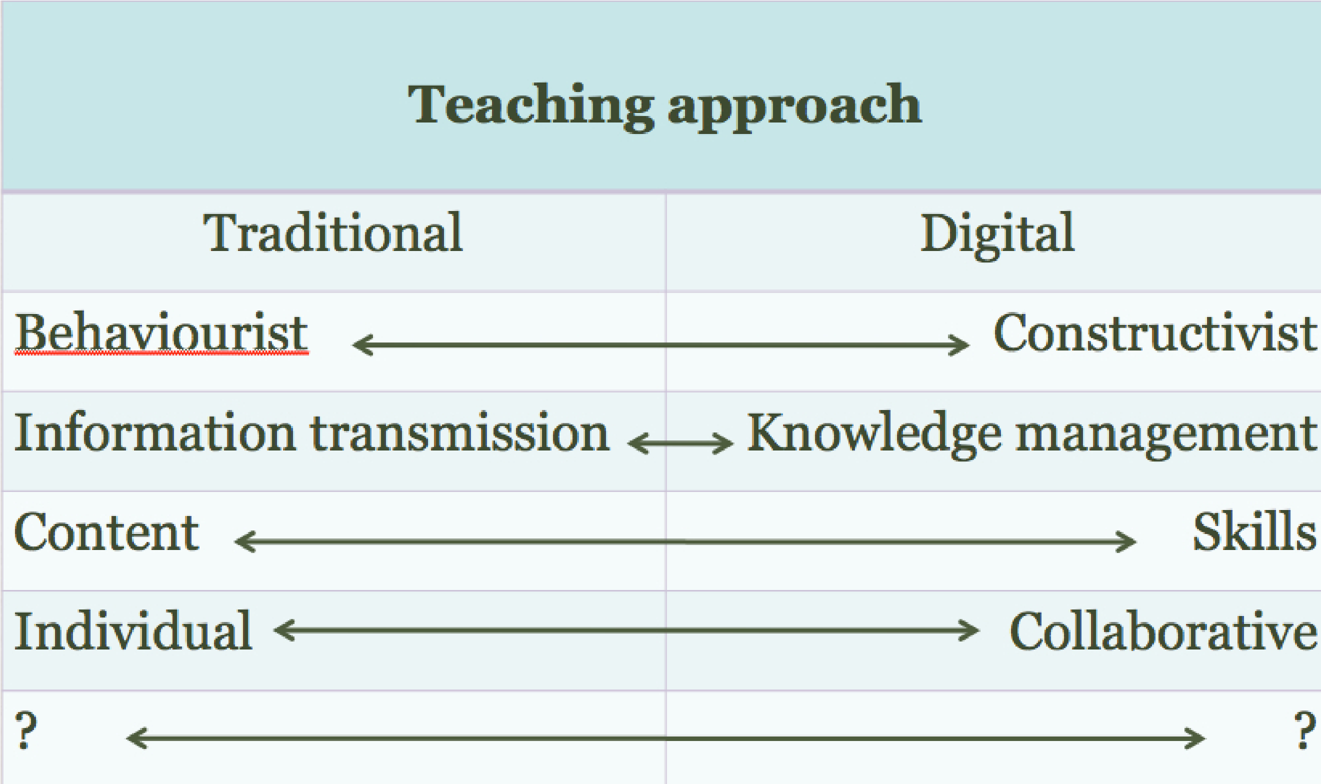


Figure 10.4.3 Which teaching approach?

This should lead to a general plan or approach to teaching that identifies the teaching methods to be used in some detail. In the example of haematology, the instructor wants to take a more constructivist approach, with students developing a critical approach to the subject matter. In particular, she wants to relate the course specifically to certain issues, such as security in handling and storing blood, factors in blood contamination, and developing student skills in analysis and interpretation of blood samples.

10.4.1.3 **Step 2**. Identify the main content to be covered

Content covers facts, data, hypotheses, ideas, arguments, evidence, and description of things (for instance, showing or describing the parts of a piece of equipment and their relationship). What do they need to know in this course? In haematology, this will mean understanding the chemical composition of blood, what its functions are, how it circulates through the body, descriptions of the relevant parts of cell biology, what external factors may weaken its integrity or functionality, and so forth, the equipment used to analyse blood and how the equipment works, principles, theories and hypotheses about blood clotting, the relationship between blood tests and diseases or other illnesses, and so on.

In particular, what are the presentational requirements of the content in this course? Dynamic activities need to be explained, and representing key concepts in colour will almost certainly be valuable. Observations of blood samples under many degrees of magnitude will be essential, which will require the use of a microscope.

There are now many ways to represent content: text, graphics, audio, video and simulations. For instance, graphics, a short video clip, or photographs down a microscope can show examples of blood cells in different conditions. Increasingly this content is already available over the web for free educational use (for instance, see the American Society of Hematology's video library). Creating such material from scratch is more expensive, but is becoming increasingly easy to do with high quality, low cost digital recording equipment. Using a carefully recorded video of an experiment will often provide a better view than students will get crowding around awkward lab equipment.

10.4.1.4 **Step 3**. Identify the main skills to be developed during the course

Skills describe how content will be applied and practiced. This might include analysis of the components of blood, such as the glucose and insulin levels, the use of equipment (where ability to use equipment safely and effectively is a desired learning outcome), diagnosis, interpreting results by making hypotheses about cause and effect based on theory and evidence, problem-solving, and report writing.

Developing *skills* online can be more of a challenge, particularly if it requires manipulation of equipment and a 'feel' for how equipment works, or similar skills that require tactile sense. (The same could be said of skills that require taste or smell). In our hematology example, some of the skills that need to be taught might include the ability to analyse analytes or particular components of blood, such as insulin or glucose, to interpret results, and to suggest treatment. The aim here would be to see if there are ways these skills can also be taught effectively online. This would mean identifying the skills needed, working out how to develop such skills (including opportunities for practice) online, and how to assess such skills online.

Let's call Steps 2 and 3 the key learning objectives for the course.

10.4.1.5 **Step 4**: Analyse the most appropriate mode for each learning objective

Then create a table as in Figure 10.4.4:

	Face-to-face	Online
Content		
Learn theory and terminology		x
Video of interactions under microscope		x
Graphics of molecular structure of blood		x
Skills		
Design experimental set-up using virtual equipment		x
Observe analytes under microscope	x	
Insert glucose	x	

Figure 10.4.4 Allocating mode of delivery

In this example, the instructor is keen to move as much as possible online, so she can spend as much time as possible with students, dealing with laboratory work and answering questions about theory and practice. She was able to find some excellent online videos of several of the key interactions between blood and other factors, and she was also able to find some suitable graphics and simple animations of the molecular structure of blood which she could adapt, as well as creating with the help of a graphics designer her own graphics. Indeed, she found she had to create relatively little new material or content herself.

The instructional designer also found some software that enabled students to design their own laboratory set-up for certain elements of blood testing which involved combining virtual equipment, entering data values and running an experiment. However, there were still some skills that needed to be done hands-on in the laboratory, such as inserting glucose and using a 'real' microscope to analyse the chemical components of blood. However, the online material enabled the instructor to spend more time in the lab with students.

It can be seen in this example that most of the content can be delivered online, together with a critically important skill of designing an experiment, but some activities still need to be done 'hands-on'. This might require one or more evening or weekend sessions in a lab for hands-on work, thus delivering most of the course online, or there may be so much hands-on work that the course may have to be a hybrid of 50 per cent hands-on lab work and 50 per cent online learning.

With the development of animations, simulations and online remote labs, where actual equipment can be remotely manipulated, it is becoming increasingly possible to move even traditional lab work online. At the same time, it is not always possible to find exactly what one needs online, although this will improve over time. In other subject areas such as humanities, social sciences, and business, it is much easier to move the teaching online.

This is a crude method of determining the balance between face-to-face teaching and online learning for a blended learning course, but it least it's a start. It can be seen that these decisions have to be relatively intuitive, based on instructors' knowledge of the subject area and their ability to think creatively about how to achieve learning outcomes online. However, we have enough experience now of teaching online to know that in most subject areas, a great deal of the skills and content needed to achieve quality learning outcomes can be taught online. It is no longer possible to argue that the default decision must always be to do the teaching in a face-to-face manner.

Thus every instructor now needs to ask the question: if I can move most of my teaching online, what are the unique benefits of the campus experience that I need to bring into my face-to-face teaching? Why do students have to be here in front of me, and when they are here, am I using the time to best advantage?

10.4.2 Analyse the resources available

There is one more consideration besides the type of learners, the overall teaching method, and making decisions based on pedagogical grounds, and that is to consider the resources available. (This should really be Step 4, before allocating learning objectives to different modes, but it will be difficult to avoid in any case.).

10.4.2.1 The time of the instructor

In particular, the key resource is the time of the teacher or instructor. Careful consideration is needed about how best to spend the limited time available to an instructor. It may be all very well to identify a series of videos as the best way to capture some of the procedures for blood testing, but if these videos do not already exist in a format that can be freely used, shooting video specially for this one course may not be justified, in terms of either the time the instructor would need to spend on video production, or the costs of making the videos with a professional crew.

Time to learn how to do online teaching is especially important. There is a steep learning curve and the first time will take much longer than subsequent online courses. The institution should offer some form of training or professional development for instructors thinking of moving online or into blended learning. Ideally instructors should get some release time (up to one semester from one class) in order to do the design and preparation for an online course, or a re-designed hybrid course. This however is not always possible, but one thing we do know. Instructor workload is a function of course design. Well designed online courses should require less rather than more work from an instructor.

10.4.2.2. Learning technology support staff.

If your institution has a service unit for faculty development and training, instructional designers and web designers for supporting teaching, use them. Such staff are often qualified in both educational sciences and computer technology. They have unique knowledge and skills that can make your life much easier when teaching online. (This will be discussed further in Chapter 13.)

The availability and skill level of learning technology support from the institution is a critical factor.

Can you get the support of an instructional designer and media producers? If not, it is likely that much more will be done face-to-face than online, unless you are already very experienced in online learning.

10.4.2.3 Readily available technology

Most institutions now have a learning management system such as Blackboard or Moodle, or a lecture capture system for recording lessons. But increasingly, instructors will need access to media producers who can create videos, digital graphics, animations, simulations, web sites, and access to blog and wiki software. Without access to such technology support, instructors are more likely to fall back on tried and true classroom teaching.

10.4.2.4 Colleagues experienced in blended and online learning

It really helps if there are experienced colleagues in the department who understand the subject discipline and have done some online teaching. They will perhaps even have some materials already developed, such as graphics, that they will be willing to share.

10.4.2.5 Money

Are there resources available to buy you out for one semester to spend time on course design? Many institutions have development funds for innovative teaching and learning, and there may be external grants for creating new open educational resources, for instance. This will increase the practicality and hence the likelihood of more of the teaching moving online.

We shall see that as more and more learning material becomes available as open educational resources, teachers and instructors will be freed up from mainly content presentation to focusing on more interaction with students, both online and face to face. However, although open educational resources are becoming increasingly available, they may not exist in the topics required or they may not be of adequate quality in terms of either content or production standards (see Chapter 11.2 for more on OERs).

The extent to which these resources are available will help inform you on the extent to which you will be able to go online and meet quality standards. In particular, you should think twice about going online if none of the resources listed above is going to be available to you.

10.4.3 The case for multiple modes

Increasingly, it is becoming difficult to separate markets for particular courses or programs. Although the majority of students taking a first year university course are likely to be coming straight from high school, some will not. There may be a minority of students who left high school directly for work, or went to a two year college to get vocational training, but now find they need a degree. Especially in professional graduate programs, students may be a mix of those who have just completed their bachelor's course and are still full-time students, and those that are already in the work-force but need the specialist qualification. There will be a mix of students in third and fourth year undergraduate courses, some of whom will be working over 15 hours a week, and others who are studying more or less full time. In theory, then, it may be possible to identify a particular market for mainly face-to-face, blended or fully online learning, but in practice most courses are likely to have a mix of students with different needs.

If, though, as seems likely, more and more courses will end up as blended learning, then it is worth thinking about how courses could be designed to serve multiple markets. For instance, if we take our haematology course, it could be offered to full-time third year undergraduate students studying biology, or it could also be offered either on its own or with other related courses as a certificate in blood management for nurses working in hospitals. It might also be useful for students studying medicine who have not taken this particular course as an undergraduate, or even for patients with conditions related to their blood levels, such as diabetes.

If for instance our instructor developed a course where students spent approximately 50 per cent of their time online and the rest on campus, it may eventually be possible to design this for other markets as well, with perhaps practical work for nurses being done in the hospital under supervision, or just the online part being offered as a short MOOC for patients. For some courses (perhaps not haematology), it may be possible to offer the course wholly online, in blended format or wholly face-to-face. This would allow the same course to reach several different markets.

10.4.4 Questions for consideration in choosing modes of delivery

In summary, here are some questions to consider, when designing a course from scratch:

1. What kind of learners are likely to take this course? What are their needs? Which mode(s) of delivery will be most appropriate to these kinds of learners? Could I reach more or different types of learners by choosing a particular mode of delivery?

2. What is my view of how learners can best learn on this course? What is my preferred method(s) of teaching to facilitate that kind of learning on this course?

3. What is the main content (facts, theory, data, processes) that needs to be covered on this course? How will I assess understanding of this content?

4. What are the main skills that learners will need to develop on this course? What are the ways in which they can develop/practice these skills? How will I assess these skills?

5. How can technology help with the presentation of content on this course?

6. How can technology help with the development of skills on this course?

7. When I list the content and skills to be taught, which of these could be taught:

- fully online
- partly online and partly face-to-face
- can only be taught face-to-face?

8. What resources do I have available for this course in terms of:

- professional help from instructional designers and media producers;
- possible sources of funding for release time and media production;
- good quality open educational resources.

9. What kind of classroom space will I need to teach the way I wish? Can I adapt existing spaces or will I need to press for major changes to be made before I can teach the way I want to?

10. In the light of the answers to all these questions, which mode of delivery makes most sense?

References

Kennepohl, D. and Shaw, L. (eds.) (2010) *Accessible Elements: Teaching Science Online and at a Distance* Athabasca AB: Athabasca University Press

Schmidt, S. and Shea, P. (2015) *NANSLO Web-based Labs: Real Equipment, Real Data, Real People!* WCET Frontiers

Activity 10.4 Deciding on the mode of delivery

1. Try following the process above for a possible new course that you would like to teach or for revising a course you are already teaching.

There is no feedback on this activity.

10.5 The future of the campus

Figure 10.5.1 The magic of the campus?
Image: © Cambridge Advanced Studies Program, Cambridge University, U.K., 2015

As more and more teaching is moved online, even for campus-based students, it will become increasingly important to think about the function of face-to-face teaching and the use of space on campus.

10.5.1 Identifying the unique characteristics of face-to-face teaching in a digital world

Sanjay Sarma, Director of MIT's Office of Digital Learning, made an attempt at MIT's LINC 2013 conference to identify the difference between campus-based and online learning, and in particular MOOCs. He made the distinction between MOOCs as open courses available to anyone, reflecting the highest level of knowledge in particular subject areas, and the 'magic' of the on-campus experience, which he claimed is distinctly different from the online experience (Sarma, 2013).

He argued that it is difficult to define or pin down the magic that takes place on-campus, but referred to:

- 'in-the-corridor' conversations between faculty and staff;
- hands-on engineering with other students outside of lectures and scheduled labs;
- the informal learning that takes place between students in close proximity to one another.

There are a couple of other characteristics that Sarma hinted at but did not mention explicitly in his presentation:

- the very high standard of the students admitted to MIT, who 'push' each other to even higher standards;
- the importance of the social networks developed by students at MIT that provide opportunities later in life.

Easy and frequent access to laboratories is a serious contender for the uniqueness of campus-based learning, as this is difficult to provide online, although there is an increasing number of developments in remote labs and the use of simulations. Opportunities for finding future spouses is another contender. Probably the most important though is access to social contacts that can further your career (see my podcast feedback on Activity 10.2 for more on the 'unique affordances' of campus-based teaching.).

I leave it to you to judge whether these are unique features of face-to-face teaching, or whether the key advantages of a campus experience are more specific to expensive and highly selective elite institutions. For most teachers and instructors, though, more concrete and more general pedagogical advantages for face-to-face teaching need to be identified.

10.5.2 The law of equal substitution

In the meantime, we should start from the assumption that *from a strictly pedagogical perspective, most courses can be taught equally well online or face-to-face*, what I call the law of equal substitution. This means that other factors, such as cost, convenience for teachers, social networking, the skills and knowledge of the instructor, the type of students, or the context of the campus, will be stronger determinants of whether to teach a course online or on campus than the academic demands of the subject matter. These are all perfectly justifiable reasons for privileging the campus experience.

At the same time, there are likely to be some critical areas where there is a strong pedagogical rationale for students to learn in a face-to-face or hands-on context. In other words, we need to identify the *exceptions* to the law of equal substitution. These unique pedagogical characteristics of campus-based teaching need to be researched more carefully, or at least be more theory-based than at present, but currently there is no powerful or convincing method or rationale to identify what the uniqueness is of the campus experience in terms of learning outcomes. The assumption appears to be that the campus experience must be better, at least for some things, because this is the way we have always done things. We need to turn the question on its head: what is the academic or pedagogical justification for the campus, when students can learn most things online?

10.5.3 The impact of online learning on the campus experience

This question becomes particularly important when we examine how an increased move to blended or hybrid learning is going to impact on learning spaces. In some ways, this may turn out to be a ticking time bomb for schools, colleges and universities.

10.5.3.1 Rethinking the design of classrooms

As we move from lectures to more interactive learning, we will need to think about the spaces in which learning will take place, and how pedagogy, online learning and the design of learning spaces influence one another. To make it worthwhile for students to come to campus when they can do an increasing amount of their study online, the on-campus activities must be meaningful. If for instance we want students to come to campus for interpersonal communication and intense group work, will there be sufficiently flexible and well-equipped spaces for students to do this, remembering that they will want to combine their online work with their classroom activities?

In essence, new technology, hybrid learning and the desire to engage students and to develop the knowledge and skills needed in a digital age are leading some teachers and architects to rethink the classroom and the way it is used.

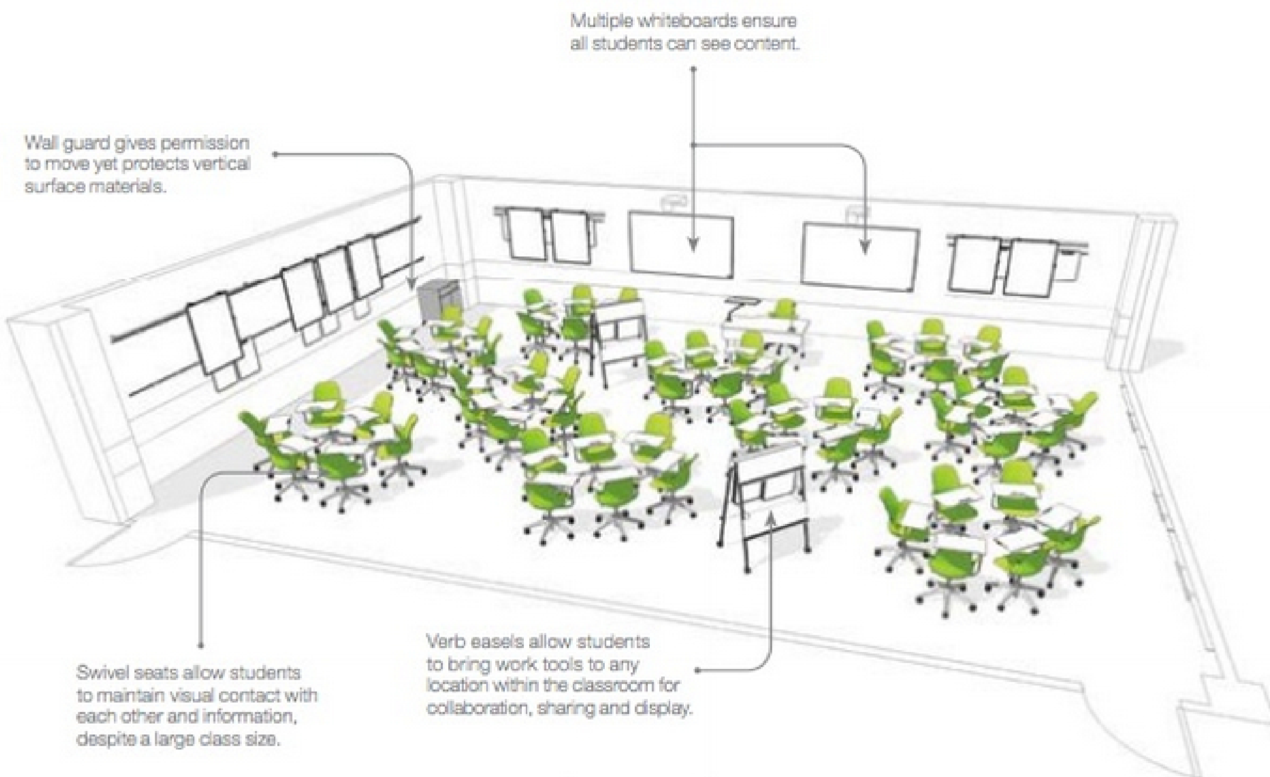


Figure 10.5.2 Design for an interactive classroom from Steelcase (© Steelcase, 2013)

Steelcase, a leading American manufacturer of office and educational furniture, is not only conducting impressive research into learning environments, but is way ahead of many of our post-secondary institutions in thinking through the implications of online learning for classroom design. Their educational research website, and two of their reports: Active Learning Spaces and Rethinking Space: Sparking Creativity are documents that all post-secondary institutions and even k-12 planners should be looking at.

In Active Learning Spaces, Steelcase reports:

Formal learning spaces have remained the same for centuries: a rectangular box filled with rows *of desks facing the instructor and writing board….As a result, today's students and teachers suffer because these outmoded spaces inadequately support the integration of the three key elements of a successful learning environment: pedagogy, technology and space.*

Change begins with pedagogy. Teachers and teaching methods are diverse and evolving. From one class to the next, sometimes during the same class period, classrooms need change. Thus, they should fluidly adapt to different teaching and learning preferences. Instructors should be supported to develop new teaching strategies that support these new needs.

Technology needs careful integration. Students today are digital natives, comfortable using technology to display, share and present information. Vertical surfaces to display content, multiple projection surfaces and whiteboards in various configurations are all important classroom considerations.

Space impacts learning. More than three-quarters of classes include class discussions and nearly 60 percent of all classes include small group learning, and those percentages are continuing to grow. Interactive pedagogies require learning spaces where everyone can see the content and can see and interact with others. Every seat can and should be the best seat in the room. As more schools adopt constructivist pedagogies, the "sage on the stage" is giving way to the "guide on the side." These spaces need to support the pedagogies and technology in the room to allow instructors who move among teams to provide real-time feedback, assessment, direction and support students in peer-to-peer learning. Pedagogy, technology and space, when carefully considered and integrated, define the new active learning ecosystem.

In Rethinking Space: Sparking Creativity, Andrew Kim, Steelcase Education Researcher, states:

Creative work is most effective in learning spaces that support team work flow and sharing of information.

Figure 10.5.4 Interactive classroom at Queen's University, Kingston, Ontario

The design of classroom spaces now needs to take into account that students are doing an increasing amount of their work online (and often outside the classroom). The classroom must support opportunities for accessing, working on, sharing and demonstrating knowledge gained both within and outside the classroom. Thus if the classroom is organized into ‘clusters’ of furniture and equipment to support small group work, these clusters will also require power so students can plug in their devices, wireless Internet access, and the ability to transmit work to shared screens around the room (in other words, a class Intranet). Students also need quiet places or breakout spaces where they can work individually as well as in groups. When faculty are presented with such use of space, they naturally adopt more active learning approaches.

10.5.3.2 The impact of flipped classrooms and hybrid learning on classroom design

These classrooms designs assume that students are learning in relatively small classes. However, we are also seeing the redesign of large lecture classes using hybrid designs such as flipped classrooms. Indeed Mark Valenti (2013) of the Sextant Group (an audio-visual company) is reported as saying: ‘*We’re basically seeing the beginning of the end of the lecture hall.*’

Nevertheless, given the current financial context, we should not assume that the classroom time for these redesigned large lectures classes will be spent in small groups in individual classrooms (there are probably not enough small classrooms to accommodate these classes which often have over a thousand students). Larger spaces that can be organized into smaller working groups, then easily reconvened into a large, single group, will be needed. What the space for these large classes certainly should *not* be is the raked rows of benches which now are now the norm in most large lecture theatres.

Steelcase is also doing research on appropriate spaces for faculty. For instance, if a university or department is planning a learning commons or common area for students, why not locate faculty offices in the same general area instead of in a separate building? Indeed, a case could be made for integrating faculty office space with more open teaching areas.

10.5.3.3 The impact on capital building plans

It is obvious why a company such as Steelcase is interested in these developments. There is a tremendous commercial opportunity for selling new and better forms of classroom furniture that meets these needs. However, that is the problem. Universities, colleges and especially schools simply do not have the money to move quickly towards new classroom designs, and even if they did, they should do some careful thinking first about:

- what kind of campus will be needed over the next 20 years, given the rapid moves to hybrid and online learning;
- how much they need to invest in physical infrastructure when students can do much of their studies online.

Nevertheless, there are several opportunities for at least setting priorities for innovation in classroom design:

- where new campuses or major buildings are being built or renewed;

- where large first and second year classes are being redesigned: maybe a prototype classroom design could be tried for one of these large lecture redesigns and tested; if successful the model could be added slowly to other large lecture classes;
- where a department or program is being redesigned to integrate online learning and classroom teaching in a major way; they would receive priority for funding a new classroom design;
- all major new purchases of classroom furniture to replace old or worn out equipment should first be subject to a review of classroom designs.

The important point here is that investment in new or adapted physical classroom space should be driven by decisions to change pedagogy/teaching methods. This will mean bringing together academics, IT support staff, instructional designers and staff from facilities, as well as architects and furniture suppliers. Second, as Winston Churchill said: 'we shape our buildings and afterwards our buildings shape us.' Providing teachers and instructors with a flexible, well-designed learning environment is likely to encourage major changes in their teaching; stuffing them into rectangular boxes with rows of desks will do the opposite.

Perhaps most important of all, institutions need to start re-examining their future growth plans for buildings on campus. In particular:

- will we need additional classrooms and additional lecture theatre buildings if students will be spending up to half their time studying online or in flipped classes?
- do we have enough learning areas where large numbers of students can work in small groups and can then quickly reconvene?
- do we have the technical facilities that will allow students seamlessly to work and study both face-to-face and online, and to share and capture the work when working physically together on campus?
- would we be better investing in the re-design of existing space rather than building new learning spaces?

What is clear is that institutions now need to do some hard thinking about online learning, its likely impact on campus teaching, and above all what kind of campus experience we want students to have when they can do much of their studying online. It is this thinking that should shape our investment in buildings, desks and chairs.

10.5.4 Re-thinking the role of the campus

If we accept the principle of equal substitution for many academic purposes, then this brings us back to the student on the bus question. If students can learn most things equally well (and more conveniently) online, what can we offer them on campus that will make the bus journey worthwhile? This is the real challenge that online learning presents.

It is not just a question of what teaching activities need to be done in a face-to-face class or lab, but the whole cultural and social purpose of a school, college or university. Students in many of our large, urban universities have become commuters, coming in just for their lectures, maybe using the learning commons between lectures, getting a bite to eat, then heading home. As we have 'massified' our universities, the broader cultural aspects have been lost.

Online and hybrid learning provides a chance to re-think the role and purpose of the whole campus, as well as what we should be doing in classrooms when students have online learning available any time and anywhere. Of course we could just close up shop and move everything online (and save a great deal of money), but we should at least explore what would be lost before doing that.

References

Sarma, S. (2013) *The Magic Beyond the MOOCs* Boston MA: LINC 2013 conference

Steelcase Education (undated) *Active Learning Spaces* Michigan: Grand Rapids

Steelcase Education (undated) *Rethinking Space: Sparking Creativity* Michigan: Grand Rapids

Valenti, M. (2013), in Williams, L., 'AV trends: hardware and software for sharing screens, *University Business*, June

Activity 10.5 Redesigning your classroom space

Where the caretaker determines pedagogy: I worked in one school where every morning the chairs and desks were laid out in neat rows facing the front. The caretaker would get furious if they were left arranged in any other layout by the end of the day. I therefore spent too much lesson time with students re-arranging the desks for group work then tidying up afterwards. (I was young and didn't dare defy the caretaker, who was quite formidable).

1. If you were designing from scratch a learning space for a group of 40 students (maximum), what would the learning space look like, given all the potential technology and teaching methods you and the students could be using?

2.If you have a lecture class of 200 students and wanted to change your teaching method, how would you redesign the teaching and what kind of space(s) would you need?

Key Takeaways from Chapter 10

1. There is a continuum of technology-based learning, from 'pure' face-to-face teaching to fully online programs. Every teacher or instructor needs to decide where on the continuum a particular course or program should be.

2. We do not have good research evidence or theories to make this decision, although we do have growing experience of the strengths and limitations of online learning. What is particularly missing is an evidence-based analysis of the strengths and limitations of face-to-face teaching when online learning is also available.

3. In the absence of good theory, I have suggested four factors to consider when deciding on mode of delivery, and in particular the different uses of face-to-face and online learning in blended courses:

- student characteristics and needs
- your preferred teaching strategy, in terms of methods and learning outcomes
- the pedagogical and presentational requirements of the subject matter, in terms of (a) content and (b) skills
- the resources available to an instructor (including the instructor's time).

4. The move to blended or hybrid learning in particular means rethinking the use of the campus and the facilities needed fully to support learning in a hybrid mode.

Chapter 11: Trends in open education

The purpose of this chapter

When you have completed this chapter you should be able to determine:

- how your role as an instructor is likely to be changed by developments in open learning;
- when you should create your own material and when you should use open educational resources;
- how to maximise the use of digital materials once created, in terms of the design of courses.

What is covered in this chapter

- Scenario H: Watershed management
- 11.1 Open learning
- 11.2 Open educational resources (OER)
- 11.3 Open textbooks, open research and open data
- 11.4 Open pedagogy
- 11.5 The implications of 'open' for course and program design: towards a paradigm shift?

Also in this chapter you will find the following activities:

- Activity 11.1 Should access to post-secondary education be completely open to everyone?
- Activity 11.2 Deciding on OER
- Activity 11.3 Using other open resources
- Activity 11.4 Contemplating open pedagogy
- Activity 11.5 Build your own scenario

Key Takeaways

1. Open educational resources offer many benefits but they need to be well designed and embedded within a rich learning environment to be effective.

2. The increasing availability of OER, open textbooks, open research and open data means that in future, almost all academic content will be open and freely accessible over the Internet.

3. As a result, students will increasingly look to institutions for learning support and help with the

development of skills needed in a digital age rather than with the delivery of content. This will have major consequences for the role of teachers/instructors and the design of courses.

4. OER and other forms of open education will lead to increased modularization and disaggregation of learning services, which are needed to respond to the increasing diversity of learner needs in a digital age.

5. MOOCs are essentially a dead end with regard to providing learners who do not have adequate access to education with high quality qualifications. The main value of MOOCs is in providing opportunities for non-formal education and supporting communities of practice.

6. OER, MOOCs, open textbooks and other digital forms of open-ness are important in helping to widen access to learning opportunities, but ultimately these are enhancements rather than a replacement for a well-funded public education system, which remains the core foundation for enabling equal access to educational opportunities.

Scenario H: Watershed management

Figure 11.H The Hart River, Yukon.
Image: © www.protectpeel.ca, CC BY-NC

Over a number of years, research faculty in the Departments of Land Management and Forestry at the University of Western Canada had developed a range of digital graphics, computer models and simulations about watershed management, partly as a consequence of research conducted by faculty, and partly to generate support and funding for further research.

At a faculty meeting several years ago, after a somewhat heated discussion, faculty members voted, by a fairly small majority, to make these educational resources openly available for re-use for educational purposes under a Creative Commons license that requires attribution and prevents commercial use without specific written permission from the copyright holders, the faculty responsible for developing the artefacts.

What swayed the vote is that the majority of the faculty actively involved in the research wanted to make these resources more widely available. The agencies responsible for funding the work that resulted in the development of the learning artefacts (mainly national research councils) welcomed the move to makes these artefacts more widely available as open educational resources.

Initially, the researchers just put the graphics and simulations up on the research group's web site. It was left to individual faculty members to decide whether to use these resources in their teaching. Over time, faculty started to introduce these resources into a range of on-campus undergraduate and graduate courses.

After a while, though, word seemed to get out about these OER. Research members began to receive e-mails and phone calls from other researchers around the world. It became clear that there was a network or community of researchers in this field who were creating digital materials as a result of their research, and it made sense to share and re-use materials from other sites. This eventually led to an international web 'portal' of learning artefacts on watershed management.

The researchers also started to get calls from a range of different agencies, from government ministries or departments of environment, local environmental groups, First Nations/aboriginal bands, and, occasionally, major mining or resource extraction companies, leading to some major consultancy work for the faculty in the departments. At the same time, the faculty were able to attract further research funding from non-governmental agencies such as the Nature Conservancy and some ecological groups, as well as from their traditional funding source, the national research councils, to develop more OER.

By this time, the departments had access to a fairly large amount of OER. There were already two fourth and fifth level fully online courses built around the OER that were being offered successfully to undergraduate and graduate students. A proposal was therefore put forward to create initially a fully online post-graduate certificate program on watershed management, built around existing OER, in partnership with a university in the USA and another one in Sierra Leone. This certificate program was to be self-funding from tuition fees, with the tuition fees for the 25 Sierra Leone students to be initially covered by an international aid agency.

The Dean, after a period of hard negotiation, persuaded the university administration that the departments' proportion of the tuition fees from the certificate program should go directly to the departments, who would hire additional tenured faculty from the revenues to teach or backfill for the certificate, and the departments would pay 25 per cent of the tuition revenues to the university as overheads.This decision was made somewhat easier by a fairly substantial grant from Foreign Affairs Canada to make the certificate program available in English and French to Canadian mining and resource extraction companies with contracts and partners in African countries.

Although the certificate program was very successful in attracting students from North America, Europe and New Zealand, it was not taken up very well in Africa beyond the partnership with the university in Sierra Leone, although there was a lot of interest in the OER and the issues raised in the certificate courses. After two years of running the certificate, then, the departments made two major decisions:

- another three courses and a research project would be added to the certificate courses, and this would be offered as a fully cost recoverable online master in watershed resource management. This would attract greater participation from managers and professionals in African countries in particular, and provide a recognised qualification that many of the certificate students were requesting;
- drawing on the very large network of external experts now involved one way or

another with the researchers, the university would offer a series of MOOCs on watershed management issues, with volunteer experts from outside the university being invited to participate and provide leadership in the MOOCs. The MOOCs would be able to draw on the existing OER.

Five years later, the following outcomes were recorded by the Dean at an international conference on sustainability:

- the online master's program had doubled the total number of graduate students in her Faculty;
- the master's program was fully cost-recoverable from tuition fees;
- there were 120 graduates a year from the master's program;
- the degree completion rate was 64 per cent;
- six new tenured faculty had been hired, plus another six post-doctoral research staff;
- several thousand students had registered and paid for at least one course in the certificate or master's program, of which 45 per cent were from outside Canada;
- over 100,000 students had taken the MOOCs, almost half from developing countries;
- there were now over 1,000 hours of OER on watershed management available and downloaded many times across the world;
- the university was now internationally recognised as a world leader in watershed management.

Although this scenario is purely a figment of my imagination, it is influenced by real and exciting work being done by the following at the University of British Columbia:

- Dr. Hans Schreier, Watershed Management Courses, Institute of Resources, Environment and Sustainability, UBC
- Virtual Soil Science Learning Resources (developed by a consortium of British Columbian universities)
- Graduate Certificate in Technology-Based Learning, Division of Continuing Studies/Faculty of Education, UBC
- International Master in Educational Technology, Faculty of Education, UBC

11.1 Open learning

Figure 11.1.1 'I'm just a committed and even stubborn person who wants to see every child getting quality education…'
Malala Yousafzai's Nobel Prize speech, 2014. Click on image to see the speech.

In recent years, there has been a resurgence of interest in open learning, mainly related to open educational resources and MOOCs. Although in themselves open educational resources (OER) and MOOCs are important developments, they tend to cloud other developments in open education that are likely have even more impact on education as a whole. It is therefore necessary to step back a little to get a broader understanding of not just OER and MOOCs, but open learning in general. This will help us better understand the significance of MOOCs, OER and other developments in open education, and their likely impact on teaching and learning now and in the future.

11.1.1 Open education as a concept

Open education can take a number of forms:

- *education for all*: free or very low cost school, college or university education available to everyone within a particular jurisdiction, usually funded primarily through the state;
- *open access to programs* that lead to full, *recognised qualifications*. These are offered by national open universities or more recently by the OERu;
- *open access to courses or programs* that are *not for formal credit*, although it may be possible to acquire badges or certificates for successful completion. MOOCs are a good example;
- *open educational resources* that instructors or learners can use for free. MIT's OpenCourseware, which provides free online downloads of MIT's video recorded lectures and support material, is one example;
- *open textbooks*, online textbooks that are free for students to use (such as this one);
- *open research*, whereby research papers are made available online for free downloading (see for instance Open Research Central);
- *open data*, that is, data open to anyone to use, reuse, and redistribute, subject only, at most, to the requirement to attribute and share; see for example the World Bank's Open Data Bank;
- *open pedagogy*, a method of teaching and learning that builds on principles of open-ness and learner participation

Each of these developments is discussed in more detail in this chapter, except for MOOCs, which are discussed extensively in Chapter 5.

11.1.2 Education for all – except higher education

Open education is primarily a goal, or an educational policy. An essential characteristic of open education is the removal of barriers to learning. It can mean no prior qualifications to study, no discrimination by gender, race, age or religion, affordability for everyone, and for students with disabilities, through a determined effort to provide education in a suitable form that overcomes the disability (for example, audio recordings for students who are visually impaired). Ideally, no-one should be denied access to an open educational program. Thus open learning must be scalable as well as flexible.

11.1.2.1 State-funded schools

State-funded public education for the education of children from around the age of five through to sixteen or in some countries eighteen is the most extensive and widespread form of open education. For example, the British government passed the 1870 Education Act that set the framework for schooling of all children between the ages of 5 and 13 in England and Wales. Although there were some fees to be paid by parents, the Act established the principle that education would be paid for mainly through taxes and no child would be excluded for financial reasons. Schools would be administered by elected local school boards (Living Heritage, undated).

Over time, access to publicly funded education in most economically developed countries has been widened to include all children up to the age of 18. UNESCO's Education for All (EFA) movement is a global commitment to provide quality basic education for all children, youth and adults, supported, at least in principle, by 164 national governments. Nevertheless today there are over 250 million of 'out-of-school' children, adolescents and youth worldwide (UNESCO, 2018), or roughly one in five.

11.1.2.2 Post-secondary education

Access to post-secondary or higher education has been more limited than access to schools, partly on financial grounds, but also in terms of 'merit'. Universities have required those applying for university to meet academic standards determined by prior success in school examinations or institutional entry exams. This has enabled elite universities in particular to be highly selective.

However, after the Second World War, the demand for an educated population, both for social and economic reasons, in most economically advanced countries resulted in the gradual expansion of universities and post-secondary education in general. In most OECD countries, roughly 35-60 per cent of an age cohort will go on to some form of post-secondary education. Especially in a digital age, there is an increasing demand for highly qualified workers, and post-secondary education is a necessary gateway to most of the best jobs. Therefore there is increasing pressure for full and free open access to post-secondary, higher or tertiary education.

11.1.2.3 The cost of widening access

However, as we saw in Chapter 1, the cost of widening access to ever increasing numbers results in increased financial pressure on governments and taxpayers. Following the financial crisis of 2008, many states in the USA found themselves in severe financial difficulties, which resulted in substantial funding cuts to the U.S. higher education system (see for instance, Rivera, 2012), which in turn resulted in a rapid increase in tuition fees.

It is probably more than co-incidental that other forms of open education such as MOOCs and OER arose at a time of increasing cuts to the funding of public education in the USA. Solutions that enable increased access without a proportionate increase in funding or tuition fees are almost desperately being sought by governments and institutions. It is against this background that the renewed interest in open education should be framed.

11.1.3 Open access in higher education

11.1.3.1 Open universities

In the 1970s and 1980s, there was a rapid growth in the number of open universities that required no or minimal prior qualifications for entry. In the United Kingdom, for instance, in 1969, less than 10 per cent of students leaving secondary education went on to university. This was when the British government established the Open University, a distance teaching university open to all, using a combination of specially designed printed texts, and broadcast television and radio, with one week residential summer schools on traditional university campuses for the foundation courses (Perry, 1976; Weinbren, 2015).

The Open University started in 1971 with 25,000 students in the initial entry intake, and now has over 200,000 registered students. It has been consistently ranked by government quality assurance agencies in the top ten U.K. universities for teaching, and in the top 30 for research, and number one for student satisfaction (out of over 180). It currently has over 200,000 registered students (Weinbren, 2015). However, it can no longer cover the full cost of its operation from government grants and there is now a range of different fees to be paid. In addition access to higher education has now widened to the point where 50% of a high school cohort now enter some form of higher education in the UK (UK Department of Education, 2018).

There are now nearly 100 publicly funded open universities around the world, including Canada (Athabasca University and Téluq). These open universities are often very large. The Open University of China has over one million enrolled undergraduate students and 2.4 million junior high school students, Anadolou Open University in Turkey has over 1.2 million enrolled undergraduate students, the Open University of Indonesia (Universitas Terbuka) almost half a million, and the University of South Africa 350,000. These large, degree awarding national open universities provide an invaluable service to millions of students who otherwise would have no access to higher education (see Daniel, 1998, and more recently, Contact North, 2019, for a good overview).

11.1.3.2 Alternatives to open universities

It should be noted however that there is no publicly funded open university in the USA, which is one reason why MOOCs have received so much attention there. The Western Governors' University is the most similar to an open university, and private, for-profit universities such as the University of Phoenix fill a similar niche in the market.

As well as the national open universities, which usually offer their own degrees, there is also the OERu, which is basically an international consortium of mainly British Commonwealth and U.S. universities and colleges offering open access courses that enable learners either to acquire full credit for transfer into one of the partner universities or to build towards a full degree, offered by the university from which most credits have been acquired. Students pay a fee for assessment.

11.1.4 Limitations of open learning

Open, distance, flexible and online learning are rarely found in their 'purest' forms. No teaching system is completely open (minimum levels of literacy are required, for instance). Thus there are always degrees of openness. Openness has particular implications for the use of technology. If no-one is to be denied access, then technologies that are available to everyone need to be used. If an institution is deliberately selective in its students, it has more flexibility with regard to choice of technology. It can for instance require all students who wish to take an online or blended course to have their own computer and Internet access. It cannot do that if its mandate is to be open to all students. Truly open universities then will always be behind the leading edge of educational applications of technology.

Despite the success of many open universities, open universities often lack the status of a campus-based institution. Their degree completion rates are often very low. The U.K. OU's degree completion rate is 22 per cent (Woodley and Simpson, 2014), but nevertheless still higher for whole degree programs than for most single MOOC courses.

Lastly, some of the open universities have been established for more than 40 years and have not always quickly adapted to changes in technology, partly because of their large size and their substantial prior investment in older technologies such as print and broadcasting, and partly because they do not wish to deny access to potential students who may not have access to the latest technology.

Thus open universities are now increasingly challenged by both an explosion in access to higher education generally, and in the use of online learning by conventional universities. For instance, in Canada, Donovan et. (2018) report that nearly all universities and most colleges are now offering fully online courses (although access is still mainly based on prior qualifications). New developments such as

MOOCs, and open educational resources, the topic of the next section, are further challenges for open universities.

References

Contact North (2019) *Searchable Directory of More than 65 Open Universities Worldwide* Sudbury ON: Teachonline.ca

Daniel, J. (1998) *Mega-Universities and Knowledge Media: Technology Strategies for Higher Education*. London: Kogan Page

Donovan, T. et al. (2018) *Tracking Online and Distance Education in Canadian Universities and Colleges: 2018* Halifax NS: Canadian Digital Learning Research Association

Living Heritage (undated) *Going to school: the 1870 Education Act*, London: UK Parliament

Perry, W. (1976) *The Open University* Milton Keynes: Open University Press

Rivera, C. (2012) Survey offers dire picture of California's two-year colleges Los Angeles Times, August 28

U.K. Department of Education (2018) *Participation Rates in Higher Education: Academic Years 2006/2007 – 2017/2018 (Provisional)* London: Department of Education HE Statistics

UNESCO (2014) *Education for All, 2000-2015: achievements and challenges* Paris FR: The UNESCO 2015 EFA Global Monitoring Report team

UNESCO (2018) *One in Five Children, Adolescents and Youth is Out of School* Paris FR: UNESCO Institute for Statistics Fact Sheet No 42

Weinbren, D. (2015) *The Open University: A History* Manchester UK: Manchester University Press/ The Open University

Woodley, A. and Simpson, O. (2014) 'Student drop-out: the elephant in the room' in Zawacki-Richter, O. and Anderson, T. (eds.) (2014) *Online Distance Education: Towards a Research Agenda* Athabasca AB: AU Press, pp. 508

Activity 11.1 Should access to post-secondary education be completely open to anyone?

1. Should access to post-secondary or higher education be open to everyone?

If yes, what are reasonable limitations on this principle?

What should be the government's role, if any, in making this possible?

If your answer is no to the first part of this question, why should education up to post-secondary education be open, but not afterwards? Is it simply money, or are there other reasons?

2. Are open universities still relevant in a digital age?

11.2 Open educational resources (OER)

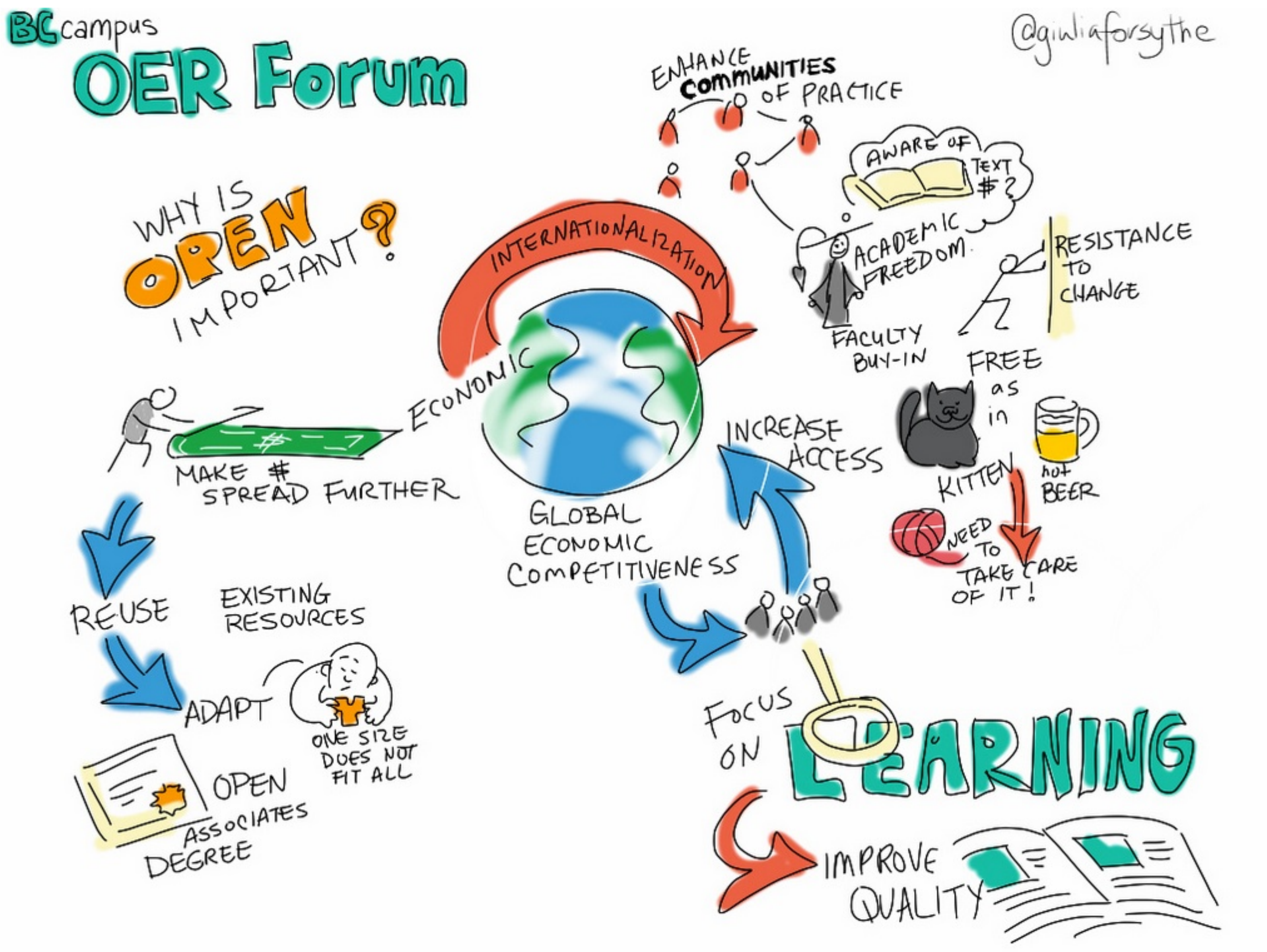


Figure 11.2.1 © Giulia Forsyth, 2012

Open educational resources are somewhat different from open learning, in that they are primarily content, while open learning includes both content and educational services, such as specially designed online materials, in-built learner support and assessment.

Open educational resources cover a wide range of online formats, including online textbooks, video recorded lectures, YouTube clips, web-based textual materials designed for independent study, animations and simulations, digital diagrams and graphics, some MOOCs, or even assessment materials such as tests with automated answers. OER can also include Powerpoint slides or pdf files of lecture notes. In order to be open educational resources, though, they must be freely available for at least educational use.

11.2.1 Principles of OER

David Wiley is one of the pioneers of OER. He and colleagues have suggested (Hilton et al., 2010) that there are five core principles (the 5Rs) of open publishing:

- **re-use**: The most basic level of openness. People are allowed to use all or part of the work for their own purposes (for example, download an educational video to watch at a later time);
- **re-distribute:** People can share the work with others (for example, send a digital article by-email to a colleague);
- **revise:** People can adapt, modify, translate, or change the work (for example, take a book written in English and turn it into a Spanish audio book);
- **re-mix:** People can take two or more existing resources and combine them to create a new resource (for example, take audio lectures from one course and combine them with slides from another course to create a new derivative work);
- **retain:** No digital rights management restrictions (DRM); the content is yours to keep, whether you're the author, an instructor using the material, or a student.

This open textbook you are reading meets all five criteria (it has a CC BY-NC license – see Section 11.2.2 below). Users of OER though need to check with the actual license for re-use, because sometimes there are limitations, as with this book, which cannot be reproduced for commercial purposes without permission. For example, the origin of the work must be accurately attributed to the original author (BY), and it cannot be converted by a commercial publisher into a printed book to be sold at a profit (NC), at least without written permission from the author. To protect your rights as an author of OER usually means publishing under a Creative Commons or other open license.

11.2.2 Creative Commons licenses

This seemingly simple idea, of an 'author' creating a license enabling people to freely access and adapt copyright material, without charge or special permission, is one of the great ideas of the 21st century. This does not take away the author's copyright, but the license gives permission automatically for different kinds of use of the material without charge or any paperwork or written permissions.

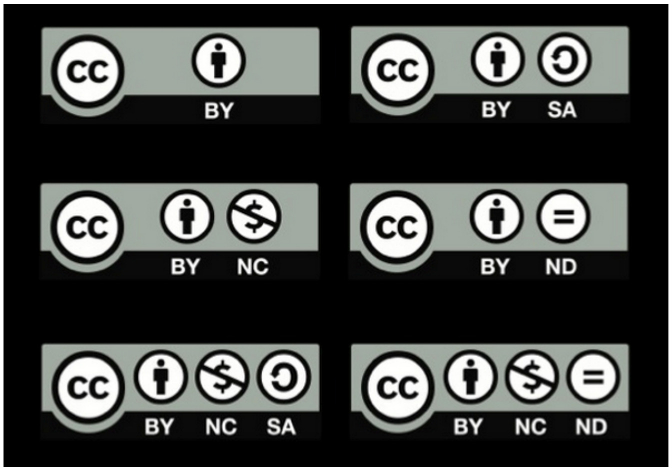


Figure 11.2.2 The spectrum of Creative Commons licenses
© The Creative Commons, 2013

There are several possible Creative Commons licenses:

- **CC BY Attribution**: lets others distribute, remix, tweak, and build upon your work, even commercially, as long as they credit you for the original creation. This is the most accommodating of licenses offered. Recommended for maximum dissemination and use of licensed materials;
- **CC BY-SA**: lets others remix, tweak, and build upon your work even for commercial purposes, as long as they credit you and license their new creations under the identical terms. This is particularly important if your work also includes other people's materials licensed through the Creative Commons;
- **CC BY-ND**: allows for redistribution, commercial and non-commercial, as long as it is passed along unchanged and in whole, with credit to you;

- **CC BY-NC**: lets others remix, tweak, and build upon your work non-commercially, and although their new works must also acknowledge you and be non-commercial, they don't have to license their derivative works on the same terms;
- **CC BY-NC-SA**: lets others remix, tweak, and build upon your work non-commercially, as long as they credit you and license their new creations under the identical terms;
- **CC BY-NC-ND**: the most restrictive of the six main licenses, only allowing others to download your works and share them with others as long as they credit you, but they can't change them in any way or use them commercially.

If you wish to offer your own materials as open educational resources, it is a relatively simple process to choose a licence and apply it to any piece of work (see Creative Commons Choose a License). If in doubt, check with a librarian.

11.2.3 Sources of OER

There are many 'repositories' of open educational resources (see for instance, for post-secondary education, MERLOT, OER Commons, and for k-12, Edutopia).The Open Professionals Education Network has an excellent guide to finding and using OER.

However, when searching for possible open educational resources on the web, check to see whether or not the resource has a Creative Commons license or a statement giving permission for re-use. It may be common practice to use free (no cost) resources without worrying unduly about copyright, but there are risks without a clear license or permission for re-use. For instance, many sites, such as OpenLearn, allow only individual, personal use for non-commercial purposes, which means providing a link to the site for students rather than integrating the materials directly into your own teaching. If in any doubt about the right to re-use, check with your library or intellectual property department.

11.2.4 Limitations of OER

The take-up of OER, other than open textbooks (see next section), by instructors is still minimal, other than by those who created the original version. For instance, in Canada in 2017, less than half the institutions reported use of OER (Donovan et al., 2018).

11.2.4.1 Quality issues

The main criticism is of the poor quality of many of the OER available at the moment – reams of text with no interaction, often available in PDFs that cannot easily be changed or adapted, crude simulation, poorly produced graphics, and designs that fail to make clear what academic concepts they are meant to illustrate.

Falconer (2013), in a survey of potential users' attitudes to OER in Europe, came to the following conclusion:

> *The ability of the masses to participate in production of OER – and a cultural mistrust of getting something for nothing – give rise to user concerns about quality. Commercial providers/publishers who generate trust through advertising, market coverage and glossy production, may exploit this mistrust of the free. Belief in quality is a significant driver for OER initiatives, but the issue of*

> *scale-able ways of assuring quality in a context where all (in principle) can contribute has not been resolved, and the question of whether quality transfers unambiguously from one context to another is seldom [addressed]. A seal of approval system is not infinitely scale-able, while the robustness of user reviews, or other contextualised measures, has not yet been sufficiently explored.*

If OER are to be taken up by others than the creators of the OER, they will need to be well designed. It is perhaps not surprising then that the most used OER on iTunes University were the Open University's, until the OU set up its own OER portal, OpenLearn, which offers as OER mainly textual materials from its courses designed specifically for online, independent study. Once again, design is a critical factor in ensuring the quality of an OER.

11.2.4.2 Instructors' professional self-image

Hampson (2013) has suggested another reason for the slow adoption of OER, mainly to do with the professional self-image of many faculty. Hampson argues that faculty don't see themselves as 'just' teachers, but creators and disseminators of new or original knowledge. Therefore their teaching needs to have their own stamp on it, which makes them reluctant to openly incorporate or 'copy' other people's work.

OER can easily be associated with 'packaged', reproductive knowledge, and not original work, changing faculty from 'artists' to 'artisans'. It can be argued that this reason is absurd – we all stand on the shoulders of giants – but it is the self-perception that's important, and for research professors, there is a grain of truth in the argument. It makes sense for them to focus their teaching on their own research. But then how many Richard Feynmans are there out there?

11.2.4.3 Free or open?

There is also considerable confusion between 'free' (no financial cost) and 'open', which is compounded by lack of clear licensing information on many OER. For instance, some Coursera MOOCs are free, but not 'open': it is a breach of copyright to re-use the material in most Coursera MOOCs within your own teaching without permission. The edX MOOC platform is open source, which means other institutions can adopt or adapt the portal software, but institutions even on edX tend to retain copyright. However, there are exceptions on both platforms: a few MOOCs do have an open licence.

11.2.4.4 Situating OER

There is also the issue of the context-free nature of OER. Research into learning shows that content is best learned within context (situated learning), when the learner is active, and that above all, when the learner can actively construct knowledge by developing meaning and 'layered' understanding. Content is not static, nor a commodity like coal. In other words, content is not effectively learned if it is thought of as shovelling coal into a truck. Learning is a dynamic process that requires questioning, adjustment of prior learning to incorporate new ideas, testing of understanding, and feedback. These 'transactional' processes require a combination of personal reflection, feedback from an expert (the teacher or instructor) and even more importantly, feedback from and interaction with friends, family and fellow learners.

The weakness with open content is that by its nature, at its purest it is stripped of these developmental, contextual and 'environmental' components that are essential for effective learning. In other words, OER are just like coal, sitting there waiting to be loaded. Coal of course is still a very valuable product. But it has to be mined, stored, shipped and processed.

More attention needs to be paid to those contextual elements that turn OER from raw 'content' into a useful learning experience. This means instructors need to build learning experiences or environments into which the OER will fit. (See Chapter 11, Section 4 for more discussion of this issue)

11.2.4.5 Study the research

For a useful overview of the research on OER, see the Review Project from the Open Education Group. Another important research project is ROER4D, which aims to provide evidence-based research on OER adoption across a number of countries in South America, Sub-Saharan Africa and Southeast Asia.

11.2.5 How to use OER

Despite these limitations, teachers and instructors are increasingly creating open educational resources, or making resources freely available for others to use under a Creative Commons license. There are increasing numbers of repositories or portals where faculty can access open educational resources. As the quantity of OER expands, it is more likely that teachers and instructors will increasingly be able to find the resources that best suit their particular teaching context.

There are therefore several choices:

- take OER selectively from elsewhere, and incorporate or adapt them into your own courses;
- create your own digital resources for your own teaching, and make them available to others (see for instance Creating OER and Combining Licenses from Florida State University);
- build a course around OER, where students have to find content to solve problems, write reports or do research on a topic (see Scenario H at the beginning of this chapter, and Chapter 11, Section 4.2);
- take a whole course from OERu, then build student activities and assessment and provide learner support for the course.

Learners can use OER to support any type of learning. For instance, MIT's OpenCourseWare (OCW) could be used just for interest, or students who struggle with the topics in a classroom lecture for a credit course may well go to OCW to get an alternative approach to the same topic.

11.2.6 Still worth the effort

Despite some of the current limitations or weaknesses of OER, their use is likely to grow, simply because it makes no sense to create everything from scratch when good quality materials are freely and easily available. We have seen in Chapter 9 on selecting media that there is now an increasing amount of excellent open material available to teachers and instructors. This will only grow over time. We shall see in Section 11.5 that this is bound to change the way courses are designed and offered. Indeed, OER will prove to be one of the essential features of teaching in a digital age.

References

Donovan, T. et al. (2018) *Tracking Online and Distance Education in Canadian Universities and Colleges: 2018* Halifax NS: Canadian Digital Learning Research Association

Falconer, I. et al. (2013) Overview and Analysis of Practices with Open Educational Resources in Adult Education in Europe Seville, Spain: European Commission Institute for Prospective Technological Studies

Hampson, K. (2013) The next chapter for digital instructional media: content as a competitive difference Vancouver BC: COHERE 2013 conference

Hilton, J., et al. (2010). The four R's of openness and ALMS Analysis: Frameworks for open educational resources *Open Learning: The Journal of Open and Distance Learning*, *25*(1), 37–44

Activity 11.2 Deciding on OER

1. Have you used OER in your own course(s)? Was this a positive or negative experience?
2. If you have not used OER, what is/are the main reason(s)? Have you explored to see what is available? What is the quality like? How could they be improved?
3. Under what circumstances would you be prepared to create or convert your own material as OER?

11.3 Open textbooks, open research and open data

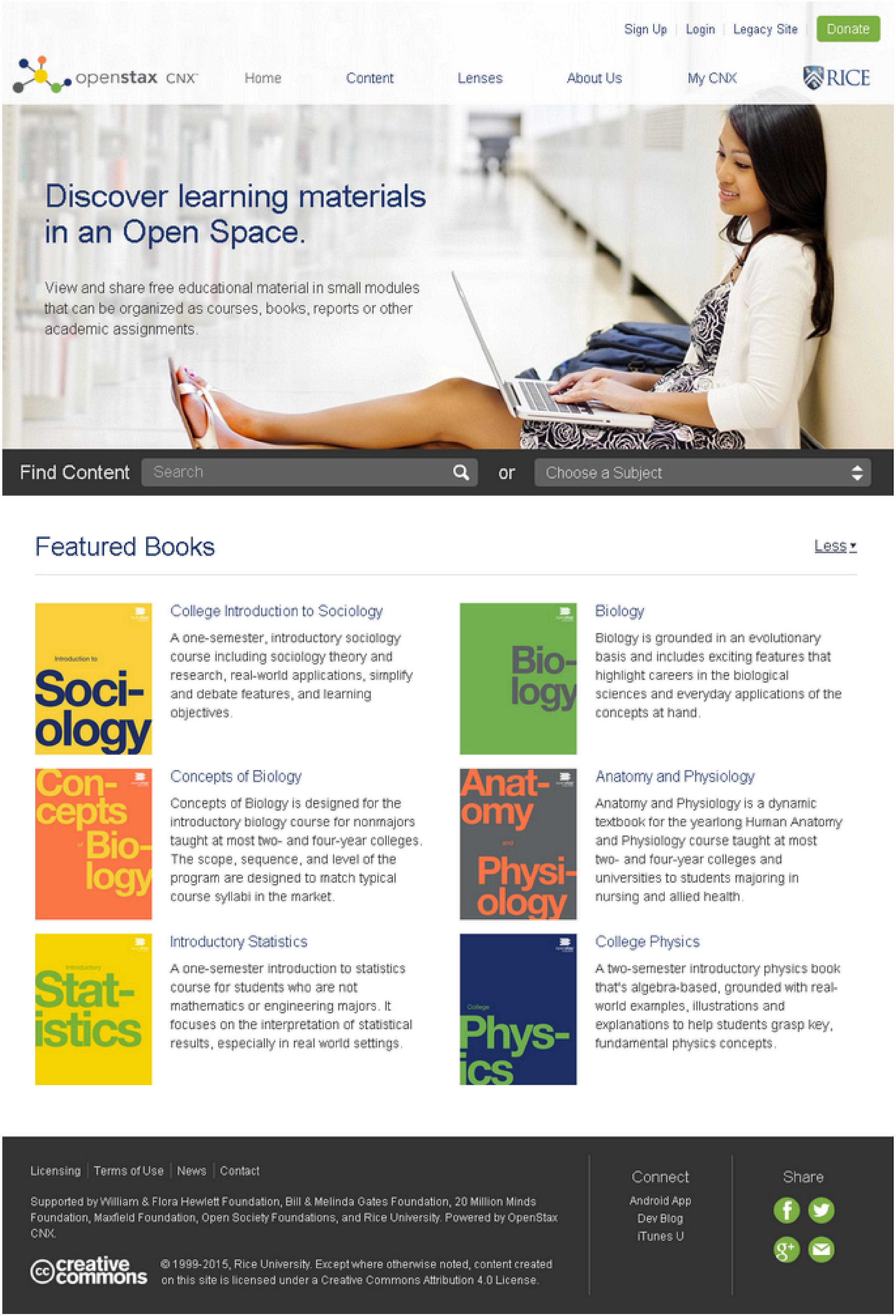

Sign Up | Login | Legacy Site
Donate
openstax CNX
Home
Content
Lenses
About Us
My CNX
RICE
Discover learning materials in an Open Space.
View and share free educational material in small modules that can be organized as courses, books, reports or other academic assignments.
Find Content
Search
or
Choose a Subject
Featured Books
Less
College Introduction to Sociology
A one-semester, introductory sociology course including sociology theory and research, real-world applications, simplify and debate features, and learning objectives.
Biology
Biology is grounded in an evolutionary basis and includes exciting features that highlight careers in the biological sciences and everyday applications of the concepts at hand.
Concepts of Biology
Concepts of Biology is designed for the introductory biology course for nonmajors taught at most two- and four-year colleges. The scope, sequence, and level of the program are designed to match typical course syllabi in the market.
Anatomy and Physiology
Anatomy and Physiology is a dynamic textbook for the yearlong Human Anatomy and Physiology course taught at most two- and four-year colleges and universities to students majoring in nursing and allied health.
Introductory Statistics
A one-semester introduction to statistics course for students who are not mathematics or engineering majors. It focuses on the interpretation of statistical results, especially in real world settings.
College Physics
A two-semester introductory physics book that's algebra-based, grounded with real-world examples, illustrations and explanations to help students grasp key, fundamental physics concepts.
Licensing | Terms of Use | News | Contact
Supported by William & Flora Hewlett Foundation, Bill & Melinda Gates Foundation, 20 Million Minds Foundation, Maxfield Foundation, Open Society Foundations, and Rice University. Powered by OpenStax CNX.
creative commons
© 1999-2015, Rice University. Except where otherwise noted, content created on this site is licensed under a Creative Commons Attribution 4.0 License.
Connect
Android App
Dev Blog
iTunes U
Share

Figure 11.3.1 Open Stax open textbooks

11.3.1 Open textbooks

Textbooks are an increasing cost to students. Some textbooks cost $200 or more, and in the USA a university undergraduate spends on average between $530 – $640 a year on textbooks (Hill, 2015), although the cost of *recommended* textbooks is between $968 and $1221 (Caulfield, 2015).

An open textbook on the other hand is an openly-licensed, online publication free for downloading for educational or non-commercial use. You are currently reading an open textbook. There is an increasing number of sources for open textbooks, such as OpenStax College from Rice University, and the Open Academics Textbook Catalog at the University of Minnesota.

In British Columbia, the provincial government funded the B.C. open textbook project, which operates in collaboration initially with the provinces of Alberta and Saskatchewan, but now also with other provinces through the Canada OER Group. The B.C. open textbook project focuses on making available openly-licensed textbooks in the highest-enrolled academic subject areas and also in trades and skills training. In the B.C. project, as in many of the other sources, all the books are selected, peer reviewed and in some cases developed by local faculty. Often these textbooks are not 'original' work, in the sense of new knowledge, but carefully written and well illustrated summaries of current thinking in the different subject areas.

11.3.1.1 Advantages of open textbooks

Students and governments, through grants and financial aid, pay billions of dollars each year on textbooks. Open textbooks can make a significant impact on reducing the cost of education. The government of British Columbia estimates that the BC Open Textbook project has saved the roughly 300,000 post-secondary students in the province more that $4 million in textbook costs between 2012 to 2017 (Bernard, 2017).

Cable Green, the Interim CEO of the Creative Commons, has a 'vision' for open textbooks: 100 per cent of students have 100 per cent free, digital access to all course materials by day one. That is far from the case today.

DeNoyelles and Raible at the University of Central Florida found (2017) that due to high costs:

- 30 percent of [student] respondents said they have opted not to purchase a textbook at least once,
- 41 percent have delayed purchasing a textbook, and
- 15 percent have taken fewer courses or decided not take a particular class.

DeNoyelles and Raible concluded that:

- the cost of textbooks is negatively impacting student access to required materials (66.6% did not purchase the required textbook) and learning (37.6% earn a poor grade; 19.8% fail a course).

A survey of all public post-secondary students in Florida conducted by the Florida Virtual Campus (2016) found that due to the high costs of textbooks:

- time to graduation and/or access to courses is impacted by cost. Students reported that they occasionally or frequently take
    - fewer courses (47.6%);
    - do not register for a course (45.5%);
    - drop a course (26.1%), or
    - withdraw from courses (20.7%).

There are also other considerations. It is a common sight to see lengthy line-ups at college bookstores all through the first week of the first semester (which eats into valuable study time). Because students may be searching for second-hand versions of the books from other students, it may well be into the second or third week of the semester before students actually get their copy.

So why shouldn't government pay the creators of textbooks directly, cut out the middleman (commercial publishers), save over 80 per cent on the cost, and distribute the books to students (or anyone else) for free over the Internet, under a Creative Commons license?

Figure 11.3.2 Open textbooks: no bookstore line-ups! Image: The Saskatoon StarPhoenix

11.3.1.2 Limitations of open textbooks

Faculty resistance is still a problem for open textbooks. Open textbooks had been adopted in between half and two thirds of all post-secondary institutions in Canada in 2017, and a further 20 per cent were exploring their use. However, this varied considerably by province. In British Columbia, 90 per cent of all post-secondary institutions had adopted open textbooks for some courses; in Saskatchewan and Quebec, less than a third of institutions were using open textbooks (Donovan et al., 2018). This indicates clearly the impact of government support for open textbooks. Adoption was highest in universities and large institutions. Donovan et al. also found that there was a lack of knowledge and even more so of training for instructors in the use of open textbooks and OER.

Murphy (2013) has questioned the whole idea of textbooks, whether open or not. She sees textbooks as a relic of 19th century industrialism, a form of mass broadcasting. In the 21st century, students should be finding, accessing and collecting digital materials over the Internet. Textbooks are merely packaged learning, with the authors doing the work for students. Nevertheless, it has to be recognized that textbooks are still the basic currency for most forms of education, and while this remains the case, open textbooks are a much better alternative for students than expensive printed textbooks.

Quality also remains a concern. There is an in-built prejudice that ‘free’ must mean poor quality.Thus the same arguments about quality of OER also apply to open textbooks. In particular, the expensive commercially published textbooks usually include in-built activities, supplementary materials such as extra readings, and even assessment questions. Nevertheless, Jhangiani and Jhangiani (2017), in a survey of 320 undergraduate students in British Columbia who had actually used an open textbook for one or more of their courses, found that 96% of respondents perceived the quality of their open textbook to be equal or superior to a commercial textbook.

Others (including myself) question the likely impact of 'open' publishing on creating original works that are not likely to get subsidized by government because they are either too specialized, or are not yet part of a standard curriculum for the subject; in other words will open publishing impact negatively on the diversity of publishing? What is the incentive for someone now to publish a unique work, if there is no financial reward for the effort? Writing an original, single authored book remains hard work, however it is published.

Although there is now a range of 'open' publishing services, there are still costs for an author to create original work. Who will pay, for instance, for specialized graphics, for editing or for review? I have used my blog to get sections of this book reviewed generally, and this has proved extremely useful. Nevertheless one can still approach top quality reviewers for an independent review, as was done for this book (see Appendix 3). I also received free technical support from both BCcampus and Contact North, but other potential open textbook authors may not have that kind of access.

Marketing is another issue. It takes time and specialised knowledge to market books effectively. On the other hand, my experience, having published twelve books commercially, is that publishers are very poor at properly marketing specialised textbooks, expecting the author to mainly self-market, while the publisher still takes 85-90 per cent of all sales revenues. Nevertheless there are still real costs in marketing an open textbook.

How can all these costs be recovered? Much more work still needs to be done to support the open publishing of original work in book format. If so, what does that mean for how knowledge is created, disseminated and preserved? If open textbook publishing is to be successful, new, sustainable business models will need to be developed. In particular, some form of government subsidy or financial support for open textbooks is probably going to be essential.

Nevertheless, although these are all important concerns, they are not insurmountable problems. Just getting a proportion of the main textbooks available to students for free is a major step forward. To see whether or not I felt it worthwhile to write the first edition of this book, see 'Writing an Online Book: Is it Worth it?' (Bates, 2015)

11.3.1.3 Learn how to adopt and use an open textbook

BC campus has mounted a short MOOC on the P2PU portal on Adopting Open Textbooks. Although the MOOC may not be active when you access the site, it still has most of the materials, including videos, available.

11.3.2 Open research

Governments in some countries such as the USA, Canada and the United Kingdom are requiring all research published as a result of government funding to be openly accessible in a digital format. In Canada, the Minister of State for Science and Technology announced (February 27, 2015) that:

> *The harmonized Tri-Agency Open Access Policy on Publications requires all peer-reviewed journal*

publications funded by one of the three federal granting agencies to be freely available online within 12 months.

Also in Canada, Supreme Court decisions and new legislation in 2014 means that it is much easier to access and use free of charge online materials for educational purposes, although there are still some restrictions.

Commercial publishers, who have dominated the market for academic journals, are understandably fighting back. Where an academic journal has a high reputation and hence carries substantial weight in the assessment of research publications, publishers are charging researchers for making the research openly available. The kudos of publishing in an established journal acts as a disincentive for researchers to publish in less prestigious open journals without having to pay to get published.

However, it can only be a question of time before academics fight back against this system, by establishing their own peer reviewed journals that will be perceived to be of the highest standard by the quality of the papers and the status of the researchers publishing in such journals. Once again, though, open research publishing will flourish only by meeting the highest standards of peer review and quality research, by finding a sustainable business model, and by researchers themselves taking control over the publishing process.

Over time, therefore, we can expect nearly all academic research in journals to become openly available.

11.3.3 Open data

The two main sources of open data are from science and government. Following an intense discussion with data-producing institutions in member states, the OECD published in 2007 the *OECD Principles and Guidelines for Access to Research Data from Public Funding*. In science, the Human Genome Project is perhaps the best example of open data, and several national or provincial governments have created web sites to distribute a portion of the data they collect, such as the B.C. Data Catalogue in Canada.

Again, increasing amounts of important data are becoming openly available, providing more resources with high potential for learning.

The significance for teaching and learning of the developments in open access, OER, open textbooks and open data will be explored more fully in the next section.

References

Bates, T. (2015) Writing an online, open textbook: is it worth it? *Online Learning and Distance Education Resources*, June 10

Bernard, R. (2017) 'Open textbooks' catching on at BC colleges and universities *CityNews*, February 10

Caulfield, M. (2015) Asking What Students Spend on Textbooks Is the Wrong Question, *Hapgood*, November 9

DeNoyelles, A. and Raible, J. (2017) Exploring the Use of E-Textbooks in Higher Education: A Multiyear Study *EDUCAUSE Review*, October 9

Donovan, T. et al. (2018) *Tracking Online and Distance Education in Canadian Universities and Colleges: 2018* Halifax NS: Canadian Digital Learning Research Association

Florida Virtual Campus (2016) 2016 Florida Student Textbook & Course Materials Survey. Tallahassee, FL.

Hill, P. (2015) How Much Do College Students Actually Pay For Textbooks? *e-Literate*, March 25

Jhangiani, R. and Jhangiani, S. (2017) Investigating the Perceptions, Use, and Impact of Open Textbooks: A survey of Post-Secondary Students in British Columbia *International Review of Research in Open and Distributed Learning*, Vol. 18, No.4

Murphy, E. (2103) *Day 2 panel discussion* Vancouver BC: COHERE 2013 conference

OECD (2017) OECD Principles and Guidelines for Access to Research Data from Public Funding Paris FR: OECD

Activity 11.3 Using other open resources

1. Check with OpenStax College, the Open Academics Textbook Catalog and the B.C. open textbook project to see if there are any suitable open textbooks for your subject.

2. What open journals are there in your subject area? (The help of a librarian may be useful here.) Are the articles of good quality? Could your students use these if they were conducting research in this area?

3. Ask your librarian for help in looking for open data sites that might have useful data that you could use in your teaching. Would students be able to find these data sites by themselves, with just a little guidance? How could they or you use this open data in their learning?

11.4 Open pedagogy

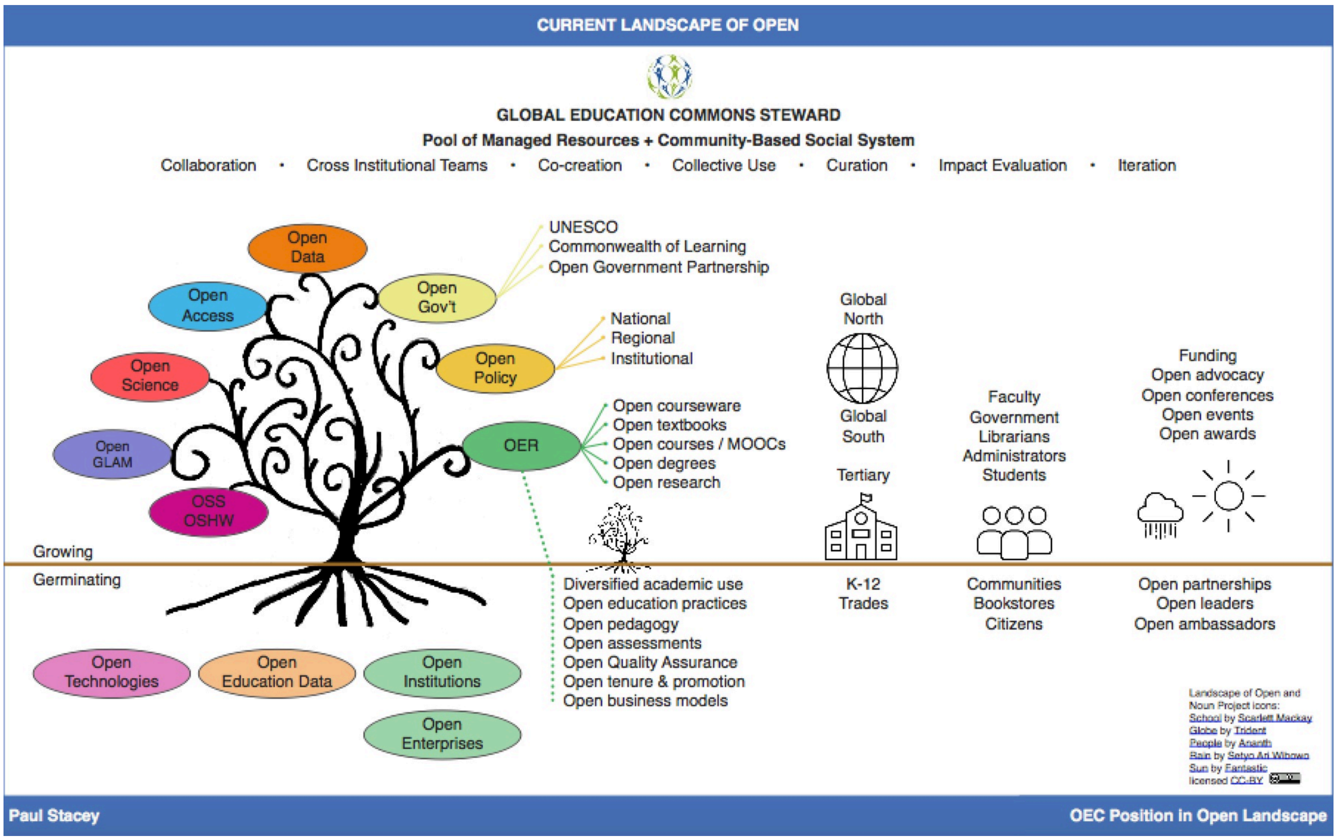


Figure 11.4.1 Current landscape of Open. Image: Paul Stacey, 2018

11.4.1 What is open pedagogy?

David Wiley (2013) originally defined open pedagogy as:

> *that set of teaching and learning practices only possible in the context of the free access and 4R permissions characteristic of open educational resources*

It will be seen later in this section that Wiley has since (2017) recanted on this definition and indeed questions the whole idea of an open pedagogy. However, this definition was influential in framing the more recent discussion of open pedagogy around the use of OER (see DeRosa and Jhangiani, 2017, for an excellent discussion about open pedagogy, its origins, and its development since 2013).

Indeed, even in 2019, BCcampus still defined open pedagogy as follows:

> *Open pedagogy, also known as open educational practices (OEP), is the use of open educational resources (OER) to support learning, or the open sharing of teaching practices with a goal of improving education and training at the institutional, professional, and individual level.*

However, it is now realised that for open educational resources to be widely adopted, as well as to change teaching practice, they need to be embedded in a much broader ecology of teaching and learning, of which open pedagogy is a critical component. The following definition from the University of Texas Arlington Libraries represents this thinking:

> *Open pedagogy is the practice of engaging with students as creators of information rather than simply consumers of it. It's a form of experiential learning in which students demonstrate understanding through the act of creation. The products of open pedagogy are student created and openly licensed so that they may live outside of the classroom in a way that has an impact on the greater community. Open projects frequently result in the creation of open educational resources (OER). OER are free teaching and learning materials that are licensed to allow for revision and reuse. They can be fully self-contained textbooks, videos, quizzes, learning modules, and more.*

I like the above definition because it focuses on student behaviour, where open educational materials are a by-product of their learning, rather than the starting point, although open pedagogy can also embrace OER as a starting point.

Hegarty (2015) describes eight attributes of open pedagogy:

- **participatory technologies**: socially constructed media such as blogs, wikis and other 'sharing' social media;
- **people, openness and trust**: students' willingness to learn is fragile, with participation and interactions unlikely to flourish unless an element of trust can be built (Mak et., 2010);
- **innovation and creativity**: finding new models of teaching and learning that better exploit OER and more emphasis on choosing digital technologies and methods that encourage the sharing of knowledge and resources;
- **sharing ideas and resources**: an open pedagogy needs peers to share willingly within a connected and trusting and professional community;
- **connected community**: a technologically linked community with common interests;
- **learner-generated:** this requires 'opening up' the process to empower students to take the lead, solve problems, and work collectively to produce artifacts that they share, discuss, reconfigure, and redeploy
- **reflective practice**: when students and teachers collaborate in partnerships, it facilitates deeper pedagogical reflection
- **peer review:** Conole (2014) sees learners as publishers and users of a range of open tools, with peer interactions and critique embedded in the learning experience.

Hegarty also makes the point that it is almost impossible to separate the components of an open pedagogy into neat, segregated dimensions. Components in each of the eight dimensions overlap in many ways.

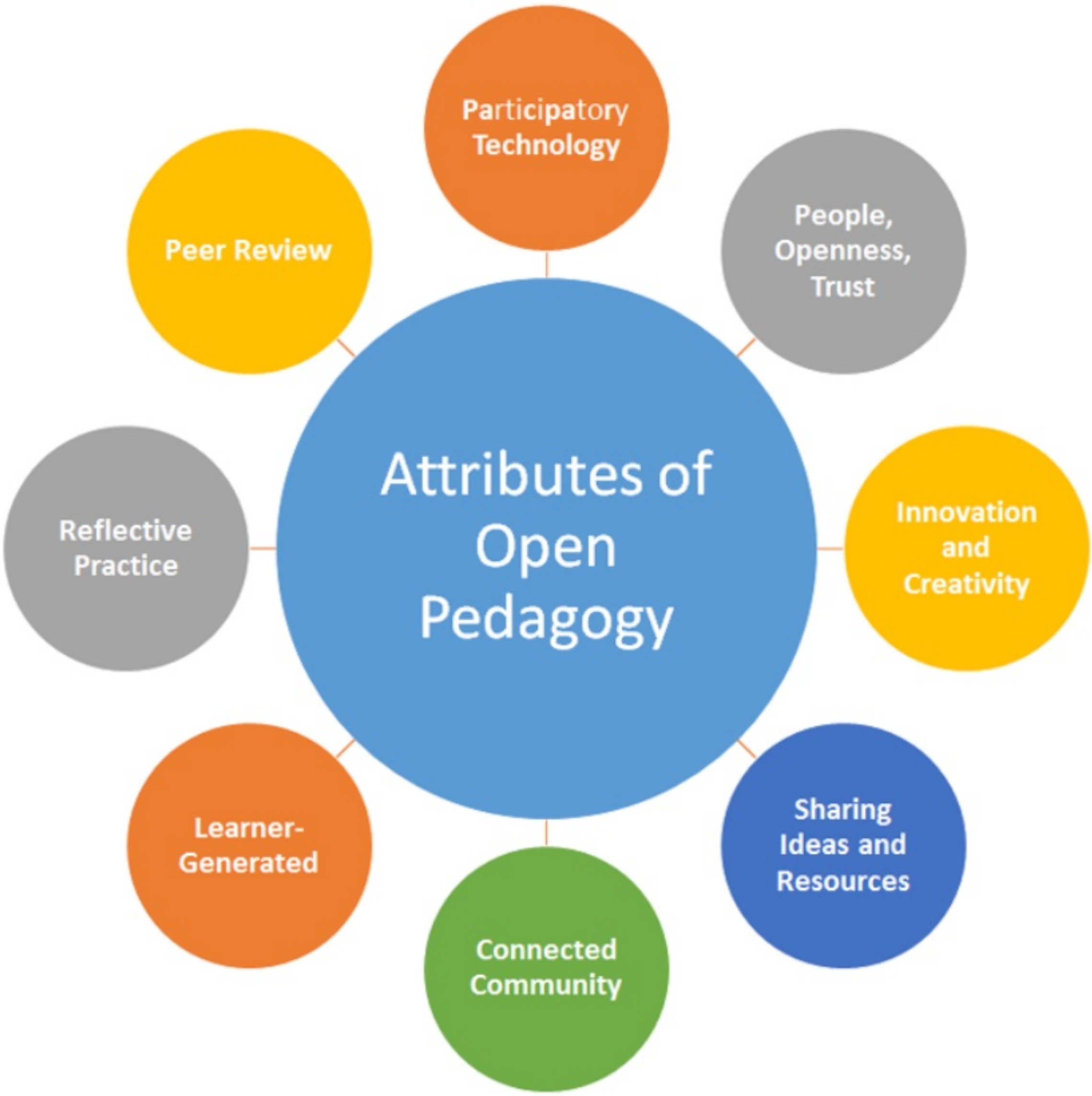


Figure 11.4.2 Hegarty's Attributes of Open Pedagogy. Image: Hegarty, 2015

DeRosa and Robison (2017) set out the key idea of open pedagogy in the following:

> *By replacing a static textbook — or other stable learning material — with one that is openly licensed, faculty have the opportunity to create a new relationship between learners and the*

> *information they access in the course. Instead of thinking of knowledge as something students need to download into their brains, we start thinking of knowledge as something continuously created and revised. Whether students participate in the development and revision of OER or not, this redefined relationship between students and their course 'texts' is central to the philosophy of learning that the course espouses. If faculty involve their students in interacting with OER, this relationship becomes even more explicit, as students are expected to critique and contribute to the body of knowledge from which they are learning. In this sense, knowledge is less a product that has distinct beginning and end points and is instead a process in which students can engage, ideally beyond the bounds of the course.*

11.4.2 Examples of open pedagogy

There is a close connection between networking, social media such as blogs and wikis, which enable students to create open educational resources, and open pedagogy.

Jon Beasley-Murray's course where students created a Wikipedia entry on Latin American literature is a good example, as is the Math Exam Resources created by graduate students at UBC (see Chapter 9, Section 8.8.3). This approach is particularly valuable for partly redressing cultural and historical bias, through the organization of Wikipedia edit-a-thons. For two examples, see Women in Red/Indigenous Women. and Indigenous Literature Edit-a-Thon.

The Universidad de Guadalajara (Mexico) has an interesting web site (in English) that provides a number of examples of open pedagogy from around the world, related to its Agora project.

Another practice of open pedagogy are textbook-free degrees, called Zed Creds or Z-degrees but also ZTC (zero textbook cost). Royal Roads University's Masters of Arts in Learning and Technology is the first master of arts degree in Canada to go textbook-free. Students can access all of the course materials through open educational resources, e-books, journal articles and other free digital resources. These types of courses aim to improve access to education and enhance student outcomes.

Many more examples of open pedagogy in practice can be found in Jhangiani and Biswas-Diener (2017) and in the Open Pedagogy Notebook.

Lastly, there is a related movement around open educational infrastructure and technology that challenges educational institutions and students to think about who owns the technology and data being used for teaching and learning and how open education practices can be enabled by open educational technologies (see, for example OpenETC.)

11.4.3 The need to provide a framework to support open educational resources

The search for a pedagogical and organizational framework to support the use of open educational resources has been driven partly by the relative slowness of adoption of OER. To give a simple example, instructors are reluctant to move away from expensive commercial first year textbooks, because these books often come with a wide range of support materials, such as interactive web sites with sample exam questions and answers, multiple-choice questions, and alternative reading. Open textbooks need to come with similar supporting materials, student activities and a wider 'network' of support to compete with commercial textbooks.

Paul Stacey, the Director of the Open Education Consortium, has mused (2018) that too much focus is given to licensing and content development, and not enough to collectively managing open resources so that they are sustainable and dynamic. He argues that OER, to be effective, need 'commoning', which reflects the management and sustainability of common, shared resources and services. He argues for:

- a social system for the long-term stewardship of resources that preserves shared values and community identity;
- a self-organized system by which communities manage resources (both depletable and and replenishable) with minimal or no reliance on the Market or State. Simply having a community and pool of resources is not enough. There needs to be a set of protocols, values and norms devised by the community to manage its resources.

Open pedagogy could provide an important pedagogical part of such a framework, but Stacey seems to be suggesting that support needs to go beyond pedagogy to a social and management structure.

11.4.4 Is open pedagogy a useful construct?

Some of you may feel like Molière's Bourgeois Gentilhomme after a lesson from his tutor: 'I have been speaking prose for 40 years and never realised it.' The concept of 'open pedagogy' has been around for a long time, even if it has seen a revival resulting from the development of OER.

Lord Crowther, in a speech presenting the charter of the British Open University in 1969, defined the Open University as:

- open to people: "We took it as axiomatic" said the Planning Committee "that no formal academic qualifications would be required for registration as a student…Anyone could try his or her hand, and only failure to progress adequately would be a bar to continuation of studies."
- open to places: "This University has no cloisters – a word meaning closed. We have no courts – or spaces enclosed by buildings….Wherever the English language is spoken or understood, or used as a medium of study, and wherever there are men and women seeking to develop their individual potentialities beyond the limits of the local provision – and I have defined a large part of the world – there we can offer our help."
- open to methods: 'Every new form of human communication will be examined to see how it can be used to raise and broaden the level of human understanding."
- open to ideas: "It has been said that there are two aspects of education, both necessary. One regards the individual human mind as a vessel, of varying capacity, into which is to be poured as much as it will hold of the knowledge and experience by which human Society lives and moves. This is the Martha of education – and we shall have plenty of these tasks to perform. But the Mary regards the human mind rather as a fire that has to be set alight and blown with the divine efflatus'.

I am not sure that open pedagogy is the divine efflatus, but Crowther's understanding of openness in methods is much wider than modern concepts of open pedagogy.

Claude Paquette, following the cultural revolution in Québec, wrote in 1979:

> *Une pédagogie ouverte est centrée sur l'interaction qui existe dans une classe entre l'étudiant et l'environnement éducatif qui lui est proposé….Il s'agit d'une façon de penser et d'une façon d'agir. L'éducateur aura donc pour rôle premier de contribuer à l'aménagement de cet environnement éducatif.*

> [My translation: Open pedagogy is focused on the interaction within a class between a learner and the educational environment that is created for him. It is about a way of thinking and a way of acting. The primary role of the teacher then is to contribute to the management of this educational environment.'

Note that there is no mention of free or open educational resources, and the quote could have come straight from Rousseau's 'Emile' (1972). It is the basis for the whole of Chapter 6 in this book.

David Wiley (who was the originator of the term 'open educational resources') writes (2017):

> *"Open" …. does not have anything to say about the nature of learning. …you can't actually build a pedagogy on a foundation of open (well, not one that isn't incredibly impoverished). Your foundational commitments in terms of pedagogy should be to an understanding of how learning happens. Once we have made fundamental commitments in terms of a theory of learning, then we can add open to our list of facilitating methods in order get better leverage.*
>
> *I wonder if it isn't nonsensical to talk about "open pedagogy" at all …… Perhaps we should only use open as a modifier for other pedagogies, like "open constructionist pedagogy" or "open connectivist pedagogy" or "open constructivist pedagogy." It's clear in each of those cases how open gives you better leverage in terms of supporting learning.*

Although many of the practices associated with open pedagogy have been around long before open educational resources were created, OER nevertheless make such practices much easier to implement and more powerful. But does this make a new pedagogy?

Morgan (2017) raises this issue with respect to the project she worked on for the Universidad de Guadalajara's Agora project.

> *The Agora design process was focussed on what an open design would actually be* a means to *which can be summarized as:*
>
> 1. *Open as a means to facilitate a faculty **culture of collaboration** across the university and across disciplines*
> 2. *Open as a means **to connect** with a broader, global community*
> 3. *Open as means to **challenge and expand existing understandings** of student centre learning*
> 4. *Open as means to **challenge ways of doing**, in this case, the options and possibilities of digital technology and mobile learning*
> 5. *Open as a means to make the lives of faculty easier in their pursuit of **better teaching and learning***
> 6. *Open as a means to create a **sustainable approach** to faculty development*
>
> *Ultimately we did create content that fits quite nicely with the 5Rs, but the goal of our open pedagogy design process was not to create OERs as a means towards or even as an essential component of open pedagogy. The Agora was alternatively all of the 'isms – behaviourism, connectivism, constructivism, constructionism – but the ism doesn't really matter. Importantly, the open pedagogy design was at times technology-enabled and at times it didn't use technology or the*

> *internet at all. OERs didn't allow us to practice a different pedagogy, rather the open pedagogy of the Agora was a bricolage of activities and practices that at times resulted in OERs and at times didn't.*

Pedagogy is primarily about practice: what teachers or learners do. Obviously, practice is and should be driven by ideas and beliefs, but it is different from philosophy. Learner-centred teaching or learners creating knowledge (with or without OER) is a pedagogy; 'open' is more of an idea and a value. In other words, looking at the quotations above, open is more a philosophy, a way of thinking, that informs practice, rather than the practice itself. However, this is a somewhat academic distinction. OER is enabling changes in teaching practice. However, I prefer a broader vision for teaching in a digital age than one so closely tied to OER.

11.4.5 Another vision for pedagogy in a digital age

The increasing availability of high quality open content is likely to facilitate the shift from information transmission by the instructor to knowledge management by the learner. Also in a digital age there is a need for greater focus on skills development embedded within a subject domain than on the memorisation of content.

The use of open educational resources could enable these developments in a number of ways, such as:

- a learner-centered teaching approach that focuses on students accessing content on the Internet (and in real life) as part of developing knowledge, skills and competencies defined by the instructor, or learners managing their learning for themselves; however, content would not be restricted to officially designated open educational resources, but to everything on the Internet, because one of the core skills students will need is how to assess and evaluate different sources of information;
- a consortium of teachers or institutions creating common learning materials within a broader program context, that can be shared both within and outside the consortium. However, not only would the content be freely available, but also the underlying instructional principles, learning outcomes, learner assessment strategies, what learner support is needed, learner activities, and program evaluation techniques, so that other instructors or learners can adapt all this to their own context. This approach is already being taken by:
  - the Carnegie Mellon Open Learning Initiative
  - to some extent by the UK Open University's OpenLearn project
  - the Virtual University of Small States of the Commonwealth
  - OER Africa
  - OERu

Overall, such developments are likely to lead to a severe reduction in lecture-based teaching and a move towards more project work, problem-based learning and collaborative learning. It will also result in a move away from fixed time and place written examinations, to more continuous, portfolio-based forms of assessment.

The role of the instructor then will shift to providing guidance to learners on where and how to find content, how to evaluate the relevance and reliability of content, what content areas are core and what peripheral, and to helping students analyse, apply and present information, within a strong learning design that focuses on clearly defined learning outcomes, particularly with regard to the development of skills. Students will work mainly online and collaboratively, developing multi-media learning artefacts or demonstrations of their learning, managing their online portfolios of work, and editing and presenting selected work for assessment.

This is a far broader vision of pedagogy than that built around the use of OER.

11.4.6 Conclusion

In summary:

- increasingly, educational resources are becoming more freely and more openly available for teachers and learners;
- OER open up the possibility of greater student participation in the creation as well as the selection of learning materials;
- it is essential to embed OER within a robust and appropriate teaching framework or pedagogy that exploits the potential of OER;
- OER may lead to a new, open pedagogy, but more likely will lead to the greater adoption and adaptation of existing teaching methods that benefit from the potential of OER;
- it is also essential to create organizational environments or management frameworks that encourage and support the development and use of high quality open educational resources; they cannot successfully exist in a vacuum;
- what should drive open educational practices and use of OERs should be a broader vision of teaching and learning that focuses on the knowledge and skills students need in a digital age. OER should be embedded in a wider concept of pedagogy than just 'open' pedagogy.

References

Conole, G. (2014) The 7Cs of Learning Design – a new approach to rethinking design practice *9th International Conference on Networked Learning*, Edinburgh

Crowther, G. (1969) This is the Open University, London, UK, 23 July

DeRosa, R. and Jhangiani, R. (2017) Open Pedagogy, in Mays, E. (ed.) *A Guide to making Open Textbooks with Students*, The Rebus Community

DeRosa, R. and Robison, S. (2017) From OER to Open Pedagogy: Harnessing the Power of Open in Jhangiani, R S. and Biswas-Diener, R. (2017 *Open: The Philosophy and Practices that are Revolutionizing Education and Science* London: Ubiquity Press.

Hegarty, B. (2015) Attributes of open pedagogy: a model for using open educational resources *Educational Technology*, July-August

Jhangiani, R. and Biswas-Diener, R. (eds.) (2017) *Open: The Philosophy and Practices that are Revolutionizing Education and Science* London: Ubiquity Press.

Mak, S. et al. (2010). Blogs and forums as communication and learning tools in a MOOC in

L. Dirckinck-Holmfeld et al. (Eds.), Proceedings of the 7th International Conference on Networked Learning 2010 (pp. 275–284)

Morgan, T. (2017) Reflections on #OER17 – From Beyond Content to Open Pedagogy *Explorations in the Ed Tech World*, 13 April

Paquette, C. (1979) Quelques fondements d'une pédagogie ouverte *Québec Français*, Vol. 36

Rousseau, J.-J. (1762) *Émile, ou de l'Éducation* (Trans. Allan Bloom). New York: Basic Books, 1979

Stacey, P. (2018) Global Education Commons Steward *Musings on the Ed Tech Frontier,* February 8

Wiley, D. (2017) When opens collide, *iterating toward openness*, 21 April

Activity 11.4 Contemplating open pedagogy

1. How does open pedagogy differ from other teaching methods such as experiential learning or problem-based learning? What makes open pedagogy unique, if anything? Does it matter?
2. Look at one of the modules or topics you are currently teaching. How could you re-design it to reflect an open pedagogical approach? What would be the advantages and disadvantages of doing this?
3. What support beyond your commitment and time would be necessary for you to be able successfully to integrate OER into your teaching?

11.5 The implications of 'open' for course and program design: towards a paradigm shift?

11.4.1 An open and free beach, Pie de la Cuesta, Mexico
Image: © Tony Bates 2015 CC BY-NC

Although in recent years MOOCs, emerging technologies and artificial intelligence have been receiving all the media attention, I believe that developments in open educational resources, open textbooks, open research and open data will be far more important and far more revolutionary. Here are some reasons why.

11.5.1 Nearly all educational content will be free and open

Eventually most academic content will be easily accessible and freely available through the Internet – for anyone. This could well mean a shift in power from teachers and instructors to students. Students will no longer be dependent on 'live' instructors as their primary source of content. Already some students are skipping lectures at their local institution because the teaching of the topic is better and clearer on OpenCourseWare, MOOCs or the Khan Academy. If students can access the best lectures or learning materials for free from anywhere in the world, including the leading Ivy League universities, why would they want to get content from a middling lecturer at Midwest State University? What is the added value that this lecturer is providing for the students?

There are good answers to this question, but it means considering very carefully how content will be presented and shaped by a teacher or instructor that makes it uniquely different from what students can access elsewhere. For research professors this may include access to their latest, as yet unpublished, research; for other instructors, it may be their unique perspective on a particular topic, and for others, a unique mix of topics to provide an integrated, inter-disciplinary approach. What will not be acceptable to most students is repackaging of 'standard' content that can easily be found elsewhere on the Internet and at a higher quality.

Furthermore, if we look at knowledge management as one of the key skills needed in a digital age, it may be better to enable students to find, analyze, evaluate and apply content than for instructors to do it for them. If most content is available elsewhere, what students will look for increasingly from their local institutions is support with their learning, rather than the delivery of content. This means directing them to appropriate sources of content, helping when students are struggling with concepts, and providing opportunities for students to apply their knowledge and to develop and practice skills. It means giving prompt and relevant feedback as and when students need it. Above all, it means creating a rich learning environment in which students can study (see Chapter 6). It means moving teaching from information transmission to knowledge management, from selecting, structuring and delivering content to learner support.

Thus for most students within their university or college (with the possible exception of the most advanced research universities) the quality of the learning support will eventually matter more than the quality of content delivery, which they can get from anywhere. This is a major challenge for instructors who see themselves primarily as content experts and deliverers.

11.5.2 Modularisation

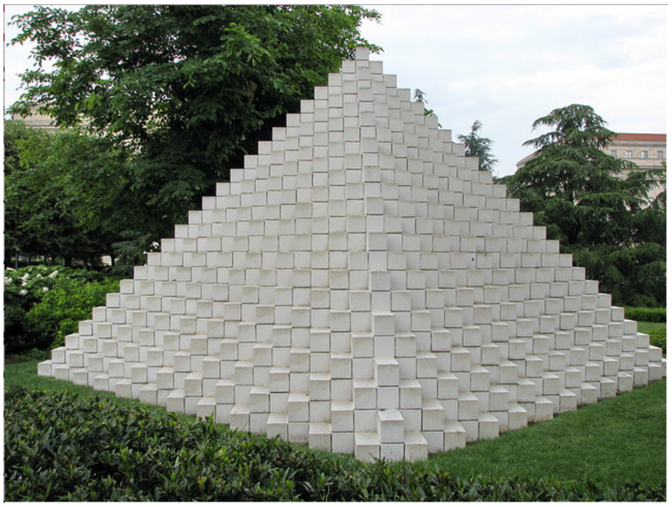


Figure 11.5.2 Four-sided pyramid, by Sol LeWitt, 1999
Image: Cliff, Flickr, © CC Attribution 2.0

The creation of open educational resources, either as small learning objects but increasingly as short 'modules' of teaching, from anywhere between five minutes to one hour of material, and the increasing diversification of markets, is beginning to result in two of the key principles of OER being applied, re-use and re-mix. In other words, the same content, available in an openly accessible digital form, may be integrated into a range of different applications, and/or combined with other OER to create a single teaching module, course or program, as in Scenario H.

Between 2015 to 2018, the Ontario government, through its online course development fund, encouraged institutions to create OER. As a result, several universities brought together faculty within their own institution but working in different departments that teach the same area of content (for example, statistics) to develop 'core' OER that can be shared between departments. The logical next step would be for statistics faculty across the Ontario system to get together and develop an integrated set of OER modules on statistics that would cover substantial parts of the statistics curriculum. Working together would have the following benefits:

- higher quality by pooling resources (two subject expert heads are better than one, combined with support from instructional designers and web producers);
- more OER than one instructor or institution could produce;
- subject coherence and lack of duplication;
- more likelihood of faculty in one institution using materials created in another if they have had input to the selection and design of the OER from other institutions.

As the range and quality of OER increases, instructors (and students) will be able to build curriculum through a set of OER 'building blocks'. The aim would be to reduce instructor time in creating materials and using their time more in supporting student learning than in delivering content. When they do create original material, it can then be shared with other instructors.

11.5.3 Disaggregation of services

Open education and digitisation enable what has tended to be offered by institutions as a complete bundle of services to be split out and offered separately, depending on the market for education and the unique needs of individual learners. These different services could be as follows:

- academic guidance (assessment of learning needs; admission counselling)
- choice of educational goals/outcomes/competencies
- access to 'open' digital content in the form of OER or MOOCs
- learner support, including a choice of
    - topic guidance (build a curriculum)
    - tutoring on demand (for example, when students are 'stuck')
    - different learning activities (tests, projects, etc.)
    - feedback on learning activities
    - assessment preparation
- assessment on demand

Learners will select and use those modules or services that best fit their needs. This is likely to be the pattern for lifelong learners in particular. Some early indications of this process are already occurring, although most of the really significant changes are yet to come.

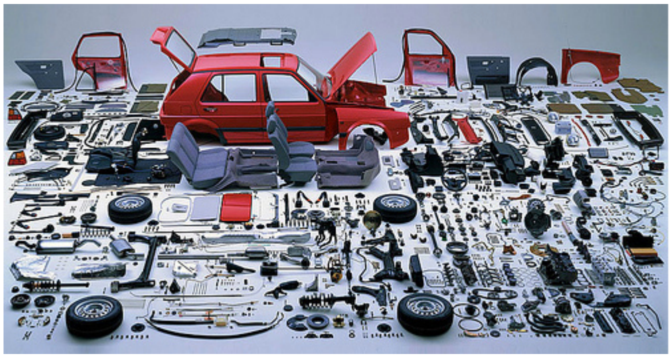


Figure 11.5.3 Disaggregation
Image: © Aaron 'tango' Tan, Flickr, CC Attribution 2.0

11.5.3.1 Admission and program counselling

This is a service already offered by Empire State University, a part of the State University of New York, through its pre-enrollment advisers. Adult learners considering a return to study or a career change can receive mentoring about what courses and combinations they can take from within the college that fit with their previous life and their future wishes. In essence, within boundaries potential students are able to design their own degree. In the future, some institutions might specialise in this kind of service at a system level.

11.5.3.2 Build a curriculum

Students could be advised on an appropriate curriculum that can be built to fit their needs. For instance, Dalhousie University's Faculty of Computer Sciences has built a tool called Daedalus which basically enables the construction of a map showing the inter-relatedness between specific learning outcomes and course content, including course sequencing (see Contact North's Pockets of Innovation for more details).

Once such a map of a degree program or other qualification or curriculum has been built, students can then navigate their own choice of courses or route through a curriculum – and perhaps negotiate what is needed for a degree. This could just as easily be based on OER as classroom teaching.

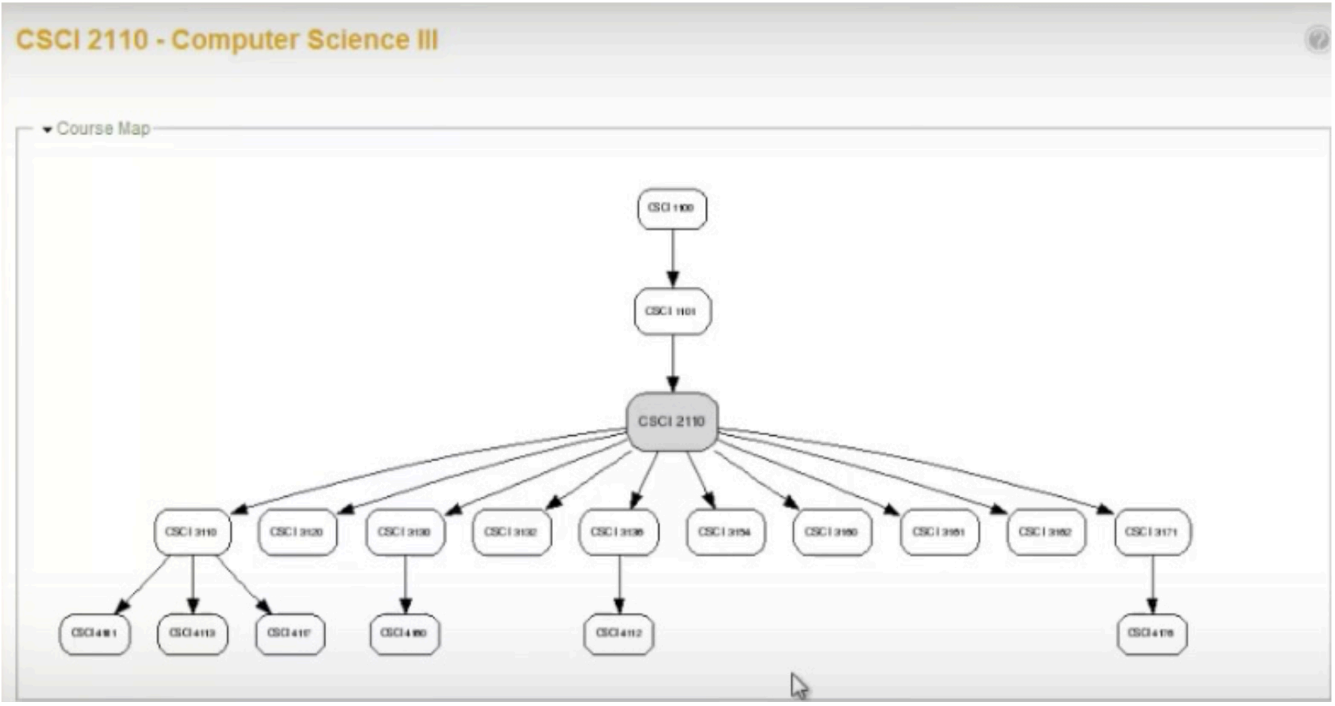


Figure 11.5.4 Daedalus. This shows the relationship between the pre-requisite courses for CSCI 2110 (below) and the courses for which CSCI 2110 is a preparation (above). By clicking on each of the courses listed, students can see the learning outcomes both needed before studying and what they should achieve after studying each course.

11.5.3.3 Learner support

Students may have already determined what they want to study through the Internet, such as a MOOC. What they are looking for is help with their studies: how to write assignments, where to look for information, feedback on their work and thinking. They are not necessarily looking for a credit, degree or other qualification, but if they are they will pay for assessment separately. Currently, students pay private tutors for this service. However, it is feasible that institutions could also provide this service, provided that a suitable business model can be built.

11.5.3.4 Assessment

Learners may feel that through prior study and work, they are able to take a challenge exam for credit. Alternatively a learner may wish to present a portfolio of work to demonstrate their knowledge and skills. All they require from the institution is a chance to be assessed. Institutions such as Western Governors' University or the Open Learning division of Thompson Rivers University are already offering this service, and this would be a logical next step for the many other universities or colleges with some form of prior learning assessment or PLAR.

11.5.3.5 'Assembled' qualifications

Learners may have acquired a range of credits, badges or certificates from a range of different institutions. The institution assesses these qualifications and experiences and helps the learner to take any further studies that are necessary, then awards the qualification. Prior learning assessment or PLAR is one step in this direction, but not the only one.

11.5.3.6 A discount on fully online courses and programs

For learners who cannot or do not want to attend campus, the course fees would be lower for online courses than for students receiving a full campus experience.

11.5.3.7 Open access to content

In this case, the learner is not looking for any qualification, but wants access to content, particularly new and emerging knowledge. MOOCs are one example, but other examples include OpenLearn and open textbooks.

11.5.3.8 The full campus experience

This would be the 'traditional' integrated package that full-time, campus-based students now receive. This would though be fully costed and much more expensive than any of the other single disaggregated services.

11.5.3.9 Funding models

Note that I have been careful not to link any of these services to a specific funding model. This is deliberate, because it could be:

- covered through privatisation, where each service is separately priced and the user pays for that service (but not for others not used);
- financed through a voucher system, whereby everyone at the age 18 is entitled to a notional amount of financial support from the state for post-secondary education, and can pay for a range of service from that voucher until their individual fund is exhausted;
- all or some services would be available for free as part of a publicly funded open education system
- a mix of the above.

Whatever the funding model, institutions disaggregating services will need to be able to price different services accurately.

11.5.3.10 The argument against disaggregation

There are also strong arguments against the disaggregation of services. Gallagher (2019) argues that the successful colleges and universities of the future will be integrated: coherently and cohesively designed to help students achieve a lifelong learning experience that is more than the sum of its parts.

However, this is not a question of either/or and should be driven to some extent by the needs of learners at different points in their learning cycle. Most younger students coming from high school probably will need an integrated college experience. However, working adults or students who have graduated may not want, need or can afford the full package. Disaggregation will provide the flexibility needed for lifelong learning.

11.5.3.11 The need for more flexibility in services

In any case, there is now an increasing diversity of learners' needs, from high school students wanting full-time education, graduate students wanting to do research, and lifelong learners, most of whom will have already passed through a publicly funded higher education system, wanting to keep learning either for vocational or personal reasons. This increasing diversity of needs requires a more flexible approach to providing educational opportunities in a digital age. Disaggregation of services and new models of funding, combined with increased accessibility to free, open content, are some ways in which this flexibility can be provided. For alternative views on this issue, see Carey, 2015; Large, 2015.

11.5.4 Conclusions

Despite all the hoopla around MOOCs, they are essentially a dead end with regard to providing learners who do not have adequate access to education with what they want: high quality qualifications. The main barrier to education is not lack of cheap content but lack of access to programs leading to credentials, either because such programs are too expensive, or because there are not enough qualified teachers, or both. Making content free is not a waste of time (if it is properly designed for secondary use), but it still needs a lot of time and effort to integrate it properly within a learning framework.

Open educational resources do have an important role to play in online education, but they need to be properly designed, and developed within a broader learning context that includes the critical activities needed to support learning, such as opportunities for student-instructor and peer interaction, and within a culture of sharing, such as consortia of equal partners and other frameworks that provide a context that encourages and supports sharing. In other words, OER need skill and hard work to make them useful, and selling them as a panacea for education does more harm than good.

Although open and flexible learning and distance education and online learning mean different things, the one thing they all have in common is an attempt to provide alternative means of high quality education or training for those who either cannot take conventional, campus-based programs, or choose not to.

Lastly, there are no insurmountable legal or technical barriers now to making educational material free. The successful use of OER does though require a particular mindset among both copyright holders – the creators of materials – and users – teachers and instructors who could use this material in their teaching. Thus the main challenge is one of cultural change.

In the end, a well-funded public higher education system remains the best way to assure access to higher education for the majority of the population. Having said that, there is enormous scope for improvements within that system. Open education and its tools offer a most promising way to bring about some much needed improvements.

11.5.5 The future is yours

This is just my interpretation of how approaches to 'open' content and resources could radically change the way we teach and how students will learn in the future. At the beginning of this chapter there is a scenario I created which suggests how this might play out in one particular program.

More importantly, there is not just one future scenario, but many. The future will be determined by a host of factors, many outside the control of teachers and instructors. But the strongest weapon we have as teachers is our own imagination and vision. Open content and open learning reflect a particular philosophy of equality and opportunity created through education. There are many different ways in which we as teachers, and even more our learners, can decide to apply that philosophy. However, the technology now offers us many more choices in making these decisions. Thus there is scope for many more scenarios that aim to extend access and educational opportunities.

References and further reading

Carey, K. (2015) *The End of College* New York: Riverhead Books

Large, L. (2015) Rebundling College *Inside Higher Ed*, April 7

Gallagher, C. (2019) *Integrative Learning for a Divided World* Baltimore ML: John Hopkins Press

Activity 11.5 Build your own scenario

1. Re-read Scenario H. Could you build a future scenario for your own courses and programs, that exploit fully the use of OER and different delivery modes?

(This will be easier and more effective if you could do this with a range of other faculty, instructional designers and web producers, through, for instance, a faculty development workshop).

Key Takeaways

1. Open educational resources offer many benefits but they need to be well designed and embedded within a rich learning environment to be effective.

2. The increasing availability of OER, open textbooks, open research and open data means that in future, almost all academic content will be open and freely accessible over the Internet.

3. As a result, students will increasingly look to institutions for learning support and help with the development of skills needed in a digital age rather than with the delivery of content. This will have major consequences for the role of teachers/instructors and the design of courses.

4. OER and other forms of open education will lead to increased modularization and disaggregation of learning services, which are needed to respond to the increasing diversity of learner needs in a digital age.

5. MOOCs are essentially a dead end with regard to providing learners who do not have adequate access to education with high quality qualifications. The main value of MOOCs is in providing opportunities for non-formal education and supporting communities of practice.

6. OER, MOOCs, open textbooks and other digital forms of open-ness are important in helping to widen access to learning opportunities, but ultimately these are enhancements rather than a replacement for a well-funded public education system, which remains the core foundation for enabling equal access to educational opportunities.

Chapter 12: Ensuring quality teaching in a digital age

Purpose of the chapter

When you have read this chapter, and in conjunction with what has been learned in previous chapters, you should be able to:

- define quality in terms of teaching in a digital age;
- determine what your preferred approaches are to teaching and learning;
- decide what mode of delivery is most appropriate for any course you are responsible for;
- understand why teamwork is essential for effective teaching in a digital age;
- make best use of existing resources for any course;
- choose and use the right technology and tools to support your learning;
- set appropriate learning goals for teaching in a digital age;
- design an appropriate course structure and set of learning activities;
- know when and how to communicate with learners;
- evaluate your teaching, make necessary improvements, and improve your teaching through further innovation.

What is covered in this chapter

- [12.12 Building a strong foundation of course design]

Also in this chapter you will find the following activities:

- Activity 12.1 Defining quality in teaching and learning
- Activity 12.2 There is no activity for this section
- Activity 12.3 Re-thinking your teaching
- Activity 12.4 Which mode of delivery?
- Activity 12. 5 There is no activity for this section
- Activity 12.6 Building on existing resources
- Activity 12.7 Mastering the technology
- Activity 12.8 Setting learning goals
- Activity 12.9 Structuring your course or program
- Activity 12.10 Communicating with your students
- Activity 12.11 Evaluating your course or program
- Activity 12.12 There is no activity for this section.

Key Takeaways

1. For the purposes of this book, quality is defined as: *teaching methods that successfully help learners develop the knowledge and skills they will require in a digital age.*

2. Formal national and institutional quality assurance processes do not guarantee quality teaching and learning. In particular, they focus on past 'best' practices, processes to be done before actual teaching, and often ignore the affective, emotional or personal aspects of learning. Nor do they focus particularly on the needs of learners in a digital age.

3. New technologies and the needs of learners in a digital age require a re-thinking of traditional campus-based teaching, especially where it is has been based mainly on the transmission of knowledge. This means re-assessing the way you teach and determining how you would really like to teach in a digital age. This requires imagination and vision rather than technical expertise.

4. It is important to determine the most appropriate mode of delivery, based on teaching philosophy, the needs of students, the demands of the discipline, and the resources available.

5. It is best to work in a team. Blended and especially fully online learning require a range of skills that most instructors are unlikely to have. Good course design not only enables students to learn better but also controls faculty workload. Courses look better with good graphic and web design and professional video production. Specialist technical help frees up instructors to concentrate on the knowledge and skills that students need to develop.

6. Full use should be made of existing resources, including institutionally-supported learning technologies, open educational resources, learning technology staff, and the experience of your colleagues.

7. The main technologies you will be using should be mastered, so you are professional and knowledgeable about their strengths and weaknesses for teaching.

8. Learning goals that are appropriate for learners in a digital age need to be set. The skills students need should be embedded within their subject domain, and these skills should be formally assessed.

9. A coherent and clearly communicable structure and learning activities for a course should be developed that are manageable in terms of workload for both students and instructor.

10. Regular and on-going instructor/teacher presence, especially when students are studying partly or wholly online, is essential for student success. This means effective communication between teacher/instructor and students. It is particularly important to encourage inter-student communication, either face-to-face or online.

11. The extent to which the new learning goals of re-designed courses aimed at developing the knowledge and skills needed in a digital age have been achieved should be carefully evaluated and ways in which the course could be improved should be identified.

12.1 What do we mean by quality when teaching in a digital age?

Figure 12.1.1 What do we mean by quality?
Image: © Wikipedia Commons

If you have followed the journey through all the previous chapters of this book, you will have been subject to a great deal of information: philosophical, empirical, technological, and administrative, set within a framework of issues related to the needs of learners in a digital age. It is now time to pull all this together into a pragmatic set of action steps that will enable you to apply these ideas and concepts within the everyday circumstances of teaching.

Thus the aim of this chapter is to provide some practical guidelines for teachers and instructors to ensure quality teaching in a digital age. This will mean drawing on all the previous chapters in this book, so there will inevitably be some repetition in this chapter of the content of earlier chapters. They aim here is to pull it all together towards developing quality digitally-based courses and programs fit for a digital age.

. Before I do this, however, it is necessary to clarify what is meant by 'quality' in teaching and learning, because I am using 'quality' here in a very specific way.

12.1.1 Definitions

Probably there is no other topic in education which generates so much discussion and controversy as 'quality'. Many books have been written on the topic, but I will cut to the chase and give my definition of quality up-front. For the purposes of this book, quality is defined as:

> *teaching methods that successfully help learners develop the knowledge and skills they will require in a digital age.*

This of course is my short answer to the question of what is quality. A longer answer means looking, at least briefly, at:

- institutional and degree accreditation;
- internal (academic) quality assurance processes;
- differences in quality assurance between traditional classroom teaching and online and distance education;
- the relationship between quality assurance processes and learning outcomes;
- 'quality assurance fit for purpose': meeting the goals of education in a digital age.

This will then provide the foundations for my recommendations for quality teaching that will follow in this chapter.

12.1.2 Institutional and degree accreditation

Most governments act to protect consumers in the education market by ensuring that institutions are properly accredited and the qualifications they award are valid and are recognised as of being of 'quality.' However, the manner in which institutions and degrees are accredited varies a great deal. The main difference is between the USA and virtually any other country.

The U.S. Department of Education's Network for Education Information states in its description of accreditation and quality assurance in the USA:

> *Accreditation is the process used in U.S. education to ensure that schools, postsecondary institutions, and other education providers meet, and maintain, minimum standards of quality and integrity regarding academics, administration, and related services. It is a voluntary process based on the principle of academic self-governance. Schools, postsecondary institutions and programs (faculties) within institutions participate in accreditation. The entities which conduct accreditation are associations comprised of institutions and academic specialists in specific subjects, who establish and enforce standards of membership and procedures for conducting the accreditation process.*

> *Both the federal and state governments recognize accreditation as the mechanism by which*

institutional and programmatic legitimacy are ensured. In international terms, accreditation by a recognized accrediting authority is accepted as the U.S. equivalent of other countries' ministerial recognition of institutions belonging to national education systems.

In other words, in the USA, accreditation and quality assurance is effectively self-regulated by the educational institutions through their control of accreditation agencies, although the government does have some 'weapons of enforcement', mainly through the withdrawal of student financial aid for students at any institution that the U.S. Department of Education deems to be failing to meet standards.

In many other countries, government has the ultimate authority to accredit institutions and approve degrees, although in countries such as Canada and the United Kingdom, this too is often exercised by arm's length agencies appointed by government, but consisting mainly of representatives from the various institutions within the system. These bodies have a variety of names, but Degree Quality Assurance Board is a typical title. However, in recent years, some regulatory agencies such as the United Kingdom's Quality Assurance Agency for Higher Education have adopted formal quality assurance processes based on practices that originated in industry. The U.K. QAA's revised Quality Code for Higher Education is set out below:

The UK Quality Code

Expectations for standards		Expectations for quality	
The academic standards of courses meet the requirements of the relevant national qualifications framework. The value of qualifications awarded to students at the point of qualification and over time is in line with sector-recognised standards.		Courses are well-designed, provide a high-quality academic experience for all students and enable a student's achievement to be reliably assessed. From admission through to completion, all students are provided with the support that they need to succeed in and benefit from higher education.	
Core practices	**Common practices**	**Core practices**	**Common practices**
The provider ensures that the threshold standards for its qualifications are consistent with the relevant national qualifications frameworks. The provider ensures that students who are awarded qualifications have the opportunity to achieve standards beyond the threshold level that are reasonably comparable with those achieved in other UK providers. Where a provider works in partnership with other organisations, it has in place effective arrangements to ensure that the standards of its awards are credible and secure irrespective of where or how courses are delivered or who delivers them. The provider uses external expertise, assessment and classification processes that are reliable, fair and transparent.	The provider reviews its core practices for standards regularly and uses the outcomes to drive improvement and enhancement.	The provider has a reliable, fair and inclusive admissions system. The provider designs and/or delivers high-quality courses. The provider has sufficient appropriately qualified and skilled staff to deliver a high-quality academic experience. The provider has sufficient and appropriate facilities, learning resources and student support services to deliver a high-quality academic experience. The provider actively engages students, individually and collectively, in the quality of their educational experience. The provider has fair and transparent procedures for handling complaints and appeals which are accessible to all students. Where the provider offers research degrees, it delivers these in appropriate and supportive research environments. Where a provider works in partnership with other organisations, it has in place effective arrangements to ensure that the academic experience is high-quality irrespective of where or how courses are delivered and who delivers them. The provider supports all students to achieve successful academic and professional outcomes.	The provider reviews its core practices for quality regularly and uses the outcomes to drive improvement and enhancement. The provider's approach to managing quality takes account of external expertise. The provider engages students individually and collectively in the development, assurance and enhancement of the quality of their educational experience.

Figure 12.1.2 The UK Higher Education Quality Code (accessed September, 2019)

However, although hardly contentious, such system-wide codes are too general for the specifics of ensuring quality in a particular course. Many institutions as a result of pressure from external agencies have therefore put in place formal quality assurance processes over and beyond the normal academic approval processes (see Clarke-Okah and Daniel, 2010, for a typical, low-cost example).

12.1.3 Internal quality assurance

It can be seen then that the internal processes for ensuring quality programs within an institution are particularly important. Although again the process can vary considerably between institutions, at least in universities the process is fairly standard.

12.1.3.1 Assuring the quality of a program

A proposal for a new degree will usually originate from a group of faculty/instructors within a department. The proposal will be discussed and amended at departmental and/or Faculty meetings, then once approved will go to the university senate for final approval. The administration in the form of the Provost's Office will usually be involved, particularly where resources, such as new appointments, are required.

Although this is probably an over-generalisation, significantly the proposal will contain information about who will teach the course and their qualifications to teach it, the content to be covered within the program (often as a list of courses with short descriptions), a set of required readings, and usually something about how students will be assessed. Increasingly, such proposals may also include broad learning outcomes for the program.

If there is a proposal for courses within a program or the whole program to be delivered fully online, it is likely that the proposal will come under greater internal scrutiny. What is unlikely to be included in a proposal though is what *methods* of teaching will be used. This is usually considered the responsibility of individual faculty members or the individual teacher (unless you are an adjunct or contract instructor). It is this aspect of quality – the effectiveness of the teaching method or learning environment for developing the knowledge and skills in a digital age – with which this chapter is concerned.

12.1.3.2 Assuring the quality of classroom teaching

There are many guidelines for quality traditional classroom teaching. Perhaps the most well known are those of Chickering and Gamson (1987), based on an analysis of 50 years of research into best practices in teaching. They argue that good practice in undergraduate education:

1. Encourages contact between students and faculty.
2. Develops reciprocity and cooperation among students.
3. Encourages active learning.
4. Gives prompt feedback.
5. Emphasizes time on task.
6. Communicates high expectations.

7. Respects diverse talents and ways of learning.

However, these standards should apply equally to both face-to-face and online teaching.

12.1.3.3 Quality in online courses and programs

Because online learning was new and hence open to concern about its quality, there have also been many guidelines, best practices and quality assurance criteria created and applied to online programming. All these guidelines and procedures have been derived from the experience of previously successful online programs, best practices in teaching and learning, and research and evaluation of online teaching and learning. A comprehensive list of online quality assurance standards, organizations and research on online learning can be found in Appendix 2.

Jung and Latchem (2012), in a review of quality assessment processes in a large number of online and distance education institutions around the world, make the following important points about quality assurance processes for online and distance education within institutions:

- focus on outcomes as the leading measure of quality;
- take a systemic approach to quality assurance;
- see QA as a process of continuous improvement;
- move the institution from external controls to an internal culture of quality;
- poor quality has very high costs so investment in quality is worthwhile.

Ensuring quality in online learning is not rocket science. There is no need to build a bureaucracy around this, but there does need to be some mechanism, some way of monitoring instructors or institutions when they fail to meet these standards. However, we should also do the same for campus-based teaching. As more and more already accredited (and 'high quality') campus-based institutions start moving into hybrid learning, the establishment of quality in the online learning elements of programs will become even more important.

12.1.4 Consistency in applying quality standards

There are plenty of evidence-based guidelines for ensuring quality in teaching, both face-to-face and online. The main challenge then is to ensure that teachers and instructors are aware of these best practices and that institutions have processes in place to ensure that guidelines for quality teaching are implemented and followed.

Quality assurance methods are valuable for agencies concerned about rogue private providers, or institutions using online learning to cut corners or reduce costs without maintaining standards (for instance, by hiring untrained adjuncts, and giving them an unacceptably high teacher-student ratio to manage). QA methods can be useful for providing instructors new to teaching with technology, or struggling with its use, with models of best practice to follow. But for any reputable state university or college, the same quality assurance standards should apply equally to face-to-face and online teaching, even if slightly adjusted for the difference in delivery method.

12.1.5 Quality assurance, innovation and learning outcomes

Most QA processes are front-loaded, in that they focus on inputs – such as the academic qualifications of faculty, or the processes to be adopted for effective teaching, such as clear learning objectives, or systems-based course design methods, such as ADDIE – rather than outputs, such as what students have actually learned. QA processes also tend to be backward-looking, that is, they focus on *past* best practices.

This needs to be considered especially when evaluating new teaching approaches. Butcher and Hoosen (2014) state:

> *The quality assurance of post-traditional higher education is not straightforward, because openness and flexibility are primary characteristics of these new approaches, whereas traditional approaches to quality assurance were designed for teaching and learning within more tightly structured frameworks.*

However, Butcher and Hoosen (2014) go on to say that:

> *fundamental judgements about quality should not depend on whether education is provided in a traditional or post-traditional manner …the growth of openness is unlikely to demand major changes to quality assurance practices in institutions. The principles of good quality higher education have not changed…. Quality distance education is a sub-set of quality education…Distance education should be subject to the same quality assurance mechanisms as education generally.'*

Such arguments though offer a particular challenge for teaching in a digital age, where learning outcomes need to include the development of skills such as independent learning, facility in using social media for communication, and knowledge management, skills that have often not been explicitly identified in the past. Quality assurance processes are not usually tied to specific types of learning outcomes, but are more closely linked to general performance measures such as course completion rates, time to degree completion, or grades based on past learning goals.

Furthermore, we have already seen in Chapters 9, 10 and 11 that new media and new methods of teaching are emerging that have not been around long enough to be subject to analysis of best practices. A too rigid view of quality assessment based on past practices could have serious negative implications for innovation in teaching and for meeting newly emerging learning needs. 'Best practice' may need occasionally to be challenged, so new approaches can be experimented with and evaluated.

12.1.6 Getting to the essence of quality

Institutional accreditation, internal procedures for program approval and review, and formal quality assurance processes, while important, particularly for external accountability, do not really get to the heart of what quality is in teaching and learning. They are rather like the pomp and circumstance of state occasions. The changing of the guard in front of the palace is ceremonial, rather than a practical defence against revolution, invasion or a terrorist attack on the President or the monarchy. As important as ceremonies and rituals are to national identity, a strong state is bound by deeper ties. Similarly, an effective school, college or university is much more than the administrative processes that regulate teaching and learning.

At its worst, quality management can end up with many boxes on a questionnaire being ticked, in that the management processes are all in place, without in fact investigating whether students are really learning more or better as a result of using technology. In essence, teaching and learning are very human activities, often requiring for success a strong bond between teacher and learner. There is a powerful affective or motivational aspect of learning, which a 'good' teacher can tap into and steer.

One reason for the concern of many teachers and instructors about using technology for teaching is that it will be difficult or even impossible to develop that emotional bond that helps see a learner through difficulties or inspires someone to greater heights of understanding or passion for the subject. However, technology is now flexible and powerful enough, when properly managed, to enable such bonds to be developed, not only between teacher and learner, but also between learners themselves, even though they may never meet in person.

Thus any discussion of quality in education needs to recognise and accommodate these affective or emotional aspects of learning. This is a factor that is too often ignored in behaviourist approaches to the use of technology or to quality assurance. Consequently, in what follows in this chapter, as well as incorporating best practices in technical terms, the more human aspects of teaching and learning are considered, even or especially within technology-based learning environments.

12.1.7 Quality assurance: fit for purpose in a digital age

At the end of the day, the best guarantees of quality in teaching and learning fit for a digital age are:

- well-qualified subject experts also well trained in both teaching methods and the use of technology for teaching;
- highly qualified and professional learning technology support staff;
- adequate resources, including appropriate teacher/student ratios;
- appropriate methods of working (teamwork, project management);
- systematic evaluation leading to continuous improvement.

Much more attention needs to be directed at what campus-based institutions are doing when they move to hybrid or online learning. Are they following best practices, or even better, developing innovative, better teaching methods that exploit the strengths of both classroom and online learning? The design of xMOOCs and the high drop-out rates in the USA of many two year colleges new to online learning suggest they are not.

If the goal or purpose is to develop the knowledge and skills that learners will need in a digital age, then this is the 'standard' by which quality should be assessed, while at the same time taking into account what we already know about general best practices in teaching. The recommendations for quality teaching in a digital age that follow in this chapter are based on this key principle of 'fit for purpose'.

References and further reading

Butcher, N. and Hoosen, S. (2014) A Guide to Quality in Post-traditional Online Higher Education Dallas TX: Academic Partnerships

Chickering, A., and Gamson, Z. (1987) 'Seven Principles for Good Practice in Undergraduate Education' *Washington Center News* (originally published in *AAHE Bulletin*, March 1987)

Clarke-Okah, W. and Daniel, J. (2010) *The Commonwealth of Learning: Review and Improvement Model* Burnaby BC: Commonwealth of Learning

Jung, I. and Latchem, C. (2012) Quality Assurance and Accreditation in Distance Education and e-Learning New York/London: Routledge

Activity 12.1 Defining quality in teaching and learning

What do you think of the current system of

- institutional accreditation and
- internal quality assurance processes?

Do these current processes guarantee quality in teaching and learning for a digital age? If not, why not?

12.2 Nine steps to quality teaching in a digital age

Figure 12.2.1 Stepping stones, Dovedale, UK Image: Tony Bates

In the previous section, I pointed out that there are lots of excellent quality assurance standards, organizations and research available online, and I'm not going to duplicate these. Instead, I'm going to suggest a series of practical steps towards *implementing* such standards.

12.2.1 An alternative to using the ADDIE model to assure quality

I am assuming that all the standard institutional processes towards program approval have been taken, although it is worth pointing out that it might be worth thinking through my nine steps outlined below before finally submitting a proposal for a new blended or online course or program. My nine steps approach would also work when considering the redesign of an existing course.

The 'standard' quality practice for developing a fully online course would be to develop a systems approach to design through something like the ADDIE model (see Chapter 4, Section 3). Puzziferro and Shelton (2008) provide an excellent example.

However, I have already pointed to some of the limitations of a systems approach in the volatile, uncertain, chaotic and ambiguous digital age (Chapter 4, Section 7), and in any case, I think we need a process that works not only for fully online courses but also for face-to-face, blended and hybrid courses and programs. So I am aiming for a more flexible but still systematic approach to quality course design, but broad enough to include a wide range of delivery methods. To get a sense of the difference in my approach to a 'standard' systems model, the ADDIE model wouldn't kick in until around Step 6 below.

Furthermore, it is not enough just to look at the actual teaching of the course, but also at building a complete learning environment in which the learning will take place (see Chapter 6). So to provide a quality framework, I will outline nine steps, although they are more likely to be developed in parallel than sequentially. Nevertheless there is a logic to the order.

1. Step 1: Decide how you want to teach
2. Step 2: Decide on mode of delivery
3. Step 3: Work in a Team
4. Step 4: Build on existing resources
5. Step 5: Master the technology
6. Step 6: Set appropriate learning goals
7. Step 7: Design course structure and learning activities
8. Step 8: Communicate, communicate, communicate
9. Step 9: Evaluate and innovate

These steps will draw on material from earlier in this book. Indeed, if you have been doing the activities thoroughly, you may already be able to answer the questions raised as you work through each of the nine steps.

Reference

Puzziferro, M., & Shelton, K. (2008). A model for developing high-quality online courses: Integrating a systems approach with learning theory *Journal of Asynchronous Learning Networks*, Vol. 12, Nos. 3-4

12.3 Step One: Decide how you want to teach

12.3.1 How do I want to teach?
Image: Remix © by Tony Bates, 2010: original photos: UBC Library

Of all the nine steps, this is the most important, and, for most instructors, the most challenging, as it may mean changing long established patterns of behaviour.

12.3.1 How would I really like to teach this course?

This question asks you to consider your basic teaching philosophy. What is my role as an instructor? Do I take an objectivist view, that knowledge is finite and defined, that I am an expert in the subject matter who knows more than the students, and thus my job is to ensure that I transfer as effectively as possible that information or knowledge to the student? Or do I see learning as individual development where my role is to help learners to acquire the ability to question, analyse and apply information or knowledge?

Do I see myself more as a guide or facilitator of learning for students? Or maybe you would like to teach in the latter way, but you are faced in classroom teaching with a class of 200 students which forces you to fall back on a more didactic form of teaching. Or maybe you would like to combine both approaches but can't because of the restrictions of timetables and curriculum.

Chapters 2, 3 and 4 set out some of the choices available to you in deciding how you want to teach, in terms of overall philosophy.

12.3.2 What's wrong with the way I'm teaching at the moment?

Another place to start would be by thinking about what you don't like about the current course(s) you are teaching. Is there too much content to be covered? Could you deal with this in another way, perhaps by getting students to find, analyse and apply content to solve problems or do research? Could you focus more on skills in this context? If so, how could you provide appropriate activities to enable students to practice these skills? How much of this could they do on their own, so you can manage your workload better?

Are the students too diverse, in that some students really struggle while others are impatient to move ahead? How could I make the teaching more personalised, so that students at all levels of ability could succeed in this course? Could I organise my teaching so that students who struggle can spend more time on task, or those that are racing ahead have more advanced work to do?

Or perhaps you are not getting enough discussion or critical thinking because the class is too large. Could you use technology and re-organise the class differently to get students studying in small groups, but in such a way you can monitor and guide the discussions? Can you break the work up into chunks that the students should be able to do on their own, such as mastering the content, so you can focus on discussion and critical thinking with students when they come to class?

For instance, by moving a great deal of the content online, maybe you can free up more time for interaction with students, in large or smaller groups, either in class or online, and at the same time reduce the number of lectures to large classes. Some instructors have redesigned large lecture classes of 200 students, by breaking down the class into 10 groups, moving much of the lecture material online, and then the instructor spends at least one week with each of the 10 groups in online discussion, interaction and group activities, thus getting more interaction with all the students.

In another context, do you feel restricted by the limitations of what can be done in labs or workshops, because of the time it takes to set up experiments or equipment, or because students don't really have enough hands-on time? Could I re-organise the teaching so that students do a lot of preparation online, so they can concentrate in the lab or workshop on what they have to do by hand. Could they report on their lab or workshop experiences afterwards, online, through an e-portfolio, for instance? Can I find good open educational resources, such as video or simulations, that would reduce the need for lab time? Or could I create good quality demonstration videos, so I can spend more time talking with students about the implications?

Finally, are you just overloaded with work on this course, because there are too many student questions to be answered, or too many assignments to mark? How could you re-organise the course to manage your work-load more easily? Could students do more by working together and helping each other? if so, how would you create groups that might meet this goal? Could you change the nature of the assignments so that students do more project work, and slowly build e-portfolios of their work during the course so you can more easily monitor their progress, while at the same time building up an assessment of their learning?

12.3.3 Use technology to re-think your teaching

Considering using new technologies or an alternative delivery method will give you an opportunity to rethink your teaching, perhaps to be able to tackle some of the limitations of classroom teaching, and to renew your approach to teaching. One way to help you rethink how you want to teach is to think of how you could build a rich learning environment for the course (see Chapter 6).

Using technology or moving part or all of your course online opens up a range of possibilities for teaching that may not be possible in the confines of a scheduled three credit weekly semester of lectures (see Chapter 4). It may mean not doing everything online, but focusing the campus experience on what can only be done on campus. Alternatively, it may enable you to totally rethink the curriculum, to exploit some of the benefits of online learning, such as getting students to find, analyse and apply information for themselves.

Thus if you are thinking about a new course, or redesigning one that you are not too happy with, take the opportunity before you start teaching the course or program to think about how you'd really like to be teaching, and whether this can be accommodated in a different learning environment. It's not a decision you have to make immediately though. As you work through the nine steps, it will become easier to make this decision. The important point is to be open to doing things differently.

Chapter 4 and Chapters 10 and 11 suggest a variety of approaches to teaching that might fit with the answers to some of these questions.

12.3.4 What NOT to do

However, you can be sure of one thing. If you merely put your lecture notes up on the web, or record your 50 minute lectures for downloading, then you are almost certain to have lower student completion rates and poorer grades than for your face-to-face class. I make this point because it is tempting for face-to-face instructors merely to move their method of classroom teaching online, such as using lecture capture for students to download recorded classroom lectures at home, or using web conferencing to deliver live lectures over the internet. However there is much evidence to suggest that doing this does not lead to good results (see for instance, Figlio, Rush and Yin, 2010).

The problem with just moving lectures online is that it fails to take account of a key requirement for most online learners: flexibility. When students are studying online, their needs are different from when they are in class. Restricted 'office hours' when the instructor is available for students do not provide the flexibility of contact that students need when working online. Students tend to work in smaller chunks of time when studying online, in several short bursts, and rarely more than an hour without a break. Online work then needs to be broken up into manageable 'chunks.' A synchronous web cast may be scheduled at times when online students are working. More importantly, online learning allows us to deliver content or information in ways that lead to better learning than through a one hour lecture.

Thus it is important to *design* teaching in such a way that it best suits the different modes of learning that students will use. Fortunately, there has been a lot of experience and research that have identified the key design principles for both classroom and online teaching. This is what the next eight steps are about.

12.3.5 A chance to fly

Technologies and new modes of delivery open up wonderful opportunities to rethink completely the teaching process. Teachers and instructors with deep knowledge of their subject can now find many unique and exciting ways to open up their teaching and to integrate their research into their teaching. The main restriction now is not time nor money, but lack of imagination. Those with the imagination will be able to fly into previously unthinkable ways of teaching their subject.

Reference

Figlio, D., Rush, N. and Yin, L. (2010) *Is it Live or is it Internet? Experimental Estimates of the Effects of Online Instruction on Student Learning* Cambridge MA: National Bureau of Economic Research

Activity 12.3 Re-thinking your teaching

1. Can you write down your philosophy of teaching – how you'd really like to teach your subject, if you weren't constrained?

2. What are the main problems you are facing at the moment with your classroom teaching?

3. Now think whether, by moving a course online, you could teach in new ways that better fit your philosophy of teaching, with the increased flexibility of access and the resources available through the Internet. What would your teaching approach now look like?

There is no feedback provided for this activity: it is for your reflection.

12.4 Step two: what kind of course or program?

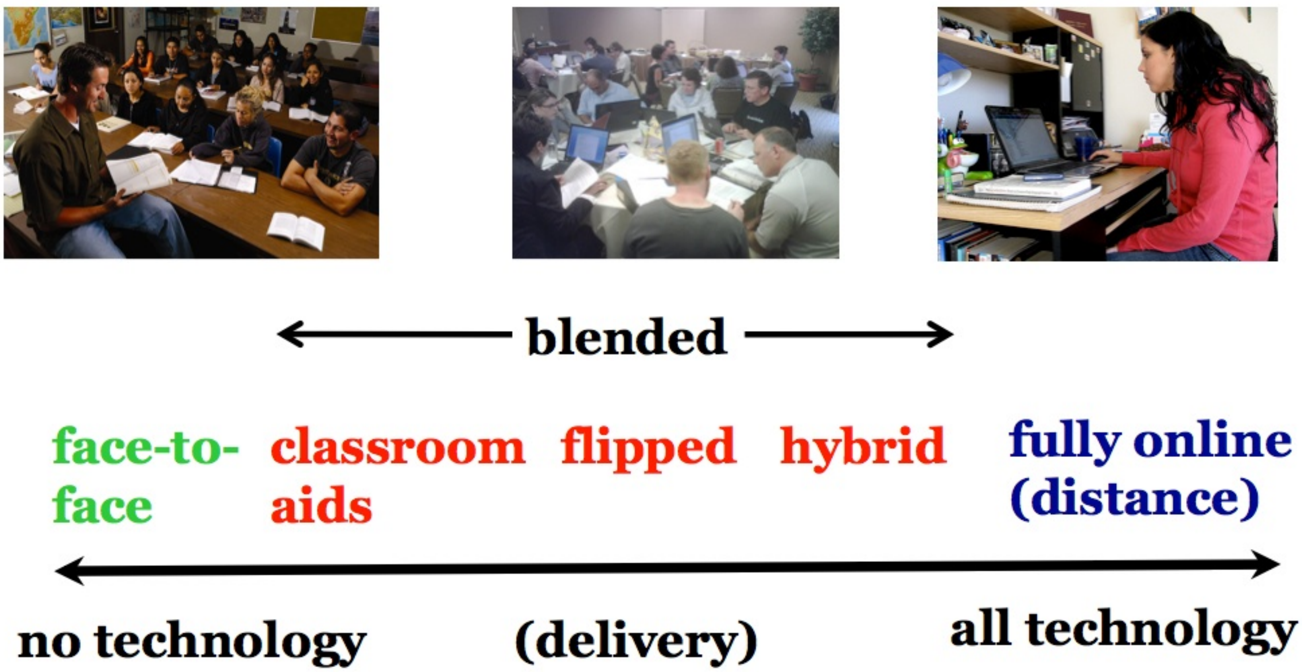


Figure 12.4.1 The continuum of technology-based teaching (from Chapter 10)

12.4.1 Choosing mode of delivery

Determining what kind of course in terms of the mix of face-to-face and online teaching is the natural next step after considering how you want to teach a course. This topic has been dealt with extensively in Chapter 10, so to summarise, there are four factors or variables to take into account when deciding what 'mix' of face-to-face and online learning will be best for your course:

- your preferred teaching philosophy – how you like to teach (see Step 1)
- the needs of the students (or potential students)
- the demands of the discipline
- the resources available to you.

Although an analysis of all the factors is an essential set of steps to take in making this decision, in the end it will come down to a mainly intuitive decision, taking into account all the factors. This becomes particularly important when looking at a program as a whole.

12.4.2 Who should make the decision?

While individual instructors should be heavily involved in deciding the best mix of online and face-to-face teaching in their specific course, it is worth thinking about this on a program rather than an individual course basis. For instance, if we see the development of independent learning skills as a key program outcome, then it might make sense to start in the first year with mainly face-to-face classes, but gradually over the length of the program introduce students to more and more online learning, so that the end of a four year degree they are able and willing to take some of their courses fully online.

Certainly every program should have a mechanism for deciding not only the content and skills or the curriculum to be covered in a program, but also how the program will be delivered, and hence the balance or mix of online and face-to-face teaching throughout the program. This should become integrated into an annual academic planning process that looks at both methods of teaching as well as content to be covered in the program (see Bates and Sangrà, 2011).

Reference

Bates, A. and Sangrà, A. (2011) *Managing Technology in Higher Education* San Francisco: Jossey–Bass/John Wiley and Co

Activity 12.3 Which mode of delivery?

If you did not do Activities 10.2, 10.3, 10.4, go back and do them now.

If you have done these activities, review your answers in terms of deciding on the best mix of face-to-face and online teaching for your course.

There is no feedback provided for this activity.

12.5 Step three: work in a team

Figure 12.5.1 Work in a team

One of the strongest means of ensuring quality is to work as a team. This is addressed at several points in the book, such as Chapter 9, Section 7, Chapter 10, Section 4, and Chapter 13, Sections 3 and 5.

12.5.1 Why work in a team?

For many teachers and instructors, classroom teaching is an individual, largely private activity between the instructor and students. Teaching is a very personal affair. However, blended and especially fully online learning are different from classroom teaching. They require a range of skills that most teachers and instructors, and particularly those new to online teaching, are unlikely to have, at a least in a developed, ready-to-use form.

The way an instructor interacts online has to be organized differently from in class, and particular attention has to be paid to providing appropriate online activities for students, and to structuring content in ways that facilitate learning in an asynchronous online environment. Good course design is essential to achieve quality in terms of developing the knowledge and skills needed in a digital age. These are pedagogical issues, in which most post-secondary instructors have had little training. In addition, there are also technology issues. Novice teachers and instructors are likely to need help in developing graphics or video materials, for example.

Another reason to work in a team is to manage workload. There is a range of technological activities that are not normally required of classroom teachers and instructors. Just managing the technology will be extra work if instructors do it all themselves. Also, if the online component of a course is not well designed or integrated with the face-to-face component, if students are not clear what they should do, or if the material is presented in ways that are difficult to understand, the teacher or instructor will be overwhelmed with student e-mail. Instructional designers, who work across different courses, and who have training in both course design and technology, can be an invaluable resource for novices teaching online for the first time.

Thirdly working with colleagues in the same department who are more experienced in online learning can be a very good means to get quickly to a high quality online standard, and again can save time. For instance, in one university I worked in, three faculty members in the same department were developing different courses with online components. However, these courses often needed graphics of the same equipment discussed in all three courses. The three instructors got together, and worked with a graphic designer to create high quality graphics that were shared between all three instructors. This also resulted in discussions about overlap and how best to make sure there was better integration and consistency between the three courses. They could do this with their online courses more easily than with the classroom courses, because the online course materials can be more easily shared and observed.

Lastly, especially where large lecture classes are being re-designed, there may be a cohort of teaching assistants that may need to be trained, organised and managed. In some institutions, part-time adjunct faculty will also need to be involved. This means clarifying roles for the senior faculty member, the adjunct or contract faculty, the teaching assistants, and the learning technology support staff.

For many teachers and instructors, developing teaching in a team is a big cultural shift. However, the benefits of doing this for online or blended learning are well worth the effort. As teachers and instructors become more experienced in blended and online learning, there is less need for the help of an instructional designer, but many experienced instructors now prefer to continue working in a team, because it makes life so much easier for them.

12.5.2 Who is in the team?

This will depend to some extent on the size of the course. In most cases, for a blended or online course with one main faculty member or subject expert, and a manageable number of students, the instructor will normally work with an instructional designer, who in turn can call on more specialist staff, such as a web or graphic designer or a media producer, as needed.

If however it is a course with many students and several instructors, adjunct faculty and/or teaching assistants, then they should all work together as a team, with the instructional designer. Also in some institutions a librarian is an important member of the team, helping identify resources, dealing with copyright issues and ensuring that the library is able to respond to learners' needs when the course is being offered.

12.5.3 What about academic freedom? Do I lose it working in a team?

No. The instructor(s) will always have final say over content and how it is to be taught. Instructional designers are advisers but responsibility for the content of the course, the way it is taught, and assessment methods always remains with the faculty member.

However, instructional and media producers should not be treated as servants, but as professionals with specialized skills. They should be respected and listened to. Often the instructional designer will have more experience of what will work and what will not in blended or online learning. Surgeons work with anaesthetists and nurses, and trust them to do their jobs properly. The working relationship between instructors and instructional designers and media producers should be similar.

12.5.4 Conclusion

Working in a team makes life a lot easier for instructors when teaching blended or online courses. Good course design, which is the area of expertise of the instructional designer, not only enables students to learn better but also controls faculty workload. Courses look better with good graphic and web design and professional video production. Specialist technical help frees up instructors to concentrate on teaching and learning. What's not to like?

This of course will depend heavily on the institution providing such support through a centre of teaching and learning. Nevertheless this is an important decision that needs to be implemented before course design begins.

Activity 12.5 Working in a team

There is no activity for this section.

12.6 Step four: build on existing resources

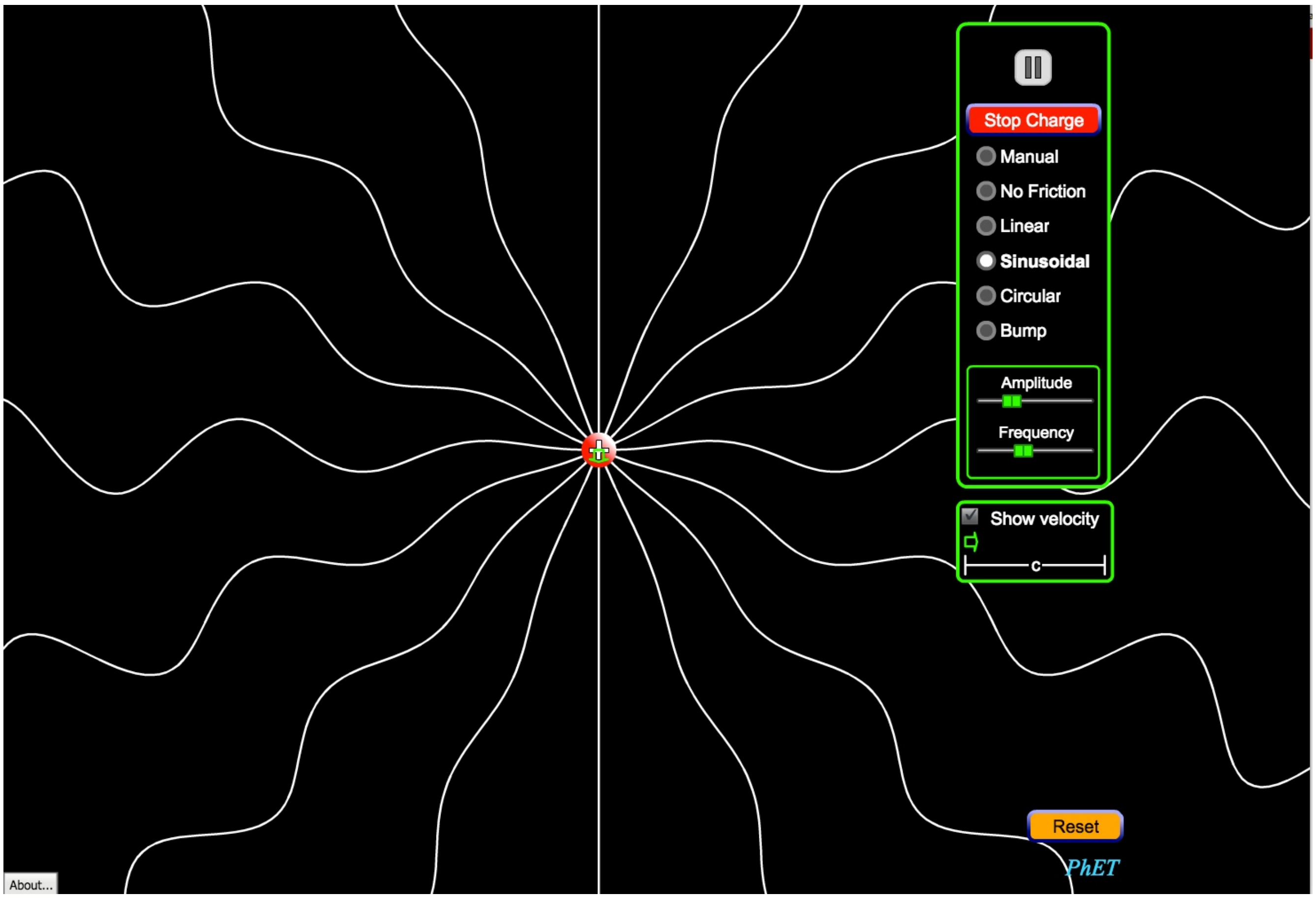


Figure 12.6.1 Radiating charge simulation, phET: click on image to run simulation
Image: © University of Colorado-Boulder

The importance of using existing resources has been stressed in several parts of the book, particularly Chapters 8 and 11.

12.6.1 Moving content online

Time management for teachers and instructors is critical. A great deal of time can be spent converting classroom material into a form that will work in an online environment, but this can really increase workload. For instance, PowerPoint slides without a commentary often either miss the critical content, or fail to cover nuances and emphasis. This may mean either using lecture capture to record the lecture, or having to add a recorded commentary over the slides at a later date. Transferring lecture notes into pdf files and loading them up into a learning management system is also time consuming. However, this is not the best way to develop online materials, both for time management and pedagogical reasons.

In Step 1 I recommended rethinking teaching, not just moving recorded lectures or class PowerPoint slides online, but developing materials in ways that enable students to learn better. Now in Step 4 I appear to be contradicting that by suggesting that you should use existing resources. However, the distinction here is between using existing resources that do not transfer well to an online learning environment (such as a 50 minute recorded lecture), and using materials already specifically developed or suitable for learning in an online environment.

12.6.2 Use existing online content

The Internet, and in particular the World Wide Web, has an immense amount of content already available, and this was discussed extensively in Chapter 11. Much of it is freely available for educational use, under certain conditions (e.g. acknowledgement of the source – look for the Creative Commons license usually at the end of the web page). You will find such existing content varies enormously in quality and range. Top universities such as MIT, Stanford, Princeton and Yale have made available recordings of their classroom lectures , etc., while distance teaching organizations such as the UK Open University have made all their online teaching materials available for free use. Much of this can be found at these sites:

- OpenCourseWare (MIT)
- iTunesU
- OpenLearn (U.K. Open University)
- The Open Education Consortium (courses in STEM: science, technology, engineering, math)
- Open Learning Initiative (Carnegie Mellon)
- MERLOT

However, there are now many other sites from prestigious universities offering open course ware. (A Google search using 'open educational resources' or' OER' will identify most of them.)

In the case of the prestigious universities, you can be sure about the quality of the content – it's usually what the on-campus students get – but it often lacks the quality needed in terms of instructional design or suitability for online learning (for more discussion on this see Hampson (2015); or OERs: The Good, the Bad and the Ugly). Open resources from institutions such as the UK Open University or Carnegie Mellon's Open Learn Initiative usually combine quality content with good instructional design.

Where open educational resources are particularly valuable are in their use as interactive simulations, animations or videos that would be difficult or too expensive for an individual instructor to develop. Examples of simulations in science subjects such as biology and physics can be found here: PhET, or at the Khan Academy for mathematics, but there are many other sources as well.

But as well as open resources designated as 'educational', there is a great deal of 'raw' content on the Internet that can be invaluable for teaching. The main question is whether you as the instructor need to find such material, or whether it would be better to get students to search, find, select, analyze, evaluate and apply information. After all, these are key skills for a digital age that students need to have.

Certainly at k-12, two-year college or undergraduate level, most content is not unique or original.

Most of the time we are standing on the shoulders of giants, that is, organizing and managing knowledge already discovered. Only in the areas where you have unique, original research that is not yet published, or where you have your own 'spin' on content, is it really necessary to create 'content' from scratch. Unfortunately, though, it can still be difficult to find exactly the material you want, at least in a form that would be appropriate for your students. In such cases, then it will be necessary to develop your own materials, and this is discussed further in Step 7. However, building a course around already existing materials will make a lot of sense in many contexts.

12.6.3 Conclusion

You have a choice of focusing on content development or on facilitating learning. As time goes on, more and more of the content within your courses will be freely available from other sources over the Internet. This is an opportunity to focus on what students need to know, and on how they can find, evaluate and apply it. These are skills that will continue well beyond the memorisation of content that students gain from a particular course. So it is important to focus just as much on student activities, what they need to do, as on creating original content for our courses. This is discussed in more detail in Steps 6, 7 and 8.

So a critical step before even beginning to teach a course is look around and see what's available and how this could potentially be used in the course or program you are planning to teach.

References

Hampson, K. (2015) Masterclass & MOOCs: Notes on the Role of Production Value in Online Learning *The Synapse*, July 31

Activity 12.6 Building on existing resources

1. How original is the content you are teaching? Could students learn just as well from already existing content? If not, what is the 'extra' you are adding? How will you incorporate the added value of your own contribution in your course design?

2. Does the content you are already thinking of covering already exist on the web? Have you looked to see what's already there? What if any are the restrictions on its re-use for educational purposes?

3. What are your colleagues doing online – or indeed in the classroom, with respect to digital teaching? Could you work together to jointly develop and/or share materials?

If you feel that your course is currently too much work, then maybe the answers to these questions may indicate where the problem lies.

There is no feedback provided for this activity.

12.7 Step five: master the technology

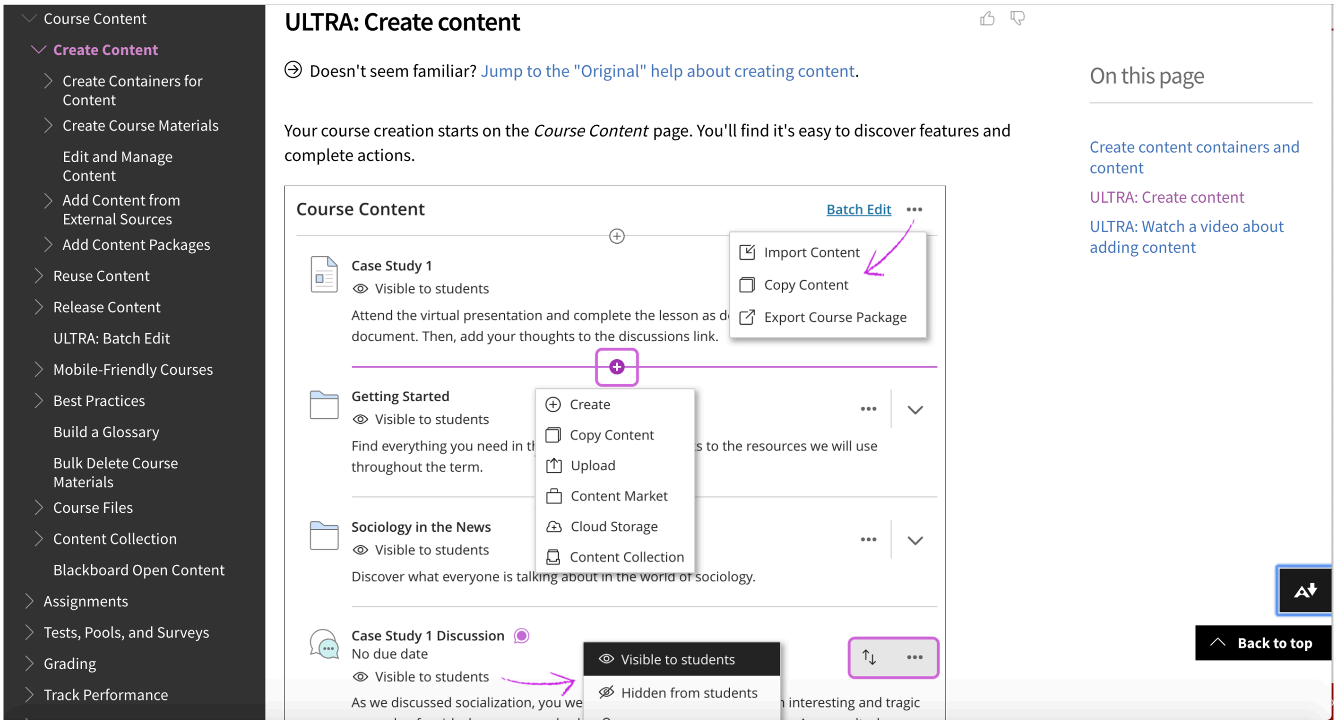


Figure 12.7.1 A 'help' page from Blackboard Learn

Taking the time to be properly trained in how to use standard learning technologies will in the long run save you a good deal of time and will enable you to achieve a much wider range of educational goals than you would otherwise have imagined.

12.7.1 The exponential growth in learning technologies

There are now many common technologies available for educational use:

- learning managements systems (such as Blackboard Learn, Moodle, D2L, Instructure/Canvas);
- synchronous technologies (such as Blackboard Collaborate, Adobe Connect, Big Blue Button, ZOOM, GoToMeeting, Microsoft Teams);
- lecture recording technologies (such as GarageBand or Audacity for podcasts and Echo360 for lecture capture);

- tablets and mobile devices, such as iPads, mobile phones, and the apps that run on them;
- MOOCs and their many variants (SPOCs, TOOCs, etc.);
- other social media, including blogging software such as WordPress, wikis such as MediaWiki, Google Hangouts, Google Docs, and Twitter;
- learner-generated tools, such as e-portfolios (for example, Mahara)
- search engines and translation tools, such as Google Search and Google Translate.

It is not necessary to use all or any of these tools, but if you do decide to use them, you need to know not only how to operate such such technologies well, but also their pedagogical strengths and weaknesses (see Chapter 7, Chapter 8 and Chapter 9). Although the technologies listed above will change over time, the general principles discussed in this section will continue to apply to other new technologies as they become available.

12.7.2 Use the existing institutional technology

If your institution already has a learning management system such as Blackboard Learn, Moodle, Instructure or D2L, use it. Don't get drawn into arguments about whether or not it is the best tool. Frankly, in functional terms, there are few important differences between the main LMSs. You may prefer the interface of one rather than another, but this will be more than overwhelmed by the amount of effort trying to use a system not supported by your institution. LMSs are not perfect but they have evolved over the last 20 years and in general are relatively easy to use, both by you and more importantly by the students. They provide a useful framework for organizing your online teaching, and if the LMS is properly supported you can get help when needed. There is enough flexibility in a learning management system to allow you to teach in a variety of different ways. In particular, take the time to be properly trained in how to use the LMS. A couple of hours of training can save you many hours in trying to get it to work the way you want.

A more important question to consider is whether you need to use an LMS at all – but that question should only be considered if the institution is willing to support alternatives, such as WordPress or Google Docs, otherwise you could end up spending too much time dealing with pure technology issues.

The same applies to synchronous web technologies such as Blackboard Collaborate, Adobe Connect, Big Blue Button or ZOOM. I have my preferences but they all do more or less the same thing. The differences in technology are nothing compared with the different ways in which you can use these tools. These are pedagogical or teaching decisions. Focus on these rather than finding the perfect technology.

Indeed, think carefully about when it would be best to use synchronous rather than asynchronous online tools. Synchronous tools are useful when you want to get a group of students together at one time, but such synchronous tools tend to be instructor-dominated (delivering lectures and controlling the discussion) and require students to be available at a set time. However, you could encourage students working in small teams on a project to use Collaborate or another synchronous tool such as ZOOM, which allows for setting up small sub-groups, to decide roles, discuss a topic and form a group view, or to finalize a project assignment, for instance. On the other hand, asynchronous tools such as an LMS provide learners with more flexibility than synchronous tools, and enable them to work more independently (an important skill for students to develop). And of course both synchronous and asynchronous tools can be used in conjunction, but that requires working out what each is best for.

12.7.3 Deceptively easy technology

Most of these technologies are deceptively easy to use, in the sense of getting started. They have been designed so that anyone without a computer science background can use them. However, over time they tend to become more sophisticated with a wide range of different functions. You won't need to use all the functions, but it will help if you are aware that they exist, and what they can and can't do. If you do want to use a particular feature, it is best to get training so that you can use it quickly and effectively.

12.7.4 Keep current, as far as possible

New technologies keep arriving all the time. It is best to focus on new tools that seem functionally different from existing tools, rather than trying to check every new synchronous meeting system, for instance. It is too difficult for any single teacher or instructor to keep up to date with newly emerging technologies and their possible relevance for teaching. This is really the job of any well-run learning technology support unit. So make the effort to attend a once-a-year briefing on new technologies, then follow-up with a further session on any tool that might be of interest.

This kind of briefing and training should be provided by the centre or unit that provides learning technology support. If your institution does not have such a unit, or such training, think very carefully about whether to use technology extensively in your teaching – even teachers and instructors with a lot of experience in using technology for teaching need such support.

Furthermore, new functions are constantly being added to existing tools. For instance, if you are using Moodle, there are 'plug-ins' (such as Mahara) that allow students to create and manage their own e-portfolios or electronic records of their work. Learning analytics software for LMSs, which allow you to analyze the way students are using the LMS and how this relates to their performance, is another recent wave of plug-ins.

Thus a session spent learning the various features of your learning management system and how best to use them will be well worthwhile, even if you have been using it for some time, but didn't have a full training on the system. Particularly important is knowing how to integrate different technologies, such as online videos within an LMS, so that the technology appears seamless to students.

Lastly, don't get locked into using only your favourite technology, and keeping a closed mind against anything else. It is is a natural tendency to try to protect the use of a technology that has taken a good deal of time and effort to master, especially if it has served you and your students well in the past, and new technology is not necessarily better for teaching than old technology. Nevertheless, game-changers do come along occasionally, and may well have educational benefits that were not previously considered. One tool is unlikely to do everything you need as a teacher; a well-chosen mix of tools is likely to be more effective. Keep an open mind and be prepared to make a shift if necessary.

12.7.5 Relate your technology training to how you want to teach

There are really two distinct but strongly related components of using technology:

- how the technology works; and
- what it should be used for.

12.7.5.1 Focus on the learning outcomes

These are tools built to assist you, so you have to be clear as to what you are trying to achieve with the tools. This is an instructional or pedagogical issue. Thus if you want to find ways to engage students, or to give them practice in developing skills, such as solving quadratic equations, learn what the strengths or weaknesses are of the various technologies for doing this (see Chapter 7 and Chapter 8 for more on this).

This is somewhat of an iterative process. When a new tool or a new feature is being described or demonstrated, think of how this might fit with or facilitate one of your teaching goals. But also be open to possibly changing your goals or methods to take advantage of a tool in enabling you to do something you had not thought of doing before. For example, an e-portfolio plug-in might lead you to change the way you assess students, so that learning outcomes are more 'authentic' and evidence-based than say with a written essay. (This will be discussed further in the next step 'Setting appropriate goals for learning.')

12.7.5.2 Avoid duplicating your classroom teaching

Podcasts and lecture capture enable lectures to be recorded, stored and downloaded by students. So why bother to learn how to use other online technologies such as an LMS? In Chapter 3, Section 3, evidence-based research on the limitations of lectures was discussed. In brief, students in general don't learn well online using recordings of 'transmissive' classroom lectures. Perhaps of equal importance, you are likely to end up doing more work because you are likely to be inundated with individual e-mails asking for clarification, or have a very high student failure rate, if you do not adapt the lecture to the online learning environment.

This is not to say that the occasional recording from you as the instructor would not be valuable. However, it is best to keep it to 10-15 minutes maximum, and it should add something unique to the course, such as being about your own research, or a guest professor being interviewed, or your relating a news item to issues or principles being studied in the course. It may even be better as an audio-only podcast, so students can concentrate on the words and possibly relate them to other learning materials, such as diagrams, graphics or animations on a web site.

If you must use lecture capture, think about structuring your in-class lecture so that it can be edited into separate sections of say 10-15 minutes. One way of doing this is pausing at an appropriate point to ask for questions from the classroom students, thus providing a clear 'editing' point for the video version. Then provide online work to follow up each of the recorded components, such as a topic for discussion on an online forum, some online student research or further reading on the topic.

However, in general, delivery of content is much better done through a learning management system, where it is permanent, organized and structured (see Step 7 later), available in discrete amounts, can be accessed at any time, and can be repeated as often as is needed by the learner. Or it may be even better to get students to find, analyse and organise content for themselves, in which case you may need tools other than an LMS, such as blog software such as WordPress, an e-portfolio or wiki. Again, the decision should be driven by pedagogical thinking, rather than trying to make one tool fit every circumstance.

12.7.6 Benefits of mastering the technology

Online learning technologies such as learning management systems have been designed to fit the online learning environment. This requires some adjustment and learning on the part of teachers and instructors whose primary experience is in classroom teaching.

Like any tool, the more you know about it the better you are likely to use it. Thus formal training on the technology is necessary but need not be onerous. Usually a total of two hours specific and well organized instruction should be sufficient on how to use any particular tool, such as a learning management or lecture capture system, e-portfolio or synchronous webinar tool, with a one hour review session every year.

The harder part will be figuring out how best to use the tools educationally. This requires you to bring a clear conception of how students best learn (Chapter 2 and Chapter 6), what methods you need to match how students learn (Chapter 3 and Chapter 4), and how to design such teaching through the use of learning technologies (Chapter 7, Chapter 8 and Chapter 9). Whenever you receive training on a new tool, try to apply what you have learned in these chapters to how you may be able best to use that tool in the future.

Activity 12.7 Mastering the technology

1. How much formal training have you had on your institutional learning management, lecture capture systems or video conferencing/synchronous technologies? Is this enough or are you now fully confident that you know all the features and how best to use them?

2. When should you use a synchronous technology such as Blackboard Collaborate? What are the disadvantages of synchronous technologies for online students? (See Chapter 7.6 for more on this).

3. Should you rethink entirely your teaching when considering blended learning or could you use mainly your classroom material?

4. What would be the possible disadvantages of using recorded lectures online?

There is no feedback provided for this activity. The answers are in the chapters highlighted in this section.

12.8 Step six: set appropriate learning goals

Figure 12.8.1 Set appropriate learning goals
Image: © www.geograph.ie

12.8.1 Setting goals for learning in a digital age

In many school systems, curriculum and learning goals are already pre-determined by national, state or provincial curriculum committees and/or ministries of education. In many trades and vocational areas, industry training boards or employers' associations set learning goals or desired outcomes or competencies that need to be followed for qualifications to be accredited. Even in a university, an instructor (particularly a contract instructor or adjunct) may 'inherit' a course where the goals are already set, either by a previous instructor or by the academic department.

Nevertheless, there remain many contexts where teachers and instructors have a degree of control over the goals of a particular course or program. In particular, a new course or program – such as an online masters program aimed at working professionals – offers an opportunity to reconsider desired learning outcomes and goals. Especially where curriculum is framed mainly in terms of content to be covered rather than by skills to be developed, there may still be room for manoeuvre in setting learning goals that would also include, for instance, intellectual skills development. In other contexts, the development or focus may be on more affective skills, such as sympathy or empathy, or on the development of manual or operational skills.

12.8.2 Learning goals for a digital age

In Chapter 1, Section 2, I listed a number of skills that learners will need in a digital age, including:

- modern communication skills;
- independent learning;
- ethics and responsibility;
- teamwork and flexibility;
- thinking skills including:
    - critical thinking;
    - problem solving;
    - creative thinking;
    - strategising and planning;
- digital skills;
- knowledge management.

These are examples of the kinds of goal that need to be identified. More traditional goals might also be included, such as comprehension and application of specific areas of content. These goals or outcomes might be expressed in terms of Bloom's taxonomy (1956) or the Royal Bank of Canada's (2018) or in a variety of other ways. All these skills need to be embedded or built within the needs of a specific subject domain. In other words, they are skills that need to be specific to a subject area rather than general. At the same time, students who develop such skills within any particular subject area will be better prepared for a digital age.

Your list of goals for a course may – indeed, should be – different from mine, but it will be essential to do the kind of analysis recommended in Step 1 (deciding how you want to teach), and then to decide on what the learning goals should be, based on:

- your understanding of the needs of the students;
- the needs of the the subject domain;
- the demands of the external world.

I have placed a particular emphasis on the development of intellectual skills. As with all learning goals, the teaching needs to be designed in such a way that students have opportunities to learn and practice such skills, and in particular, such skills need to be evaluated as part of the formal assessment process. Perhaps more challenging is to identify what you will be adding to general skills development such as critical thinking. What is the level of critical thinking skills that students will come with, and how do I make sure they progress in their ability in this skill during the course? This emphasises the value of having learning outcomes clearly identified for a whole program, perhaps using a curriculum mapping tool such as Daedalus.

What this means in terms of course design is using the Internet increasingly as a major resource for learning, giving students more responsibility for finding and evaluating information themselves, and instructors providing criteria and guidelines for finding, evaluating, analysing and applying information within a specific knowledge domain. This will require a critical approach to online searches, online data, news or knowledge generation in specific knowledge domains – in other words the development of critical thinking about the Internet and modern media – both their potential and limitations within a specific subject domain.

12.8.3 Bring in the outside world

One great characteristic of modern media is the opportunity to bring in the world to your teaching in many ways, for instance:

- by directing students to online sites, and encouraging them to identify and share relevant sites;
- students themselves can collect data or provide real world examples of concepts or issues covered in the course, through the use of cameras in mobile phones, or audio interviews of local experts, or identifying relevant open educational resources;
- setting up a course wiki that both you and the students contribute to, and make it open to other professors and students to contribute to, depending on the topic;
- if you are teaching professional masters or diploma programs, or MOOCs, the students themselves will have very relevant world experiences that can be drawn into the program. This is a great way to enable students to evaluate and apply knowledge within their subject domain.

There are many other possible goals that are either impossible to meet without using the Internet, or would be very difficult to do in a purely classroom environment. The art of the instructor is to decide which are relevant, and which in particular could be key learning goals for the course.

Figure 12.8.2 Using social media during the Arab Spring in Egypt, 2011

12.8.4 Learning goals: the same or different, depending on mode of delivery?

In many cases, it will be appropriate (indeed, essential) to keep the same teaching goals for an online course as in a similar face-to-face course. Many dual-mode institutions, campus-based institutions who also offer credit courses online, such as the University of British Columbia, Penn State, University of Nebraska, offer the same courses both face-to-face and online, particularly in the fourth year of an undergraduate program. Usually the transcript of the exam grade makes no distinction as to whether the course was done online or face-to-face, since the students take the same end of course exam, and the actual content covered is usually identical in each version.

Nevertheless, there may be occasions where some goals in the campus-based class may need to be sacrificed for different but equally valuable goals that can be achieved better online. It is also important to remember that although it may be possible to achieve the same goals online as in class, the design of the teaching will likely have to be different in the online environment. Thus often the goals remain the same, but the method changes. This will be discussed further in Steps 7 and 8. The important point is to be aware that some things can be more easily done in a campus environment, and others better done online, then to build your teaching around these somewhat different goals. Using a blended approach may enable you to widen the range of goals, but be careful not to overload students by doing this.

12.8.5 Assessment is the key

It is pointless to introduce new learning goals or outcomes then not assess how well students have achieved those goals. Assessment drives student behaviour. If they are not to be assessed on the skills outlined above, they won't make the effort to develop them. The main challenge may not be in setting appropriate goals for online learning, but ensuring that you have the tools and means to assess whether students have achieved those goals.

And even more importantly, it is necessary to communicate very clearly to students these new learning goals and how they will be assessed. This may come as a shock to many students who are used to being fed content then tested on their memory of it.

12.8.6 Conclusion

In some ways, with the Internet (as with other media), the medium is the message. Knowledge is not completely neutral. What we know and how we know it are affected by the medium through which we acquire knowledge. Each medium brings another way of knowing. We can either fight the medium, and try to force old content into new bottles, or we can shape the content to the form of the medium. Because the Internet is such a large force in our lives, we need to be sure that we are making the most of its potential in our teaching, even if that means changing somewhat what and how we teach. If we do that, our students are much more likely to be better prepared for a digital age.

Reference

Bloom, B. S.; Engelhart, M. D.; Furst, E. J.; Hill, W. H.; Krathwohl, D. R. (1956). *Taxonomy of educational objectives: The classification of educational goals*. *Handbook I: Cognitive domain.* New York: David McKay Company

Royal Bank of Canada (2018) *Humans Wanted* Toronto ON: Royal Bank of Canada

Activity 12.8 Setting learning goals

1. Take a course you are teaching in class at the moment. Write down the learning goals. Given the need for developing the skills needed in a digital age, would you want to change the goals of this course? If so, would you have to change your teaching methods and/or use of technology?

2. If you could design this course from scratch, would the learning goals change or just the teaching methodology?

3. If you were to introduce some of the skills for a digital age listed in Chapter 1, Section 2, what activities would need to be built into the course to enable students to develop such skills? How would you assess these skills?

Again there is no feedback on this activity; other chapters in the book contain some guidelines or answers.

12.9 Step seven: design course structure and learning activities

Figure 12.9.1 A good structure is critical for a quality course or program
Image: © Arisean Reach, 2012

The importance of providing students with a structure for learning and setting appropriate learning activities is probably the most important of all the steps towards quality teaching and learning, and yet the least discussed in the literature on quality assurance.

12.9.1 Some general observations about structure in teaching

First a definition, since this is a topic that is rarely directly discussed in either face-to-face or online teaching, despite structure being one of the main factors that influences learner success. Three dictionary definitions of structure are as follows:

1. Something made up of a number of parts that are held or put together in a particular way.
2. The way in which parts are arranged or put together to form a whole
3. The interrelation or arrangement of parts in a complex entity.

Teaching structure would include two critical and related elements:

- the choice, breakdown and sequencing of the curriculum (content);
- the deliberate organization of student activities by teacher or instructor (skills development; and assessment).

This means that in a strong teaching structure, students know exactly what they need to learn, what they are supposed to do to learn this, and when and where they are supposed to do it. In a loose structure, student activity is more open and less controlled by the teacher (although a student may independently decide to impose his or her own 'strong' structure on their learning). The choice of teaching structure of course has implications for the work of teachers and instructors as well as students.

In terms of the definition, 'strong' teaching structure is not inherently better than a 'loose' structure, nor inherently associated with either face-to-face or online teaching. The choice (as so often in teaching) will depend on the specific circumstances. However, choosing the optimum or most appropriate teaching structure is critical for quality teaching and learning, and while the optimum structures for online teaching share many common features with face-to-face teaching, in other ways they differ considerably.

The three main determinants of teaching structure are:

(a) the organizational requirements of the institution;
(b) the preferred philosophy of teaching of the instructor;
(c) the instructor's perception of the needs of the students.

12.9.2 Institutional organizational requirements of face-to-face teaching

Although the institutional structure in face-to-face teaching is so familiar that it is often unnoticed or taken for granted, institutional requirements are in fact a major determinant of the way teaching is structured, as well as influencing both the work of teachers and the life of students. I list below some of the institutional requirements that influence the structure of face-to-face teaching in post-secondary education:

- the minimum number of years of study required for a degree;
- the program approval and review process;
- the number of credits required for a degree;
- the relationship between credits and contact time in the class;
- the length of a semester and its relationship to credit hours;
- instructor:student ratios;
- the availability of classroom or laboratory spaces;
- time and location of examinations.

There are probably many more. There are similar institutional organizational requirements in the school system, including the length of the school day, the timing of holidays, and so on. (To understand the somewhat bizarre reasons why the Carnegie Unit based on a Student Study Hour came to be adopted in the USA, see Wikipedia.)

As our campus-based institutions have increased in size, so have the institutional organizational requirements 'solidified'. Without this structure it would become even more difficult to deliver consistent teaching services across the institution. Also such organizational consistency across institutions is necessary for purposes of accountability, accreditation, government funding, credit transfer, admission to graduate school, and a host of other reasons. Thus there are strong systemic reasons why these organizational requirements of face-to-face teaching are difficult if not impossible to change, at least at the institutional level.

Thus any teacher is faced by a number of massive constraints. In particular, the curriculum needs to fit within the time 'units' available, such as the length of the semester and the number of credits and contact hours for a particular course. The teaching has to take into account class size and classroom availability. Students (and teachers and instructors) have to be at specific places (classrooms, examination rooms, laboratories) at specific times.

Thus despite the concept of academic freedom, the structure of face-to-face teaching is to a large extent almost predetermined by institutional and organizational requirements. I am tempted to digress to question the suitability of such structural limitations for the needs of learners in a digital age, or to wonder whether faculty unions would accept such restrictions on academic freedom if they did not already exist, but the aim here is to identify which of these organizational constraints apply also to online learning, and which do not, because this will influence how we can structure teaching activities.

12.9.3 Institutional organizational requirements of online teaching

One obvious challenge for online learning, at least in its earliest days, was acceptance. There was (and still is) a lot of skepticism about the quality and effectiveness of online learning, especially from those that have never studied or taught online. So initially a lot of effort went into designing online learning with the same goals and structures as face-to-face teaching, to demonstrate that online teaching was 'as good as' face-to-face teaching (which, research suggests, it is).

However, this meant accepting the same course, credit and semester assumptions of face-to-face teaching. It should be noted though that as far back as 1971, the UK Open University opted for a degree program structure that was roughly equivalent in total study time to a regular, campus-based degree program, but which was nevertheless structured very differently, for instance, with full credit courses of 32 weeks' study and half credit courses of 16 weeks' study. One reason was to enable integrated, multi-disciplinary foundation courses. The Western Governors' University, with its emphasis on competency-based learning, and Empire State College in New York State, with its emphasis on learning contracts for adult learners, are other examples of institutions that have different structures for teaching from the norm.

If online learning programs aim to be at least equivalent to face-to-face programs, then they are likely to adopt at least the minimum length of study for a program (e.g. four years for a bachelor's degree in North America), the same number of total credits for a degree, and hence implicit in this is the same amount of study time as for face-to-face programs. Where the same structure begins to break down though is in calculating 'contact time', which by definition is usually the number of hours of classroom instruction. Thus a 13 week, 3 credit course is roughly equal to three hours a week of classroom time over one semester of 13 weeks.

There are lots of problems with this concept of ‘contact hours’, which nevertheless is the standard measuring unit for face-to-face teaching. Study at a post-secondary level, and particularly in universities, requires much more than just turning up to lectures. A common estimate is that for every hour of classroom time, students spend a minimum of another two hours on readings, assignments, etc. Contact hours vary enormously between disciplines, with usually arts/humanities having far less contact hours than engineering or science students, who spend a much larger proportion of time in labs. Another limitation of ‘contact hours’ is that it measures input, not output.

When we move to blended or hybrid learning, we may retain the same semester structure, but the ‘contact hour’ model starts to break down. Students may spend the equivalent of only one hour a week in class, and the rest online – or maybe 15 hours in labs one week, and none the rest of the semester.

A better principle would be to ensure that the students in blended, hybrid or fully online courses or programs work to the same academic standards as the face-to-face students, or rather, spend the equivalent ‘notional’ time on doing a course or getting a degree. This means structuring the courses or programs in such a way that students have the equivalent amount of work to do, whether it is online, blended or face-to-face. However, the way that work will be distributed can very considerably, depending on the mode of delivery.

12.9.4 How much work is an online course?

Before decisions can be made about the best way to structure a blended or an online course, some assumption needs to be made about how much time students should expect to study on the course. We have seen that this really needs to be equivalent to what a full-time student would study. However, just taking the equivalent number of contact hours for the face-to-face version doesn’t allow for all the other time face-to-face students spend studying.

A reasonable estimate is that a three credit undergraduate course is roughly equivalent to about 8-9 hours study a week, or a total of roughly 100 hours over 13 weeks. (A full-time student then taking 10 x 3 credits a year, with five 3 credit courses per semester, would be studying between 40-45 hours a week during the two semesters, or slightly less if the studying continued over the inter-semester period.).

Now this is my guideline. You don’t have to agree with it. You may think this is too much or too little for your subject. That doesn’t matter. You decide the time. The important point though is that you have a fairly specific target of total time that should be spent on a course or program by an average student, knowing that some will reach the same standard more quickly and others more slowly. This total student study time for a particular chunk of study such as a course or program provides a limit or constraint within which you must structure the learning. It is also a good idea to make it clear to students from the start how much time each week you are expecting them to work on the course.

Since there is far more content that could be put in a course than students will have time to study, this usually means choosing the minimum amount of content for the course for it to be academically sound, while still allowing students time for activities such as individual research, assignments or project work. In general, because instructors are experts in a subject and students are not, there is a tendency for instructors to underestimate the amount of work required by a student to cover a topic. Again, an instructional designer can be useful here, providing a second opinion on student workload.

12.9.5 Strong or loose structure?

Another critical decision is just how much you should structure the course for the students. This will depend partly on your preferred teaching philosophy and partly on the needs of the students.

If you have a strong view of the content that must be covered in a particular course, and the sequence in which it must be presented (or if you are given a mandated curriculum by an accrediting body), then you are likely to want to provide a very strong structure, with specific topics assigned for study at particular points in the course, with student work or activities tightly linked.

If on the other hand you believe it is part of the student's responsibility to manage and organize their study, or if you want to give students some choice about what they study and the order in which they do it, so long as they meet the learning goals for the course, then you are likely to opt for a loose structure.

This decision should also be influenced by the type of students you are teaching. If students come without independent learning skills, or know nothing about the subject area, they will need a strong structure to guide their studies, at least initially. If on the other hand they are fourth year undergraduates or graduate students with a high degree of self-management, then a looser structure may be more suitable to their needs. Another determining factor will be the number of students in your class. With large numbers of students, a strong, well defined structure will be necessary to control your workload, as loose structures require more negotiation and support for individual students.

My preference is for a strong structure for fully online teaching, so students are clear about what they are expected to do, and when it has to be done by, even at graduate level. The difference is that with post-graduates, I will give them more choices of what to study, and longer periods to complete more complex assignments, but I will still define clearly the desired learning outcomes in terms of skill development in particular, such as research skills or analytical thinking, and provide clear deadlines for student work, otherwise I find my workload increases dramatically.

ETEC 522 at the University of British Columbia is a loosely structured graduate course, in that students organize their own work around the course themes. The course design changes every year because the course deals with a fast-changing study domain (the potential of new technologies for education), an example of agile design.

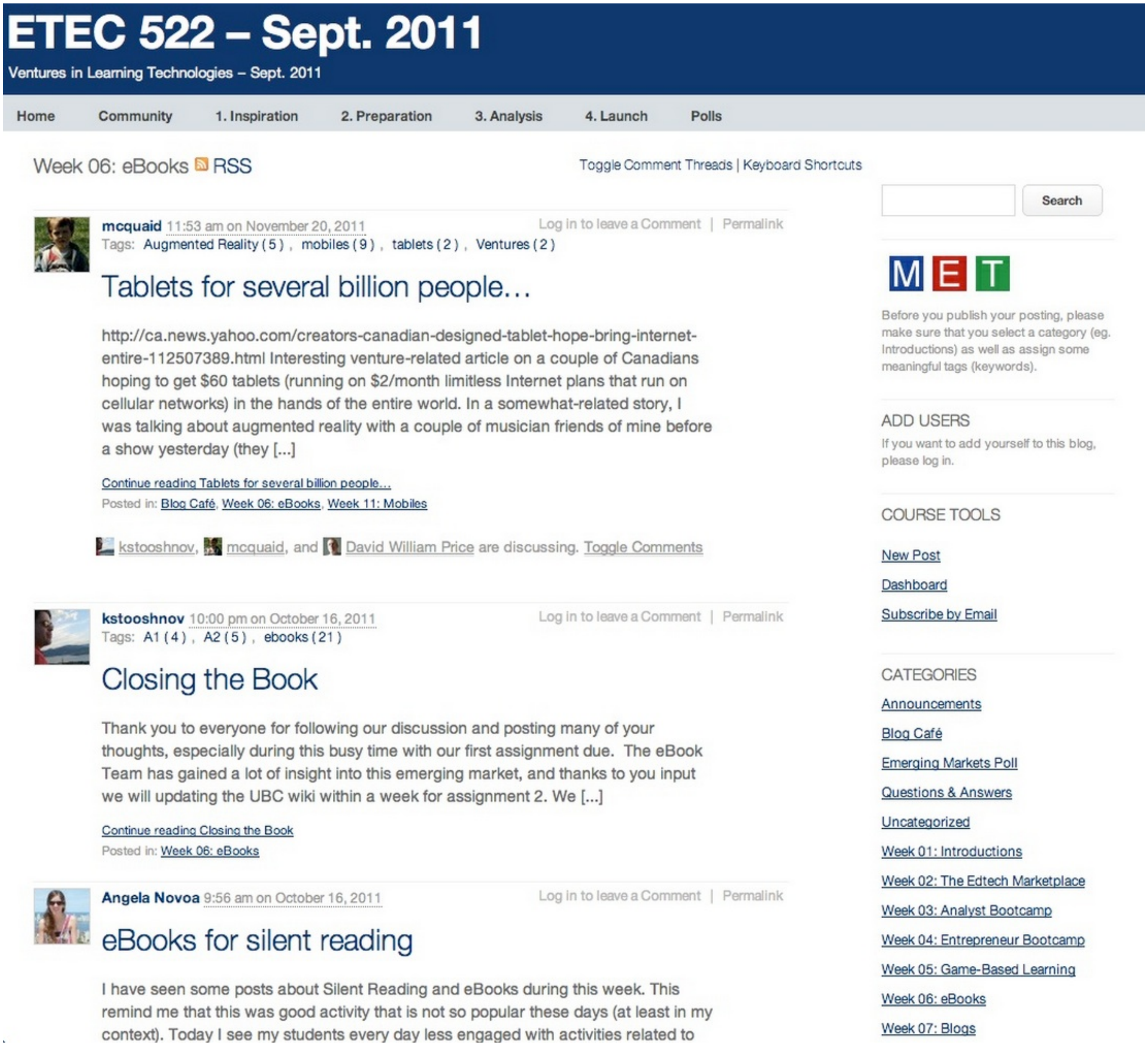


Figure 12.9.2 The University of British Columbia's ETEC 522

The web page illustrated in Figure 12.9.2 though from the 2011 version of the course demonstrates clearly a relatively loose structure. The weekly topic structure is on the right, covering seven weeks of the course, the remaining six being time for students to work on their projects. The outcomes of student activities are in the main body, posted by students through their blogs. Note this is not using a learning management system, but WordPress, a content management system, which allows students more easily to post and organize their activities.

Blended learning provides an opportunity to enable students to gradually take more responsibility for their learning, but within a 'safe' structure of a regularly scheduled classroom event, where they have to report on any work they have been required to do on their own or in small groups. This means thinking not just at a course level but at a program level, especially for undergraduate programs. A good strategy would be to put a heavy emphasis on face-to-face teaching in the first year, and gradually introduce online learning through blended or hybrid classes in second and third year, with some fully online courses in the fourth year, thus preparing students better for lifelong learning.

12.9.6 Moving a face-to-face course online

This is the easiest way to determine the structure for an online course. The structure of the course will have already been decided to a large extent, in that the content of each week's work is clearly defined by lecture topics. The main challenge will not be structuring the content but ensuring that students have adequate online activities (see later). Most learning management systems enable the course to be structured in units of one week, following the classroom topics. This provides a clear timetable for the students. This applies also to alternative approaches such as problem-based learning, where student activities may be broken down almost on a daily basis.

However, it is important to ensure that the face-to-face content is moved in a way that is suitable for online learning. For instance, Powerpoint slides may not fully represent what is covered in the verbal part of a lecture. This often means reorganizing or redesigning the content so that it is complete in an online version (your instructional designer should be able to help with this). At this point, you should look at the amount of work the online students will need to do in the set time period to make sure that with all the readings and activities it does not exceed the rough average weekly load you have set. It is at this point you may have to make some choices about either removing some content or activities, or making the work 'optional.' However, if optional it should not be assessed, and if it's not assessed, students will quickly learn to avoid it. Doing this time analysis incidentally sometimes indicates that you've overloaded the face-to-face component as well.

It needs to be constantly in your mind that students studying online will almost certainly study in a more random manner than students attending classes on a regular basis. Instead of the discipline of being at a certain place at a certain time, online students still need clarity about what they are supposed to do each week or maybe over a longer time period as they move into later levels of study. What is essential is that students do not procrastinate online and hope to catch up towards the end of the course, which is often the main cause of failure in online courses (as in face-to-face classes).

We will see that defining clear activities for students is critical for success in online learning. We shall see when we discuss student activities below that there is often a trade-off to be made between content and activities if the student workload is to be kept to manageable proportions.

12.9.7 Structuring a blended learning course

Many blended learning courses are designed almost by accident, rather than deliberately. Online components, such as a learning management system to contain online learning materials, lecture notes or online readings, are gradually added to regular classroom teaching. There are obvious dangers in doing this if the face-to-face component is not adjusted at the same time. After a number of years, more and more materials, activities and work for students is added online, often optional but sometimes essential for assignments. Student workloads can increase dramatically as a result – and so too can the instructor's, with more and more material to manage.

Rethinking a course for blended learning means thinking carefully about the structure and student workload. Means et al. (2010) hypothesised that one reason for better results from blended learning was due to students spending more time on task; in other words, they worked harder. This is good, but not if *all* their courses are adding more work. It is essential therefore when moving to a blended model to make sure that extra work online is compensated by less time in class (including travel time).

12.9.8 Designing a new online course or program

If you are offering a course or program that has not to date been offered on campus (for instance a professional or applied masters program) then you have much more scope for developing a unique structure that best fits the online environment and also the type of students that may take this kind of course (for example, working adults).

The important point here is that the way this time is divided up does not have to be the same as for a face-to-face class, because there is no organizational need for the student to be at a particular time or place in order to get the instruction. Usually an online course will be 'ready' and available for release to the students before the course officially begins. Students could in theory do the course more quickly or more slowly, if they wished. Thus the instructor has more options or choices about how to structure the course and in particular about how to control the student work flow.

This is particularly important if the course is being taken mainly by lifelong learners or part-time students, for instance. Indeed, it may be possible to structure a course in such a way that different students could work at different speeds. Competency-based learning means that students can work through the same course or program at very different speeds. Some open universities even have continuous enrolment, so they can start and finish at different times. Most students opting for an online course are likely to be working, so you may need to allow them longer to complete a course than full-time students. For instance, if on-campus masters programs need to be completed in one or two years, students may need up to five years to complete an online professional masters program.

12.9.9 Key principles in structuring a course

Now there may be good reasons for not doing some of these things, but this will be because of pedagogical rather than institutional organizational reasons. For instance, I'm not keen on continuous enrollment, or self-paced instruction, because especially at graduate level I make heavy use of online discussion forums and online group work. I like students to work through a course at roughly the same pace, because it leads to more focused discussions, and organizing group work when students are at different points in the course is difficult if not impossible. However, in other courses, for instance a math course, self-paced instruction may make a lot of sense.

I will discuss other non-traditional course structures when we discuss student activities below. However you structure the course, though, two basic principles remain:

- there must be some notional idea of how much time students should spend each week on the course;
- students should be clear each week about what they have to do and when it needs to be done.

12.9.10 Designing student activities

This is the most critical part of the design process, especially for fully online students, who have neither the regular classroom structure or campus environment for contact with the instructor and other students nor the opportunity for spontaneous questions and discussions in a face-to-face class. Regular student activities though are critical for keeping all students engaged and on task, irrespective of mode of delivery. These can include:

- assigned readings, with some activity that enables students to demonstrate their understanding;
- simple multiple choice self-assessment tests of understanding with automated feedback, using the computer-based testing facility within a learning management system;
- questions requiring short paragraph answers which may be shared with other students for comparison or discussion;
- formally marked and assessed monthly assignments in the form of short essays or reports;
- individual or group project work spaced over several weeks;
- an individual student blog or e-portfolio that enables the student to reflect on their recent learning, and which may be shared with the instructor or other students;
- online discussion forums, which the instructor will need to organize and monitor.

There are many other activities that instructors can devise to keep students engaged. However, all such activities need to be clearly linked to the stated learning outcomes for the course and can be seen by students as helping them prepare for any formal assessment. If learning outcomes are focused on skills development, then the activities should be designed to give students opportunities to develop or practice such skills.

These activities also need to be regularly spaced and an estimate made of the time students will need to complete the activities. In step eight, we shall see that student engagement in such activities will need to be monitored by the instructor.

It is at this point where some hard decisions may need to be made about the balance between 'content' and 'activities'. Students must have enough time to do regular activities (other than just reading) once each week at least, or their risk of dropping out or failing the course will increase dramatically. In particular they will need some way of getting feedback or comments on their activities, either from the instructor or from other students, so the design of the course will have to take account of the instructors' workload as well as the students'.

In my view, most university and college courses are overstuffed with content and not enough consideration is given to what students need to do to absorb, apply and evaluate such content. I have a very rough rule of thumb that students should spend no more than half their time reading content and attending lectures, the rest being spent on interpreting, analyzing, or applying that content through the kinds of activities listed above. As students become more mature and more self-managed the proportion of time spent on activities can increase, with the students themselves being responsible for identifying appropriate content that will enable them to meet the goals and criteria laid down by the instructor. However, that is my personal view. Whatever your teaching philosophy though, there must be plenty of activities with some form of feedback for online students, or they will drop like flies on a cold winter's day.

12.9.11 Many structures, one high standard

There are many other ways to ensure an appropriate structure for an online course. For instance, the Carnegie Mellon Open Learning Initiative provides a complete course 'in a box' for standard first and second year courses in two year colleges. These include a learning management system site with content, objectives and activities pre-loaded, with an accompanying textbook. The content is carefully structured, with in-built student activities. The instructors' role is mainly delivery, providing student feedback and marking where needed. These courses have proved to be very effective, in that most students successfully complete such programs.

The History instructor in Scenario D kept a normal three lectures a week structure for the first three weeks, then students worked entirely online in small groups on a major project for five weeks, then returned to class for one three-hour session a week for five weeks for students to report back on and discuss their projects as a whole class group.

We saw that in competency-based learning, students can work at their own speed through highly structured courses academically, in terms of topic sequences and learner activities, that nevertheless have flexibility in the time students can take to successfully complete a competency.

The Integrated Science Program at McMaster University is built around 6-10 week undergraduate research projects.

cMOOC's such as Stephen Downes, George Siemen's, and Dave Cormier's #Change 11 (Milligan, 2012) have a loose structure, with different topics with different contributors each week, but student activities, such as blog posts or comments, are not organized by the course designers but left to the students. However, these are not credit courses, and few students work all the way through the whole MOOC, and that is not their intent. The Stanford and MIT xMOOC's on the other hand are highly structured, with student activities, and the feedback is fully automated. Less than 10 per cent of students who start these MOOCs successfully complete them, but they too are non-credit courses. Increasingly MOOCs are becoming shorter, some of as little as three or four weeks in length.

Online learning enables teachers and instructors to break away from a rigid three semester, 13 week, three lectures a week structure, and build courses around structures that best meet the needs of learners and the preferred teaching method of the teacher or instructor. My aim in a credit course or program is to ensure high academic quality *and* high completion rates. For me that means developing an appropriate structure and related learning activities as a key step in achieving quality in credit online courses.

References

Means, B. et al. (2010) *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies* Washington, DC: US Department of Education

Milligan, C. (2012) Change 11 SRL-MOOC study: initial findings *Learning in the Workplace*, December 19

Activity 12.9 Structuring your course or program

1. How many hours a week should a typical student spend studying a three credit course? If your answer differs from mine (8-9 hours), why?

2. If you were designing an online credit program from scratch, would you need to follow a 'traditional' structure of three credits over 13 weeks? If not, how would you structure such a program, and why?

3. Do you think most credit courses are 'overstuffed' with content and do not have enough learning activities? Do we focus too much on content and not enough on skills development in higher education? How does that affect the structure of courses? How much does it affect the quality of the learning?

Again, no feedback provided on this activity.

12.10 Step eight: communicate, communicate, communicate

Figure 12.10.1 Communicate!
Image: Care2, 2012

Some methods of teaching, such as online collaborative learning (Chapter 4, Section 4), depend on high quality discussion between instructor and students. However, there is substantial research evidence to suggest that ongoing, continuing communication between teacher/instructor and students is essential in *all* online learning. At the same time it needs to be carefully managed in order to control the teacher/instructor's workload.

12.10.1 The concept of 'instructor presence'

In a classroom environment, the presence of the teacher or instructor is taken for granted. Usually, the teacher is at the front of the class and at the centre of attention. Students may want to ignore a teacher but that is not always easy to do, even in a very large lecture theatre. The instructor just being there in the room is often considered to be enough. We can learn a lot though about the important pedagogical aspects of teacher presence from the research into online learning, where instructor presence has to be worked at.

12.10.2 Instructor presence and the loneliness of the long distance learner

Research has clearly indicated that 'perceived instructor presence' is a critical factor for online student success and satisfaction (Jonassen et al., 1995; Anderson et al., 2001; Garrison and Cleveland-Innes, 2005; Baker, 2010; Sheridan and Kelly, 2010). Students need to know that the instructor is following the online activities of students and that the instructor is actively participating during the delivery of the course.

The reasons for this are obvious. Online students often study from home, and if they are fully online may never meet another student on the same course. They do not get the important non-verbal cues from the instructor or other students, such as the stare at a stupid question, the intensity in presentation that shows the passion of the instructor for the topic, the 'throwaway' comment that indicates the instructor doesn't have much time for a particular idea, or the nodding of other students' heads when another student makes a good point or asks a pertinent question. An online student does not have the opportunity for a spontaneous discussion by bumping into the instructor in the corridor.

However, a skilled instructor can create just as compelling a learning environment online, but it needs to be deliberately planned and designed, and be done in such a way that the instructor's workload can be controlled.

12.10.3 Setting students' expectations

It is essential right at the start of a course for the instructor to make it clear to students what is expected of them when they are studying online, whether in a blended or fully online course. On reflection, why would we not do the same for face-to-face teaching?

Most institutions have a code of behaviour for the use of computers and the Internet, but these are often lengthy documents written in a bureaucratic language, and are more concerned with spam, general online behaviour such as 'flaming' or bullying, or hacking. Although necessary, this is not sufficient for teaching purposes. Thus instructors are advised to develop a set of specific requirements for student behaviour that is related to the needs of the particular course, and deals with the academic requirements of studying online. Some guidelines or principles for developing meaningful online discussion can found in Chapter 4, Section 4.4.4. However, there are some other specific actions that teachers and instructors can take to ensure instructor presence.

A small task can be set in the first week of a course that sets up student expectations for the rest of the course. For instance students can be asked to post their bio and respond to other students bio posts, or can be asked to comment on a topic related to the course and their views on this before the course really begins, using the discussion forum facility in the learning management system. It is important to pay particular attention to this activity, because research indicates that students who do not respond to set activities in the first week are at high risk of non-completion. Instructors should follow up with a phone call or e-mail to non-respondents at the end of the first week, and ensure that each student is following the guidelines or doing the task set, even if students are experienced in studying online. Students know that the instructor is then following what they do (or more importantly don't do) from the outset.

Different courses may require different guidelines. For instance a math or science course may not put so much emphasis on discussion forums, but more on self-assessed computer-marked multiple choice questions. It should be made clear whether students must do these or if they are optional, or how much time should be spent as a minimum on doing such non-graded activities, and their relationship to activities that are graded or assessed. They should get such an activity within the first week of a course, and the instructor should follow up with those that avoid the activity or have difficulties with it.

Lastly, instructors should follow their own guidelines. Your comments should be helpful and constructive, rather than negative. You should actively encourage discussion by being 'present' and stepping in on a discussion where necessary – for instance if the comments are getting off topic or too personal.

12.10.4 Teaching philosophy and online communication

Instructors who have a more objectivist approach to teaching are more likely to focus on whether students are not only covering the necessary content but are also understanding it. This often requires students going back over content, providing misunderstood or difficult content in an alternative manner (e.g. a video as well as text), and instructor or automated (computer-based) feedback. Most LMSs will provide summaries of student activities, and it is important to track each individual student's progress. Instructors with a more constructivist approach are more likely to emphasize online discussion and argument.

Whatever your approach, students want to know where you stand on some of the topics. Thus while it is necessary often to present content objectively with an 'on the one hand… on the other…' approach, students usually feel more committed to a course where the instructor's own views or approach to a topic are made clear. This can be done in a variety of ways, such as a podcast on a topic, or an intervention in a discussion, or a short video of how you would go about solving an equation. These personal interventions have to be carefully judged, but can make a big difference to student commitment and participation.

12.10.5 Choice of medium for instructor communication

There is now a wide variety of media by which instructors can communicate with students, or students can communicate with each other. Basically, though, they fall into four categories:

- face-to-face, such as set office hours, scheduled classes or serendipity (bumping into each other in the corridor);
- synchronous communication media, including voice phone calls, text and audio conferencing over the web (for example, Blackboard Collaborate), or even video-conferencing (for example, ZOOM);
- asynchronous communication media, including e-mail, podcasts or recorded video clips, and online discussion forums within an LMS;
- social media, such as blogs, wikis, text or voice messages on mobile phones, Facebook and Twitter.

In general, I much prefer asynchronous communication for two reasons. Students are often working and have busy lives; asynchronous discussion, questions and answers are more convenient for them.

Asynchronous communications can be accessed at any time. Also, they are much more convenient for me as an instructor. For instance I can go to a conference even in another country yet still log on to my course when I have some free time. I also have a record of what I have said to students. If using an LMS, it is password protected and communications can be kept within the class group.

However, asynchronous communication can be frustrating for students when complex decisions need to be made within a tight timescale, such as deciding the roles and responsibilities for group work, the final draft of a group assignment, or a student's lack of understanding that is blocking any further progress on the topic. Then face-to-face or technology-based synchronous communication is better, depending on whether it is a blended or fully online course.

In a fully online course, I also sometimes use a conferencing system such as Blackboard Collaborate or ZOOM to bring all the students together once or twice during a semester, to get a feeling of community at the start of a course, to establish my 'presence' as a real person with a face or voice at the start of a course, or to wrap up a course at the end, and I try to provide plenty of opportunity for questions and discussion by the students themselves. However, these synchronous 'lectures' are always optional as there will always be some students who cannot be present (although they can be made available in recorded format).

For a blended course, though, I would organise a series of relatively small face-to-face group sessions in the first or second week of a course, so students can get to know each other as well as me, then keep them in the same groups for any group work or discussions.

Blogs or e-portfolios can be used by students to record their learning or to reflect on what they have learned, and blogs can be a useful way for the instructor to comment on news or events relevant to a course, but care is needed to keep a clear separation between students' private lives and conversations, and the more formal in-class communications.

12.10.6 Managing online discussion

Whole books have been written on this topic (see Salmon, 2000, Paloff and Pratt, 2007; Harasim, 2017) and this is discussed in detail in Chapter 4, Section 4.4.4. However, there are some basic guidelines to follow.

12.10.6.1 Threaded discussion

Use the *threaded discussion* forum facility in the LMS (in some LMSs the instructor has to choose to switch this on).

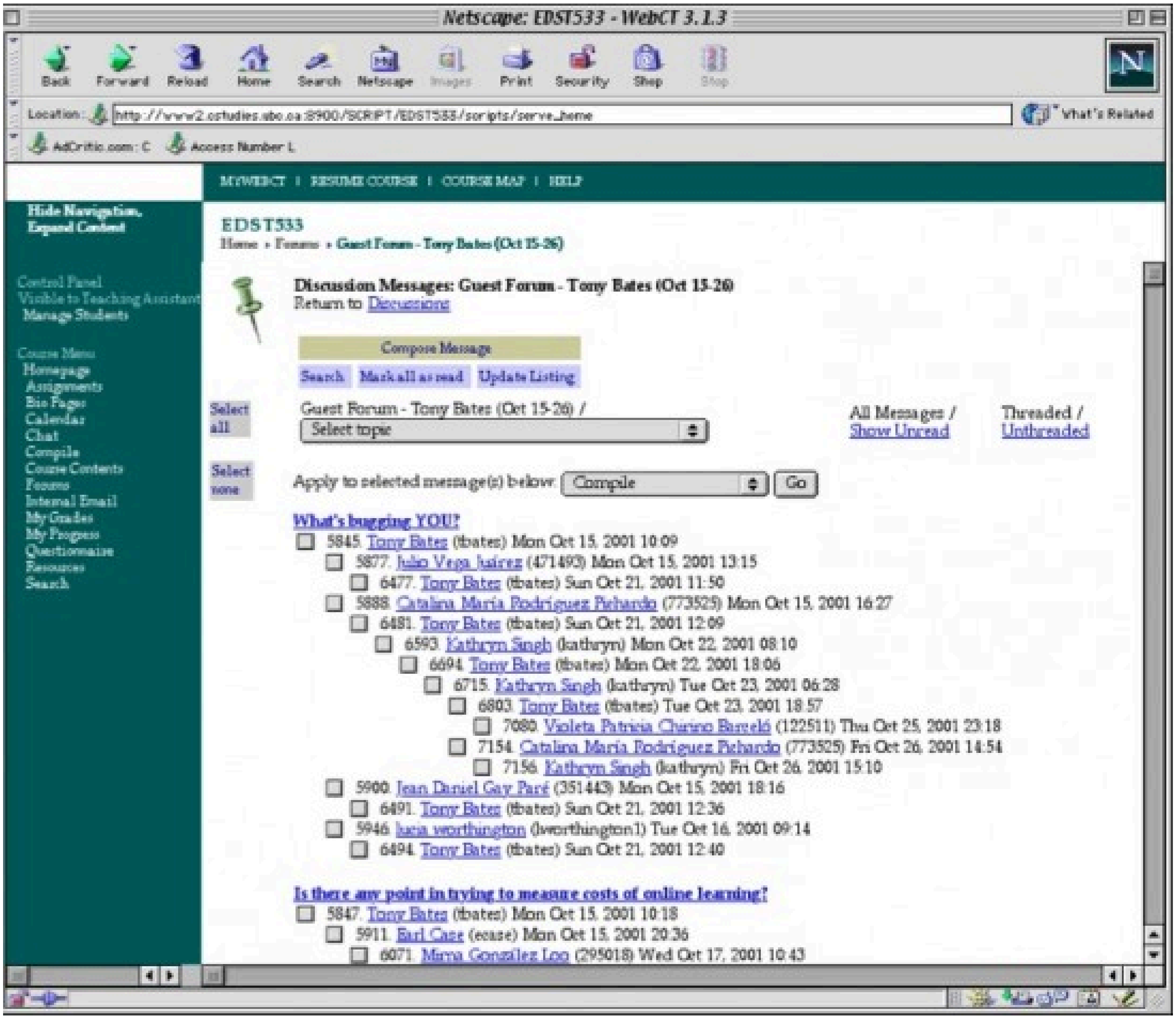


Figure 12.10.2 Example of a threaded discussion topic. This is an old LMS (WebCT) but illustrates clearly the value of a threaded discussion.

Although LMSs are losing some of their original appeal, with more and more instructors using WordPress or other content management systems, I like to use the LMS forum discussion tool because I can organize the discussion by separate topics (a forum for each topic).

In a threaded discussion, a student comment on someone else's post on a topic is posted next to the post, allowing either the student making the original post or other students to respond to the comment. This way a 'thread' of comments linked to a specific topic can be followed. A well chosen topic or sub-topic will often have ten or more threaded comments, and the instructor can tell at a glance which topics have gained 'traction'.

The alternative, comments posted in time order, as in comments on a blog, for instance, make it difficult to follow a thread of an argument. Also I like to keep a least some of the discussion 'private', just between me and the students on the course, as I am using the discussion forum to identify areas of misunderstanding and to develop skills such as critical thinking and clear communication.

12.10.6.2 Be there!

By that I mean ensure that students are aware of your regular *online presence*. This means monitoring the discussions on a regular basis, and occasionally intervening when appropriate, without hogging the discussion.

For more guidance on handling online communication with students, take a look particularly at the books by Gilly Salmon, Rena Paloff and Keith Pratt, and Linda Harasim in the references below.

12.10.7 Cultural and other student differences

The most interesting and exciting courses that I have taught have included a wide range of international students from different countries. However, even if all the students are within one hour's commute of the institution, they will have different learning styles and approaches to studying online. This is why it is important to be clear about the desired learning outcomes, and the goals for discussion forums.

Students learn in different ways. If one of the desired learning outcomes is critical thinking, students can achieve that in different ways. Some may prefer to discuss course issues with other students over a coffee. Some may do a lot of reading, seeking out different viewpoints. Others may prefer to work mainly in the online discussion forums. Some students learn a lot by lurking online but never contribute directly. Now if you are trying to improve international students' language skills, then you may require them to participate in the online discussions, and will assess them on their contributions. However, I try not force students to participate. I see it as my challenge to make the topic interesting enough to draw them in. I don't really care how they achieve the learning outcomes so long as they do.

Having said that, much can be done to facilitate or encourage students to participate. I taught one graduate course where I had about 20 of the 30 students in my class with Chinese surnames. From the student records and the short bios they posted I noted that a few students were from the Chinese mainland, several more were living in Hong Kong, and the rest had Canadian addresses. However even the latter consisted of two quite different groups: recent immigrants to Canada, and at least one student whose great grandfather had been one of the first immigrants to Canada in the 19th century.

Although it is dangerous to rely on stereotypes, I noticed that the further away 'psychologically' or geographically the student was, the less they were initially inclined to participate online. This was partly a language issue but also a cultural issue. The mainland Chinese in particular were very reluctant to post comments. Fortunately we had a visiting Chinese scholar with us and she advised us to get the three mainland Chinese women on the course to develop a collective contribution to the discussion and then ask them to send it to me to check that it was 'appropriate' before they posted. I made a few comments then sent it back and they then posted it. Gradually by the end of the course they each had the confidence to post individually their own comments. But it was a difficult process for them. (On the other hand, I had Mexican students who commented on everything, whether it was about the course or not, and especially about the World Cup soccer tournament that was on at the time).

Students differences (and possibly stereotypes) also change over time. I am not sure whether 20 years later the differences would apply to students with Chinese names today. The important point is that different students respond differently to online discussion and the instructor needs sensitivity to these differences, and strategies to ensure participation from everyone.

12.10.8 Conclusion

This is a big topic and difficult to cover adequately in one section. However, the importance of instructor presence cannot be overemphasized for getting students successfully to complete any course with an online component. The lack of instructor online presence in xMOOCs is one reason so few students complete the courses.

There is an unlimited number of ways in which you, as an instructor, can communicate now with students, but it is also essential at the same time to control your workload. You cannot be available 24×7, and this means designing the online delivery in such a way that your 'presence' is used to best effect. At the same time, communication with online students can end up being the most interesting and satisfying part of teaching.

Activity 12.10 Communicating with your students

1. How could you apply some of the principles of instructor presence in an online course to a large lecture class?

2. In a blended class where students have at least one classroom session once a week, how would you decide what interactions with students should be done on campus, and what online? What are the reasons for your decision? Does it matter?

3. How important is student discussion in your subject area? What learning goals does it support? How can you help students to achieve these goals through discussion?

4. Interaction/communication between students and teachers/instructors is one of the main cost drivers of education. Could the goals that justify the use of discussion or other forms of communication between learners and teachers or instructors be achieved in other, less costly, ways? Could this be replaced by computers, for instance? If not, why not?

For feedback on this activity, click on the podcast below:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=323

References and further reading

(This is just a small sample of many publications on this topic,)

Anderson, T., Rourke, L., Garrison, R., & Archer, W. (2001). Assessing teaching presence in a computer conferencing context *Journal of Asynchronous Learning Networks*, Vol. 5, No.2.

Baker, C. (2010) The Impact of Instructor Immediacy and Presence for Online Student Affective Learning, Cognition, and Motivation *The Journal of Educators Online* Vol. 7, No. 1

Garrison, D. R. & Cleveland-Innes, M. (2005). Facilitating cognitive presence in online learning: Interaction is not enough *American Journal of Distance Education*, Vol. 19, No. 3

Harasim, L. (2017) *Learning Theory and Online Technologies 2nd edition* New York/London: Taylor and Francis

Jonassen, D., Davidson, M., Collins, M., Campbell, J. and Haag, B. (1995) 'Constructivism and Computer-mediated Communication in Distance Education', *American Journal of Distance Education*, Vol. 9, No. 2, pp 7-26.

Paloff, R. and Pratt, K. (2007) *Building Online Learning Communities* San Francisco: John Wiley and Co.

Salmon, G. (2000) *E-moderating* London/New York: Taylor and Francis

Sheridan, K. and Kelly, M. (2010) The Indicators of Instructor Presence that are Important to Students in Online Courses *MERLOT Journal of Online Learning and Teaching*, Vol. 6, No. 4

12.11 Step nine: evaluate and innovate

Figure 12.11.1 Evaluate and innovate Image: Hilary Page-Bucci, 2002

The last key 'fundamental' of quality teaching and learning in a digital age is evaluation and innovation: assessing what has been done, and then looking at ways to improve on it (for a more in-depth discussion of the issues involved in evaluating online learning, see Gunawardena et al., 2000)

12.11.1 Why evaluation is important

For tenure and promotion, it is important if you are teaching to be able to provide evidence that the teaching has been successful. New tools and new approaches to teaching are constantly coming available. They provide the opportunity to experiment a little to see if the results are better, and if we do that, we need to evaluate the impact of using a new tool or course design. It's what professionals do. But the main reason is that teaching is like golf: we strive for perfection but can never achieve it. It's always possible to improve, and one of the best ways of doing that is through a systematic analysis of past experience.

12.11.2 What to evaluate: summative

In Step 1, I defined quality very narrowly:

> *teaching methods that successfully help learners develop the knowledge and skills they will require in a digital age.*

It will be clear from reading this book that I believe that to achieve these goals, it will be necessary to re-design most courses and programs. So it will be important to know whether these redesigned courses are more effective than the 'old' courses. One way of evaluating these new courses is to see how they compared with the older courses, for instance:

- *completion rates will be at least as good if not better for the new version of the course(s)*
- *grades or measures of learning will be at least as good if not better for the new version.*

The first two criteria are relatively easily measured in quantitative terms. We should be aiming for completion rates of at least 85 per cent, which means of 100 students starting the course, 85 complete by passing the end of course assessment (unfortunately, many current courses fail to achieve this rate, but if we value good teaching, we should be trying to bring as many students as possible to the set standard).

The second criterion is to compare the grades. We would expect at least as many As and Bs in our new version as in the old classroom version, while maintaining the same (hopefully high) standards or higher.

However, to be valid the evaluation will also would need to define the knowledge and skills within a course that meet the needs of a digital age, then measuring how effective the teaching was in doing this. Thus a third criterion would be:

- *the new design(s) will lead to new and different learning outcomes that are more relevant to the needs of a digital age.*

This third criterion is more difficult, because it suggests a change in the intended learning goals for courses or programs. This might include assessing students' communication skills with new media, or their ability to find, evaluate, analyze and apply information appropriately within the subject domain (knowledge management), which have not previously been (adequately) assessed in the classroom version. This requires a qualitative judgement as to which learning goals are most important, and this may require endorsement or support from a departmental curriculum committee or even an external accreditation body.

With a new design, and new learning outcomes, it may be difficult to reach these standards immediately, but over two or three years it should be possible.

12.11.3 What to evaluate: formative

However, even if we measure the course by these three criteria, we will not necessarily know what worked and what didn't in the course. We need to look more closely at factors that may have influenced students' ability to learn. We have laid out in steps 1-8 some of these factors. Some of the questions for which you may want answers are as follows:

- Were the learning outcomes or goals clear to students?
- What learning outcomes did most students struggle with?
- Was the teaching material clear and well structured?
- Were the learning materials and tools students needed easily accessible and available 24 x 7?
- What topics generated good discussion and what didn't?
- Did students draw appropriately on the course materials in their discussion forums or assignments?
- Did students find their own appropriate sources and use them well in discussions, assignments and other student activities?
- Which student activities worked well, and which badly? Why?
- What of the supplied learning materials did students make most and least use of?
- Did the assignments adequately assess the knowledge and skills the course was aiming to teach?
- Were the students overloaded with work?
- Was it too much work for me as an instructor?
- If so, what could I do to better manage my workload (or the students') without losing quality?
- How satisfied were the students with the course?
- How satisfied am I with the course?

I will now suggest some ways that these questions can be answered without again causing a huge amount of work.

12.11.4 How to evaluate factors contributing to or inhibiting learning

There is a range of resources you can draw on to do this, much more in fact than for evaluating traditional face-to-face courses, because online learning leaves a traceable digital trail of evidence:

- student grades;
- individual student participation rates in online activities, such as self-assessment questions, discussion forums, podcasts;
- qualitative analysis of the discussion forums, for instance the quality and range of comments, indicating the level or depth of engagement or thinking;
- student e-portfolios, assignments and exam answers;
- student questionnaires;
- focus groups.

However, before starting, it is useful to draw up a list of questions as in the previous section, and then look at which sources are most likely to provide answers to those questions.

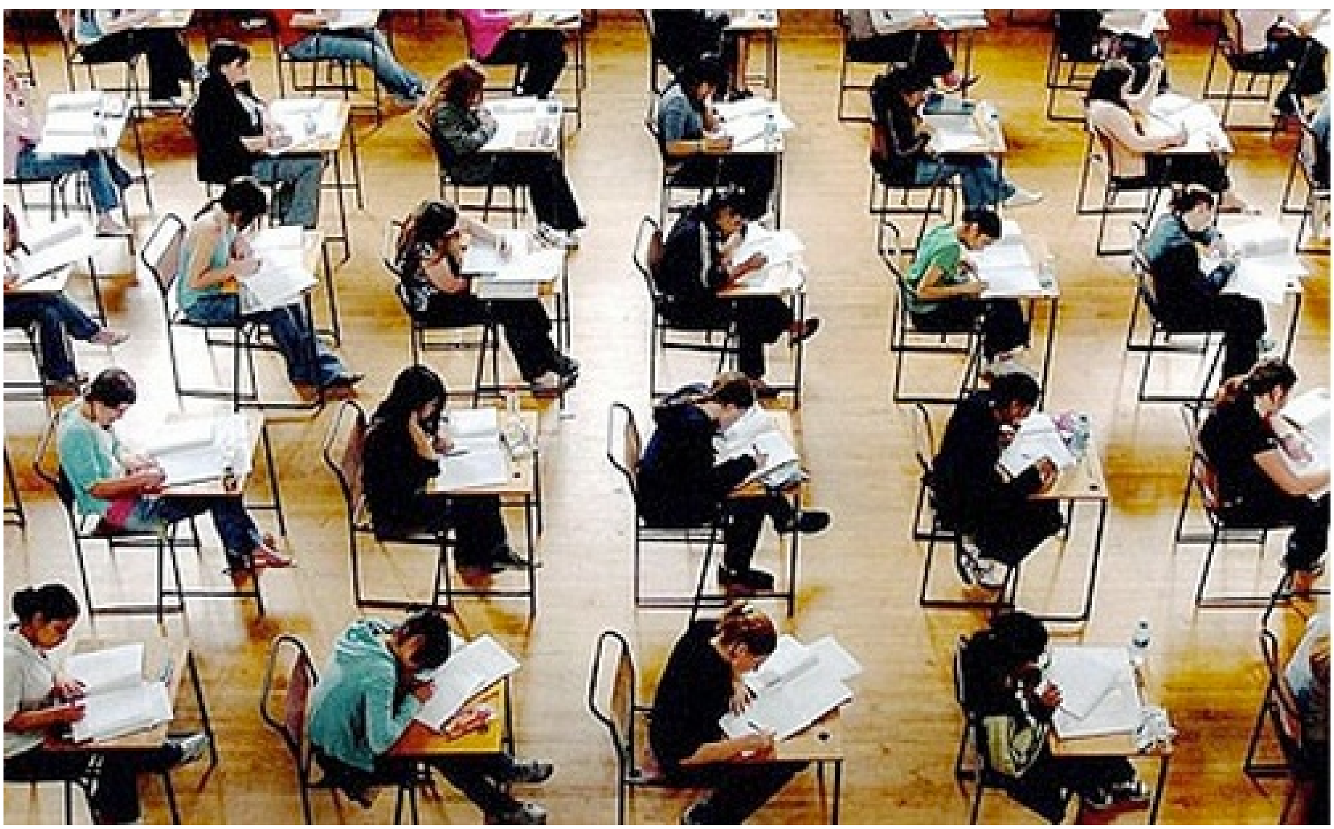


Figure 12.11.2 Analysis of a sample of exam answers will often provide information about course structure and the presentation of materials

At the end of a course, I tend to look at the student grades, and identify which students did well and which struggled. This depends of course on the number of students in a class. In a large class I might sample by grades. I then go back to the beginning of the course and track their online participation as far as possible (learning analytics make this much easier, although it can also be done manually if a learning management system is used). I find that some factors are student specific (e.g. a gregarious student who communicates with everyone) and some are course factor specific, for example, related to learning goals or the way I have explained or presented content. This qualitative approach will often suggest changes to the content or the way I interacted with students for the next version of the course. I may for instance determine next time to manage more carefully students who 'hog' the conversation.

Many institutions have a 'standard' student reporting system at the end of each course. These are often useless for the purposes of evaluating courses with an online component. The questions asked need to be adapted to the mode of delivery. However, because such questionnaires are used for cross course comparisons, the people who manage such evaluation forms are often reluctant to have a different version for online teaching. Secondly, because these questionnaires are usually voluntarily completed by students after the course has ended, completion rates are often notoriously low (less than 20 per cent). Low response rates are usually worthless or at best highly misleading. Students who have dropped out of the course won't even get the questionnaire in most cases. Low response rates tend to be heavily biased towards successful students. It is the students who struggled or dropped out that you need to hear from.

I find small focus groups work better than student questionnaires, and for this I prefer either face-to-face or synchronous tools such as Blackboard Collaborate. I will deliberately approach 7-8 specific students covering the full range of achievement, from drop-out to A, and conduct a one hour discussion around specific questions about the course. If one selected student does not want to participate, I try to find another in the same category. If you can find the time, two or three such focus groups will provide more reliable feedback than just one.

12.11.5 Innovate

Usually I spend quite a bit of time at the end of the first presentation of a redesigned course evaluating it and making changes in the next version, usually working with a trusted instructional designer. After that I concentrate mainly on ensuring completion rates and grades are at the standard I have aimed for.

What I am more likely to do in the third or subsequent offerings is to look at ways to improve the course that are the result of new external factors, such as new software (for instance. an e-portfolio package), or new processes (for instance, student-generated content, using mobile phones or cameras, collecting project-related data). This keeps the course 'fresh' and interesting. However, I usually limit myself to one substantive change, partly for workload reasons but also because this way it is easier to measure the impact of the change.

It is indeed an exciting time to be an instructor. In particular, the new generation of web 2.0 tools, including WordPress, new, instructor-focused 'lightweight' LMSs such as Instructure/Canvas, open educational resources, mobile learning, tablets and iPads, MOOCs, and emerging technologies such as serious games, virtual and augmented reality and artificial intelligence, all offer a wide variety of opportunities for innovation and experiment. These can be either be integrated within the existing LMS and existing course structure, or designs can be more radical. Chapters 3 to 5 discuss a wide range of possible designs.

However, it is important to remember that the aim is to enable students to learn effectively. We do have enough knowledge and experience to be able to design 'safe', effective learning around standard LMSs. New is not always better. Thus for instructors starting in online learning, I would urge caution. Follow the experienced route, then gradually add and evaluate new tools and new approaches to learning as you become more experienced.

Lastly, if you do make an interesting innovation in your course, make sure you properly evaluate it as suggested above, then share these findings with colleagues and help them either include the innovation within their own course, or help them make the innovation even better through their own modifications. That way we can all learn from each other.

Reference/further reading

Gunawardena, C., Lowe, C. & Carabajal, K. (2000) Evaluating Online Learning: models and methods in D. Willis et al. (eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2000* San Diego CA

Activity 12.11 Evaluating your course or program

1. Design and conduct an evaluation of your course using the questions in Section 12.11.3 and the data and methods suggested in Section 12.11.4. What changes, if any, will you make as a result?

Ther eis no feedback provided for this activity.

12.12 Building a strong foundation of course design

Figure 12.12 Building a strong foundation for quality teaching
Image: © Wikipedia Commons

The emphasis in this series of steps is on getting the fundamentals of teaching right. The nine steps are based on two foundations:

- effective strategies resulting from learning theories tested in both classroom and online environments;
- experience of successfully teaching both in classrooms and online (best practices).

The discerning reader will have noted that there isn't much in this chapter about exciting new tools, MOOCs, the Khan Academy, MIT's edX, mobile learning, artificial intelligence, and many other new developments. These tools and new programs offer great potential and these have been discussed extensively in other chapters. However, it doesn't matter what revolutionary tools or teaching approaches are being used, what we know of how people learn does not change a great deal over time, and we do know that learning is a process, and you ignore the factors that influence that process at your peril.

A subsidiary aim is to encourage you to work with other professionals, such as instructional and web designers and media producers, and preferably in a team with other online instructors.

I have focused mainly on using learning management systems, because that is what most institutions currently have, and LMSs provide an adequate ‘framework’ within which the key processes of teaching and learning can be managed, whatever the mode of delivery. I have more difficulty with integrating lecture capture or web conferencing within the nine steps, because the pedagogy they require is not suitable for developing the skills needed in a digital age.

But if you get the fundamentals of the nine steps right, they will transfer well to the use of new tools, and the design of new courses and new programs; if they don’t transfer well, such tools are likely to be a passing fad and will eventually fade away in education, because they don’t enable the key processes that support learning for a digital age. For example, MOOCs may reach hundreds of thousands of students, but if there is no suitable communication with or ‘online presence’ from an instructor, then most students will fail or lose interest (as is the case at the moment), unless there is significant support from other, more experienced, co-learners, as in cMOOCs. However, this support needs to be structured and organised for effective learning to take place.

The approach I have suggested is quite conservative, and some may wish to jump straight into what I would call second generation flexible learning, based on social media such as mobile learning, blogs and wikis, and so on. These do offer intriguing new possibilities and are worth exploring. Nevertheless, whether or not an LMS is used, for learning leading to qualifications, it is important to remember that most students need:

- well-defined learning goals;
- a clear timetable of work, based on a well-structured organization of the curriculum;
- manageable study workloads appropriate for their conditions of learning;
- regular instructor communication and presence;
- a social environment that draws on, and contributes to, the knowledge and experience of other students;
- a skilled teacher or instructor;
- other motivated learners to provide mutual support and encouragement.

There are many different ways these criteria can be met, with many different tools.

Key Takeaways

1. For the purposes of this book, quality is defined as: *teaching methods that successfully help learners develop the knowledge and skills they will require in a digital age.*

2. Formal national and institutional quality assurance processes do not guarantee quality teaching and learning. In particular, they focus on past ‘best’ practices, processes to be done before actual teaching, and often ignore the affective, emotional or personal aspects of learning. Nor do they focus particularly on the needs of learners in a digital age.

3. New technologies and the needs of learners in a digital age require a re-thinking of traditional campus-based teaching, especially where it is has been based mainly on the transmission of knowledge. This means re-assessing the way you teach and determining how you would really like to teach in a digital age. This requires imagination and vision rather than technical expertise.

4. It is important to determine the most appropriate mode of delivery, based on teaching philosophy, the needs of students, the demands of the discipline, and the resources available.

5. It is best to work in a team. Blended and especially fully online learning require a range of skills that most instructors are unlikely to have. Good course design not only enables students to learn better but also controls faculty workload. Courses look better with good graphic and web design and professional video production. Specialist technical help frees up instructors to concentrate on the knowledge and skills that students need to develop.

6. Full use should be made of existing resources, including institutionally-supported learning technologies, open educational resources, learning technology staff, and the experience of your colleagues.

7. The main technologies you will be using should be mastered, so you are professional and knowledgeable about their strengths and weaknesses for teaching.

8. Learning goals that are appropriate for learners in a digital age need to be set. The skills students need should be embedded within their subject domain, and these skills should be formally assessed.

9. A coherent and clearly communicable structure and learning activities for a course should be developed that are manageable in terms of workload for both students and instructor.

10. Regular and on-going instructor/teacher presence, especially when students are studying partly or wholly online, is essential for student success. This means effective communication between teacher/instructor and students. It is particularly important to encourage inter-student communication, either face-to-face or online.

11. The extent to which the new learning goals of re-designed courses aimed at developing the knowledge and skills needed in a digital age have been achieved should be carefully evaluated and ways in which the course could be improved should be identified.

Chapter 13: Supporting teachers and instructors in a digital age

The purpose of the chapter

When you have read this chapter, you should be able to:

- recognise the need for professional development and training in teaching and define your own needs;
- recognise the role and importance of learning technology support systems;
- be able to design a team approach to teaching large classes;
- understand the need for an institutional strategy to support teaching and learning in a digital age;
- press for changes within your organisation to ensure that quality teaching is properly supported.

What is covered in this chapter

Also in this chapter you will find the following activities

- [Activity 13.6 Developing an institutional strategy for supporting teaching and learning]
- [Activity 13.7 Develop a future scenario for your teaching]

Key Takeaways (from the book as a whole)

1. There is increasing pressure from employers, the business community, learners themselves, and also from a significant number of educators, for learners to develop the type of knowledge and the kinds of skills that they will need in a digital age.

2. The knowledge and skills needed in a digital age, where all 'content' will be increasingly and freely available over the Internet, requires graduates with expertise in:

- knowledge management (the ability to find, evaluate and appropriately apply knowledge);
- IT knowledge and skills;
- inter-personal communication skills, including the appropriate use of social media;
- independent and lifelong learning skills;
- a range of intellectual skills, including:
  - knowledge construction;
  - reasoning;
  - critical analysis;
  - problem-solving;
  - creativity;
- collaborative learning and teamwork;
- multi-tasking and flexibility.

These are all skills that are relevant to any subject domain, and need to be embedded within that domain. With such skills, graduates will be better prepared for a volatile, uncertain, complex and ambiguous world.

3. To develop such knowledge and skills, teachers and instructors need to set clear learning outcomes and select teaching methods that will support the development of such knowledge and skills, and, since all skills require practice and feedback to develop, learners must be given ample opportunity to practice such skills. This requires moving away from a model of information transmission to greater student engagement, more learner-centred teaching, and new methods of assessment that measure skills as well as mastery of content.

4. Because of the increased diversity of students, from full-time campus-based learners to lifelong learners already with high levels of post-secondary education to learners who have slipped through the formal school system and need second-chance opportunities, and because of the capacity of new information technologies to provide learning at any time and any place, a much wider range of modes of delivery are needed, such as campus-based teaching, blended or hybrid learning and fully online courses and programs, both in formal and in non-formal settings.

5. The move to blended, hybrid and online learning and a greater use of learning technologies offers more options and choices for teachers and instructors. In order to use these technologies well, teachers and instructors require not only to know the strengths and weaknesses of different kinds of technology, but also need to have a good grasp of how students learn best. This requires knowing about:

- the research into teaching and learning;
- different theories of learning related to different concepts of knowledge (epistemology);
- different methods of teaching and their strengths and weaknesses.

Without this basic foundation, it is difficult for teachers and instructors to move away from the only model that many are familiar with, namely the lecture and discussion model, which is limited in terms of developing the knowledge and skills required in a digital age.

6. The challenge is particularly acute in universities. There is no requirement to have any training or qualification in teaching to work in a university in most Western countries. Nevertheless teaching will take up a minimum of 40 per cent of a faculty member's time, and much more for many adjunct or contract faculty or full time college instructors. However, the same challenge remains, to a lesser degree, for school teachers and college instructors: how to ensure that already experienced professionals have the knowledge and skills required to teach well in a digital age.

7. Institutions can do much to facilitate or impede the development of the knowledge and skills required in a digital age. They need to:

- ensure that all levels of teaching and instructional staff have adequate training in the new technologies and methods of teaching necessary for the development of the knowledge and skills required in a digital age;
- ensure that there is adequate learning technology support for teachers and instructors;
- ensure that conditions of employment and in particular class size enable teaching and instructional staff to teach in the ways that will develop the knowledge and skills needed in a digital age;
- develop a practical and coherent institutional strategy to support the kind of teaching needed in a digital age.

8. Although governments, institutions and learners themselves can do a great deal to ensure success in teaching and learning, in the end the responsibility and to some extent the power to change lies within teachers and instructors themselves.

9. It will be the imagination of teachers inventing new ways of teaching that will eventually result in the kinds of graduates the world will need in the future.

13.1 Are you a super-hero?

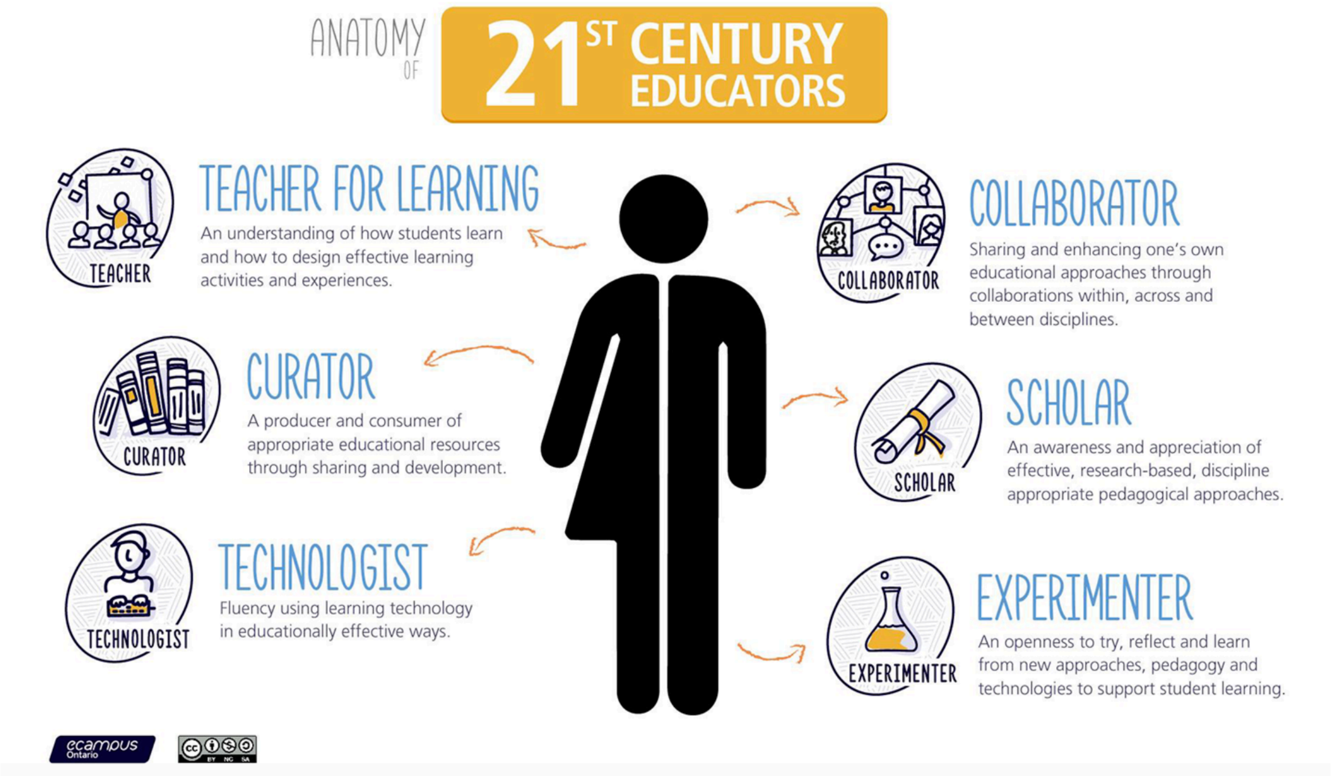


Figure 13.1.1 Image: © Simon Bates/eCampus Ontario

Figure 13.1.1, developed by Simon Bates, Associate Provost, Teaching and Learning at UBC (2016), encapsulates well the role of a teacher or instructor in a digital age. At this point in the book, you might be forgiven for thinking that this is all too much, especially if you are a university professor whose passion is the discipline in which you are an expert, and whose priority is to extend the boundaries of knowledge in that subject through research or other scholarly work. Where an earth will you find the time to become expert in teaching if this means completely changing the teaching model you have become comfortable with? You are not alone in thinking this. Martha Cleveland-Innes (2013) writes:

> *It is unrealistic to expect higher education faculty to have sound, current, content expertise, a productive research program, an active service commitment AND be expert online teachers. The biggest lie in the academy is that the role of faculty, and its rewards and responsibilities, is made up of a seemingly balanced set of activities around teaching, research and service (Atkinson, 2001). With some variation across type of institution, research is the most valued work and most notably*

> *rewarded. While this reality has not changed "…classroom teaching and course materials (have become) more sophisticated and complex in ways that translate into new forms of faculty work. ….. such new forms are not replacing old ones, but instead are layered on top of them, making for more work." (Rhoades, 2000, p, 38). It is time to clarify this reality and consider how, if at all, changes in teaching are, or may be, integrated into the role of faculty member.*

How changes may be integrated into the role of faculty member, instructor or classroom teacher in a digital age is what this chapter is about. It is *not* realistic to expect all teachers to be super-heroes (even if you are the exception), but it *is* realistic to expect all teachers to be competent and professional in a digital age.

The good news though is that if you have read your way through all the chapters in this book, you will have done what you need to do to be competent and professional for teaching in a digital age, and will certainly be ahead of 99 per cent of your colleagues on this (at least until they have also read this book). At the same time, there is much your employing organisation and senior administrators can do to help you in this, which is the focus of the rest of this chapter.

References

Atkinson, M.P. (2001) 'The scholarship of teaching and learning: reconceptualizing scholarship and transforming the academy' *Social Forces*, Vol. 79, No. 4 (pp. 1217-1229).

Bates, S. (2016) The 21st Century Educator Burnaby BC: BCIT Faculty of Nursing Scholarship Day, May

Cleveland-Innes, M. (2013) 'Teaching in an online community of inquiry: institutional and individual adjustment in the new higher education', in Akyol, Z. & Garrison, R.D. (eds.) *Educational communities of inquiry: theoretical framework, research and practice*, (pp. 389-400). Hershey, PA: IGI Global

Rhoades, G. (2000) 'The changing role of faculty' in Losco, J. and Fife, B. (eds.) *Higher Education in Transition: the challenges of the new millennium* Westport CT: Bergin and Garvey

13.2 The development and training of teachers and instructors in a digital age

Figure 13.2.1 A faculty development workshop

13.2.1 The need

By mid-August in most countries in the northern hemisphere, teachers' pro-d and faculty development workshops and conferences have ended, and everyone has headed off for a well earned vacation. Many thousands will have learned how to use a learning management or lecture capture system for the first time, and hundreds of others will have been introduced to new technologies such as e-portfolios, mobile learning, and open educational resources. A smaller but significant number will have been introduced to new methods of teaching built around the potential of new technologies. All good stuff – and all totally inadequate for the needs facing teachers and instructors in a digital age.

13.2.2 A broken professional development model

In universities, faculty are trained, through the doctoral route, to do research, but there is no requirement to be trained in teaching methods. At best faculty development is voluntary for faculty once appointed, and although post-doctoral students may be offered short courses or in some instances even a certificate in preparation for classroom teaching, this is usually voluntary and minimal. Indeed, post-graduate students interested in experimenting with learning technologies or taking professional courses or programs in teaching are often deliberately discouraged by their supervisors from doing so, as it would detract from their research. Increased use of adjunct/contract faculty exacerbates the problem (see Chapter 13.4). Being on contract, they require payment for any training, but institutions are often reluctant to train contract workers who may then leave at the end of the contract and take their training and skills to a competitor.

The situation is somewhat different in two year colleges. Many jurisdictions (but by no means all) have a regional, state or provincial Instructor Diploma Program that some colleges require instructors to take on appointment or shortly afterwards. However, many of these programs have not been adapted to take account of online learning, and probably none are yet up to date on blended learning. I was an external reviewer for one such program a while ago, and there was almost no mention of online or blended learning. Most of the technologies discussed in this program were at least 20 years old.

The lack of comprehensive and systematic training at a pre-service level places a disproportionate burden on ongoing professional development, which is at best ad hoc and variable in both quantity and quality. Above all, it is an entirely voluntary system – in other words, teachers or instructors can choose not to take any in-service workshops or courses on teaching, if they decide – as most do – that their professional development time will be better spent focusing on research rather than teaching. Christensen Hughes and Mighty (2010) argue that less than 10 per cent of all university instructors take professional development activities focused on improving their teaching, and the faculty that do opt in are often those in least need of training as they are often already excellent teachers.

Lastly, most faculty and instructors do not base their teaching practice on empirically-based evidence or research on the effectiveness of different approaches. Christensen Hughes and Mighty (2010) have edited a collection of studies on research on teaching and learning in higher education. In the opening chapter the editors state:

> *…researchers have discovered much about teaching and learning in higher education, but that dissemination and uptake of this information have been limited. As such, the impact of educational research on faculty-teaching practice and student-learning experience has been negligible.*

In the same book, Christopher Knapper (also of Queens University) states (p. 229-230):

> *There is increasing empirical evidence from a variety of international settings that prevailing teaching practices in higher education do not encourage the sort of learning that contemporary society demands….Teaching remains largely didactic, assessment of student work is often trivial, and curricula are more likely to emphasize content coverage than acquisition of lifelong and life-wide skills….*
>
> *[However] there is an impressive body of evidence on how teaching methods and curriculum design affect deep, autonomous and reflective learning. Yet most faculty are largely ignorant of this scholarship, and instructional practices are dominated by tradition rather than research evidence.*

This book has shown that we do not have to invent or discover what's needed to teach well in a digital age. There is a well-established literature and generally agreed best practices, yet, as Christensen Hughes and Mighty have pointed out, many if not a majority of teachers and instructors are unaware or continue to ignore these standards.

13.2.3 Why the system needs to change

When university education was limited to an elite few students, where faculty had a close, one-on-

one relationship with students, it was possible to manage quite effectively without formal training in teaching. That is not the case today. Faculty are challenged by large classes, and heterogeneous students who learn in a variety of ways, with different learning skills and abilities. The emphasis is changing from knowledge as content to knowledge as process. Teaching methods need to be chosen that will develop the skills and competencies needed in a knowledge-based society, and on top of all this, constantly changing technology requires instructors to have analytical frameworks to help choose and use technologies appropriately for teaching.

In particular, the profound effect of the Internet on scholarship, research, work and leisure requires major reconsideration of our teaching methods, if we are to develop the skills and knowledge our students will need in a knowledge-based society. This requires comprehensive and systematic training of our instructors, not a system that depends heavily on opting-in, and that fails to reward adequately excellence in teaching as measured by the standards required in today's context.

Moving to blended, hybrid and online learning requires a much higher standard of training for faculty and instructors. It is not just a question of learning how to use a learning management system or an iPad. The use of technology needs to be combined with an understanding of how students learn, how skills are developed, how knowledge is represented through different media and then processed, and how learners use different senses for learning. It means examining different approaches to learning, such as the construction of knowledge compared with a transmission model of teaching, and how technology best works with either approach. Above all, it means linking the use of technology to the specific requirements of a particular knowledge domain or subject area.

The expansion into blended and online learning has been facilitated mainly by the establishment of separate learning technology support units to support faculty and instructors who do not have the experience or skills to teach online. Although this is essential, it will be prohibitively expensive to continue to expand such units as blended and online learning continues to grow (Bates and Sangrà, 2011). It is much more cost-effective to provide adequate initial pre-service training so that learning technology units can concentrate on training, professional development and R&D into new methods of teaching and learning as new technologies develop.

13.2.4 What needs to be done

Identifying the problem is much easier than fixing it. In particular, the culture especially of universities protects the existing system. Academic freedom is often used as an argument for the status quo, and unions in the college system insist on payment for instructors for any time spent on training over and above their normal teaching load. As Bates and Sangrà (2011) have pointed out, this is a systemic problem. It is difficult for a university, for example, to change for fear that their best young researchers will move to another institution where training in teaching is not demanded.

There are many different ways to address this challenge. I set out one possible strategy below.

13.2.4.1 Recognize that there's a problem

First, it has to be recognized and accepted by institutional leaders, teachers, instructors and faculty, the relevant unions, quality assurance boards and state funding agencies that there is a major problem here. Donovan et al. (2019) in a national survey of post-secondary institutions in Canada, found that while 71 per cent of all institutions rated online learning as very or extremely important for their long-term future, 79 per cent reported that the main barrier to greater adoption of online learning was inadequate training, and in only 29 per cent of institutions was it required in order to teach online.

Developing skilled teachers (and that's what we need in schools, colleges and universities) is as much an economic development as an educational issue. If we want people with the knowledge and skills needed in a digital age, then teachers must get the knowledge themselves about how to develop such skills, and in particular recognize that learning technologies and online learning are critical components in the development of such skills.

13.2.4.2 Start in graduate school

It is much more economical and effective to prepare instructors properly at the start of their careers than to try to get large chunks of their time for training while in their mid or late careers. Although technology will change over time, the basic essentials of teaching and learning are relatively stable. Thus the problem needs to be tackled at the pre-service level. For those wishing to work as faculty in universities, we need to examine the post-graduate degree and in particular the Ph.D., to ensure that there is adequate time for courses on and practice in post-secondary teaching, or develop a parallel route for developing teaching and research skills.

13.2.4.3 Adopt a system-wide approach

Ideally the state or provincial Council of Universities or Colleges, or school boards, should get together and develop a comprehensive system of training for all teachers and ensure that such programs are continually updated. Similarly, a common plan and set of standards needs to be established across a jurisdiction for hiring and promotion linked to proper training in teaching and learning, through the establishment of appropriate working groups that would include professionals from learning technology units and professional development offices.

13.2.4.4 Self-help

We need to walk the talk, and use technology to support professional development. Increasingly, centres for teaching and learning are creating web sites with 'on-demand' resources for faculty and instructors, such as best practices in using video, podcast production, or designing a course with technology. Too often, though, other faculty development support sites focus on the technical operation of technology or just provide a schedule of faculty development workshops, rather than providing pragmatic advice on best educational practice in the use of a particular technology or medium. Also, teachers and instructors need to know about such sites – and use them.

13.2.4.5 Set standards

The system-wide working groups should agree on a 'core' curriculum, minimum standards, and measures of performance for pre-service training in teaching for each sector. These standards should include knowledge and skills needed by learners in a digital age. No person should be hired to new positions that have a major teaching component without recognized training in teaching, once the training system is in place.

ALT (Association of Learning Technologists), UK, provides professional accreditation of learning technologists, operating at three levels (novice, career, advanced) through certified membership of ALT (Association of Learning Technologists). It uses a combination of personal portfolios of work and peer assessment. A similar program could be extended to teachers and instructors, enabling a form of accreditation based on practice as well as taking courses.

For in-service professional development, one strategy would be to require an individual professional development plan for every teacher or instructor annually negotiated between the teacher and their head of department. This plan would include regular up-dating in new teaching methods and technologies, similar to the compulsory professional development programs for medical practitioners. Different individual professional development plans will be needed for different subject areas.

13.2.4.6 Government as watch dog and enforcer

Governments should exert pressure on school boards, colleges and universities to ensure that an adequate pre-service and in-service training system is in place, as a condition of future funding. Governments should refuse to fund any public institution that does not follow the standards for training in teaching set and endorsed by the relevant system-wide authorities.

13.2.4.7 Integrate internally

Blended and fully online teaching and learning technologies should be seen as integral components of professional development, not as separate activities. Therefore faculty development offices should be integrated with learning technology support units into Centres for Teaching and Learning (either centrally or divisionally, depending on the size of the institution), where this has not already occurred.

Figure 13.2.2 Teachers brainstorming about using technology for teaching

13.2.5 Conclusion

We would not dream of allowing doctors or pilots do their work without formal training related to their main work activities, yet this is exactly the situation regarding teaching in post-secondary education. We have to move from a system of voluntary amateurism to a professional, comprehensive system of training for teaching in post-secondary education, and a modern, up-to-date curriculum for pre-service and in-service training of school teachers. This book attempts to provide at least a basic curriculum for this kind of training.

I have suggested some solutions to the systemic problem. Others support the professional communities of practice route (see for instance Carvalho-Fino et al., 2019), which is more culturally acceptable to university faculty, but does not meet the test of being comprehensive and systematic.

Online learning and new learning technologies are not the cause of the problem nor the solution, but they do provide a necessary catalyst for change. Our students deserve no less than properly trained teachers. The current situation, at least in post-secondary education, is increasingly unacceptable, a truth no-one dares to speak. It's about time we dealt with it.

References

Bates, A. and Sangrà, A. (2011) *Managing Technology in Higher Education: Strategies for Transforming Teaching and Learning* San Francisco: Jossey-Bass/John Wiley & Co.

Carvalho-Fina, M. et al. (2019) Twelve tips for implementing a community of practice for faculty development *Medical Teacher*, February 1

Christensen Hughes, J. and Mighty, J. (eds.) (2010) *Taking Stock: Research on Teaching and Learning in Higher Education* Montreal QC and Kingston ON: McGill-Queen's University Press, 350 pp

Donovan, T. et al. (2019) *Tracking Online and Distance Education in Canadian Universities and Colleges: 2019 Canadian National Survey of Online and Distance* Education Halifax NS: Canadian Digital Learning Research Association

Knapper, C. (2010) 'Changing Teaching Practice: Barriers and Strategies' in ChristensenHughes, J. and Mighty, J. eds. *Taking Stock: Research on Teaching and Learning in Higher Education* Toronto ON: McGill-Queen's University Press

Activity 13.2 Identifying your professional training needs

1. Do you believe the professional development system is 'broken'? Is this as true for school teacher education as it is for post-secondary education? Or does the training system in your organisation work reasonably well for teaching in a digital age?

2. Would it be better not to train faculty in universities to teach, but just put them in working groups with instructional designers and media producers?

3. Having read this book (or parts of it) can you now define your own professional training needs? Can you get support for this where you work?

4. In universities, faculty themselves control appointment, tenure and promotion committees. What could be done to make teaching count for more in appointments, tenure and promotion without weakening the academic status or standing of a university?

There is no feedback for this activity; my views on this should be clear from this section!

13.3 Learning technology support

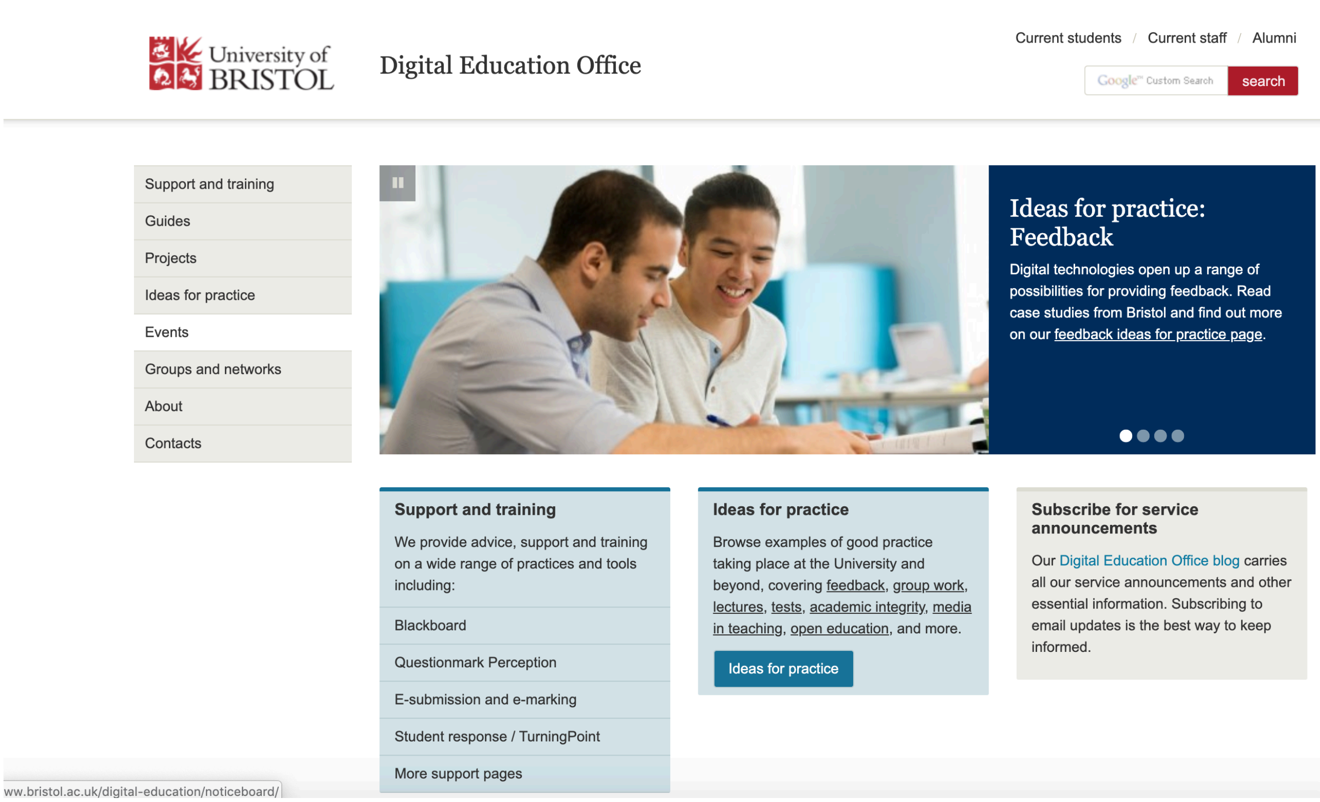


Figure 13.3.1 The University of Bristol Digital Education support site. Click on image to go to web site.

13.3.1 The need for learning technology support systems

There have been many references in this book to the need for teachers and instructors to work, wherever possible, with instructional designers and media producers when teaching in a digital age. The reasons for this are fairly obvious:

- no teacher can be an expert on everything; working in a team covers a wider a range of skills and knowledge;
- technology should be used to decrease instructor and faculty workload, not to increase it, as at present; instructional designers in particular should be able to help teachers and faculty to manage their workload while still producing high quality teaching; media producers enable

subject experts to focus on content and skills development;

- team teaching, with different skills within the team (two or more subject experts, instructional designer, media producer) will lead to higher quality teaching.

As a result, over the last ten to twenty years, there has been a rapid expansion in the number of learning technology support systems, both centrally, and in larger institutions, within different academic departments. Over time, separate units focusing on faculty development, learning technology support, and distance education have become merged or integrated into multi-functional units, under a variety of names, although legacy systems can sometimes take a long while to make this shift.

13.3.2 The scaling problem

As the move to blended, hybrid and online learning increases, so does the demand for these support units, to such an extent that one university I know well now has over 60 support staff and a budget of over $12 million a year for its central Centre for Teaching, Learning and Technology, plus several 'satellite' units in the larger faculties. At the other end a small elementary school will be lucky to have one teacher with some training in maintaining the computers and the Internet added to their responsibilities. However, many school systems also have a central educational technology unit that can provide support to individual teachers and schools within the system.

Institutions are already spending a good deal to support just the fully online courses or programs. We have good models here based on instructional designers and media specialists working in a team with instructors in developing fully online courses. This way, the special design requirements for students studying off campus can be met.

However, at the moment, fully online courses constitute somewhere around 10-15 per cent of all the credit-based teaching in North American universities. What happens when we go to 85 per cent or more of the teaching being blended? The current learning technology support model just won't be able to handle this expansion, certainly not at the rate that it is being predicted. However, without a design strategy for blended learning, and adequate support for faculty and instructors, it is almost certain that the quality will be poor, and it is certain that all the potential benefits of blended learning for transforming the quality of teaching will not be achieved.

Trying to extend the support system from fully online to blended courses and programs will ultimately be unsustainable. Although support units will be essential to get blended learning successfully started, teaching activities must be economically sustainable, which means faculty and instructors will eventually need to become able to design and manage blended learning effectively without continuous and ongoing support from instructional designers and media producers. This will require a huge training and retraining effort for instructors.

13.3.3 Faculty training or support units? The need for balance

I am a strong supporter of such specialised units to work with teachers and instructors. However, this has to be balanced against the costs. Funding from these units usually comes from within the overall budget for teaching and learning which in the end results in larger classes. These support units grow in inverse proportion to the lack of pre-service and in-service training.

However, these learning technology support units are essential for the effective development of teaching in a digital age. Thus a balance needs to be found between the provision of training in the use of learning technologies and the need for learning technology support units, which is why faculty development and learning technology units have tended to become integrated, and why institutions need a defined strategy for supporting teaching and learning. Thus although it is possible for a particularly dedicated teacher to teach successfully without such support, learning technology support units are becoming an essential service for most teachers and instructors.

Activity 13.3 Learning technology support

1. What kind of learning technology support can you readily access? Is there enough? Can it provide the help you need? Have you tried? Is it close at hand or distant?
2. What kind of support would you like that isn't being provided at the moment? Have you talked to your learning technology support unit about what kind of help you would like?
3. Does the unit combine faculty development, learning technology support, and distance education, or are they all in separate units? Does this matter to you?

There is no feedback on this activity.

13.4 Conditions of employment

Figure 13.4.1 Class size affects the capacity to develop the skills and knowledge needed in a digital age

There are currently some major changes in conditions of employment that will influence the ability of individual teachers and instructors to deliver the kind of teaching needed in a digital age.

13.4.1 Class size

The most obvious is class size. Although some economies of scale are definitely achievable through the use of technology for teaching (see for instance, Bates, 2013), and there is no magic number as to how many students there should be per teacher, we have seen in earlier chapters that instructor presence and the interaction between subject experts and students are critical factors in developing the knowledge and skills needed in a digital age.

Although technology can replace the need for instructors for the transmission of content, the need for ongoing communication between teacher and students for deep understanding and the development of skills, means that there soon becomes a limit, in terms of the number of students per instructor, beyond which the teaching rapidly starts to become ineffective, at least in terms of the knowledge and skills that matter most (Carey and Trick, 2013).

Thus the major challenge is in universities and some large two-year colleges, where first and second year classes can number in the thousands, and even in third or fourth year classes, in the hundreds. What can be done to ensure that teacher student ratios are kept to a manageable size? Institutions have taken a number of different approaches to this challenge.

13.4.2 The increased use of contract instructors and teaching assistants

One of the biggest changes to universities in North America over the last twenty years has been the growth of non-tenured teaching faculty in universities. An explosion in undergraduate enrolments across Canada – 400,000 more students from 2002 to 2012 – has come without a corresponding increase in tenure-track faculty. While the number of instructors doubled between the 1980s and 2006, there was a decline of 10 per cent in tenure and tenure-track faculty (Chiose, 2015). The position is, if anything, even more dramatic in the USA, where universities and colleges were much harder hit by the economic crisis in 2008 than their Canadian counterparts.

In an article in Canada's leading newspaper, the Globe and Mail, Simona Chiose wrote (2018):

> *Canadian universities say they can no longer afford to deliver higher education through tenured academics who may spend more than a third of their time engaged in research. Instead, most universities have decided that, to staff their classrooms at reasonable cost, they must turn, in varying degrees, to contract instructors and teaching-track faculty.*

Contract staff such as adjuncts or sessionals usually have either a doctoral degree in the subject area, or strongly related work experience for more vocational subjects. In Canada, the union representing contract instructors (CUPE) is fighting to get multiyear contracts for sessional instructors who now have to reapply each year for their jobs. Ideally, the union would like universities to give sessional instructors priority for teaching-track jobs, which do not have tenure, but have more job security than contract positions. With job security can come opportunities for training in teaching.

However, an even more alarming development in recent years has been an increasing tendency to use post-graduate students as teaching assistants, often responsible for delivering lectures to 200 students or more in first and second year courses. This model is also being increasingly used where institutions are moving to a hybrid model, combining both online and face-to-face components, especially where a former very large lecture-based course is being redesigned for hybrid learning. Even including the TAs, the instructor/student ratio is often 1:100 or higher for these large enrollment courses. There is usually no additional training for TAs about how to teach online, although in many – but by no means all – cases, they do get some kind of training in teaching face-to-face.

With fully online courses, though, a different model has often been used where the instructor:student ratio has been deliberately targeted at under 40 for undergraduate courses, and under 30 for graduate courses. Scaling up has been handled by hiring additional part-time adjunct or associate professors on contract. The adjuncts would be paid to take a short online briefing course on teaching online which sets out the expectations for online teaching. This was an affordable model because the additional student tuition fees would more than cover the cost of hiring additional contract instructors, once the course was developed (Bates and Poole, 2003).

However, this has been possible because most of such online courses have been aimed mainly at higher level undergraduate students or graduate students. With both blended and online courses now being targeted at large first and second year classes, new models are being developed that may not have the same level of quality as the 'best practice' online courses. This is a particularly difficult issue for several reasons:

- practices both for dealing with large face-to-face classes and with online classes vary considerably within each form of delivery, and from one institution to another, so making generalizations is fraught with danger;
- decisions about whether to use teaching assistants or part-time, contract instructors, are driven more by financial considerations than by best pedagogical practice;
- there are other factors at work besides money and pedagogy in the use of teaching assistants and adjunct faculty, such as the desire to provide financial support to international and graduate students, the idea of apprenticeship in teaching, and the supply and demand effects on the employment of doctoral graduates seeking a career in university teaching and research;
- there is no golden mean for instructor/student ratios in either blended or online learning. In the mainly quantitative/STEM subjects, much higher ratios are sustainable without the loss of quality, through the use of automated marking and feedback, for the theory component, while the practical component requires much lower ratios due to the need to share equipment and monitor students;
- MOOCs are (wrongly) giving the impression that it is possible to scale up even credit-based online learning at lower cost, by eliminating learning support provided by tenured faculty.

Despite these caveats, there is a genuine concern that the over-reliance on teaching assistants for online and blended courses will have three negative consequences for both students and online learning in general:

- as with the large face-to-face classes, the pedagogy for online or blended courses will resort more to information transmission, due to the TAs' lack of training and experience in teaching online;
- for the online or hybrid courses, student drop-out and dissatisfaction will increase because, especially in first and second year teaching, they will not get the learning support they need when studying online. As a result, faculty and students will claim that hybrid or fully online learning is inferior to classroom-based instruction;
- faculty and especially faculty unions will see online learning and blended learning being used by administrations to cut costs and over time to reduce the employment of tenured faculty, and will therefore try to block its implementation.

Why can't TAs provide the support needed online if they can do this for face-to-face classes? First, it is arguable whether they do provide adequate support for students in large first year classes, but in online courses in subject domains where discussion is important, where qualitative judgements and decisions have to be made by students and instructors, where knowledge needs to be developed and structured, in other words in any field where the learning requires more than the transmission and repetition of information, then students need to be able to interact with an instructor that has a deep understanding of the subject area. Thus there are good reasons to hire adjunct faculty (as usually they already have post-graduate qualifications) to teach online or in blended formats, but not TAs in general (although there will always be exceptions).

13.4.3 The elephant in the room

However, the discussion about the use of adjuncts and TAs masks a more significant issue. There are two factors that lead to the very large class sizes in first and second year that faculty and their unions really don't want to talk about:

- the starvation of first and second year students of teaching resources; senior faculty concentrate more on upper level courses, and want to keep these class sizes smaller. As a consequence first and second year students suffer;
- teaching subsidizes research: too often tuition revenues get filtered off into supporting research activities. The most obvious case is that if teachers spent more time teaching and less doing research, there would be more faculty available for teaching. Teaching loads for experienced, tenured faculty are often quite light and as stated above, focused on small upper level classes. A report from the Higher Education Quality Council of Ontario (Jonker and Hicks, 2014) suggested that if professors whom it has classified as laggards in research doubled their teaching time, it would be the equivalent of adding 1,500 faculty members across the province, enough to staff an additional mid-sized university.

13.4.4 The increasing diversity of teachers

Much has been said in this book about the increasing diversity of students, and the implications for teaching. We should add to that the increasing diversity of teachers:

- fully tenured, research-focused faculty, with very high academic qualifications but relatively little or no training in teaching;
- contract adjunct or sessional instructors, highly qualified academically, but with little or no chance of professional development in the teaching area;
- teaching assistants, with mid-level academic qualifications and little or no training in teaching;
- work-experienced vocational and technical instructors, with a small amount of training in teaching;
- school teachers, well trained in general teaching methods, but few with training specifically for teaching in a digital age.

The reasons for and the significance of this increasing diversity of teachers and instructors is beyond the scope of this book. Nevertheless, without some kind of job security there is little opportunity or incentive for training in new technologies and teaching methods.

References

Bates, A. and Poole, G. (2003) *Effective Teaching with Technology in Higher Education: Foundations for Success* San Francisco: Jossey-Bass

Bates, T. (2013) Productivity and online learning redux, Online Learning and Distance Education Resources, December 23

Carey, T., & Trick, D. (2013). *How Online Learning Affects Productivity, Cost and Quality in Higher Education: An Environmental Scan and Review of the Literature*. Toronto: Higher Education Quality Council of Ontario,

Chiose, S. (2018) Increased pressures, class sizes, taking their toll on faculties in academia, *Globe and Mail*, May 12

Jonker, L. and Hicks, M. (2014) *Teaching Loads and Research Outputs of Ontario University Faculty: Implications for Productivity and Differentiation* Toronto: Higher Education Quality Council of Ontario

Activity 13.4 Conditions of employment

1. Why does class size matter particularly for developing the knowledge and skills needed in a digital age?
2. Some governments think online learning will enable larger classes. Do you agree? What are your reasons?
3. What are the advantages and disadvantages of having just teaching staff in universities, such as tenure track teaching professors and/or adjuncts/sessionals/contract instructors, in terms of the development of the knowledge and skills required in a digital age?

Click on the podcast below for my views on the above:

An audio element has been excluded from this version of the text. You can listen to it online here: https://pressbooks.bccampus.ca/teachinginadigitalagev2/?p=343

13.5 Team teaching

Figure 15.5.1 Breaking down a large lecture class into smaller groups Image: © University of Texas at San Antonio

There is no easy solution to the problem of reducing class size to numbers that will ensure all students can be helped to develop the knowledge and skills needed in a digital age. Alex Usher in his blog One Thought to Start Your Day examines different ways to allocate teaching loads to instructors, resulting in classes of different sizes. However, teaching load is usually organised at a departmental level. Too often, an individual instructor has little choice over the size of class to which they are allocated.

Whatever the course design, face-to-face, blended or fully online, large numbers of students per instructor limits what is possible pedagogically. It is extremely difficult to teach the higher level skills of critical thinking, problem-solving and collaborative working in very large classes. Nevertheless, there are several successful approaches to re-designing these large introductory courses of 1,000 students or more, involving the use of blended learning. See for instance:

- the National Center for Academic Transformation's course redesign process,
- a large first year psychology course at McMaster University,
- an online large enrolment course in anatomy at Dalhousie University

The following design attempts to build in at least some opportunities for the development of high level skills in a very large class:

- create a team to design, develop and deliver the course; the team will include a senior tenured professor, four TAs, plus an instructional designer and web/multimedia designer allocated to help with the initial design;
- the senior professor acts as a teaching consultant, responsible for the overall design of the course, hiring and supervising the work of the TAs, and designing the assessment strategy/ questions and rubrics, in consultation with the rest of the team;
- nearly all content is provided online through a combination of short videos and textual material designed and loaded on the LMS; this is largely the work of the senior professor working with the instructional designer, assisted by the TAs, before the course begins;
- computer-marked assignments are used to mark student comprehension and understanding, and to provide automated feedback/guidance; there is an end-of semester computer-marked assignment that provides an individual mark for each student;
- students are allocated to groups of 33, and each of the TAs is responsible for eight student groups, or 250 per TA;
- each TA acts as the day-to-day link for each of the 33 students in each of the eight groups they are responsible for;
- each class of 33 is divided into five sub-groups of six to seven students, who work on two projects a semester; the first project is not assessed, but is subject to student peer review, using guidelines/rubrics established by the senior professor; the second project is assessed by the TAs (roughly 40 assignments per TA), again using rubrics designed by the senior professor. The projects aim to develop specific, pre-identified skills, such as critical thinking, problem solving, and collaborative working.
- students in each group of six or seven work through online discussion forums or face-to-face on each project, depending on convenience to the students. The discussion forums are lightly moderated by the TAs, mainly to ensure that students are on topic and respectful to each other; if serious issues arise, these are referred to the senior professor;
- TAs mark the group assignments, following rubrics decided earlier, and the senior professor monitors and calibrates the marking between instructors; for each student their group mark (50%) is added to their individual mark (50%) from the end-of-semester computer-marked assignment;
- the senior professor meets for one hour a week with a different group of 33 students three times a week either face-to-face or synchronously online; this means that every student gets at least one hour of personal interaction with the senior professor during the semester. The sessions are used to discuss key issues in the course and focus on the pre-determined skills development.

Whatever detailed design is done, these large courses should have a clear business model to work with, which basically provides an overall budget for the course, that includes the cost of the TAs, and takes account of the students numbers (more students, more budgeted money), but allowing the senior professor to build the team as best as possible within that budget. TAs would receive a briefing on responsibilities, online mentoring, assessment marking, for which they would be paid in addition to or as part of their teaching contract.

Ideally though the organization of teaching should not result in such very large classes, if at all possible. However, the principle of team teaching should be considered for all classes with more than 30 or so students.

Reference

Sana, F. et al. (2011) A Case Study of the Introductory Psychology Blended Learning Model at McMaster University *The Canadian Journal for the Scholarship of Teaching and Learning*, Vol. 2, No.1

Usher, A. (2019) Managing Class Size *One Thought to Start Your Day*, Higher Education Strategy Associates, September 18

Activity 13.5 Designing a team approach

1. Assume you have a class of 1,600 students for which you are responsible. You have the resources to hire two adjunct faculty and six TAs. How would you design the class?

There is no feedback for this activity.

13.6 An institutional strategy for teaching in a digital age

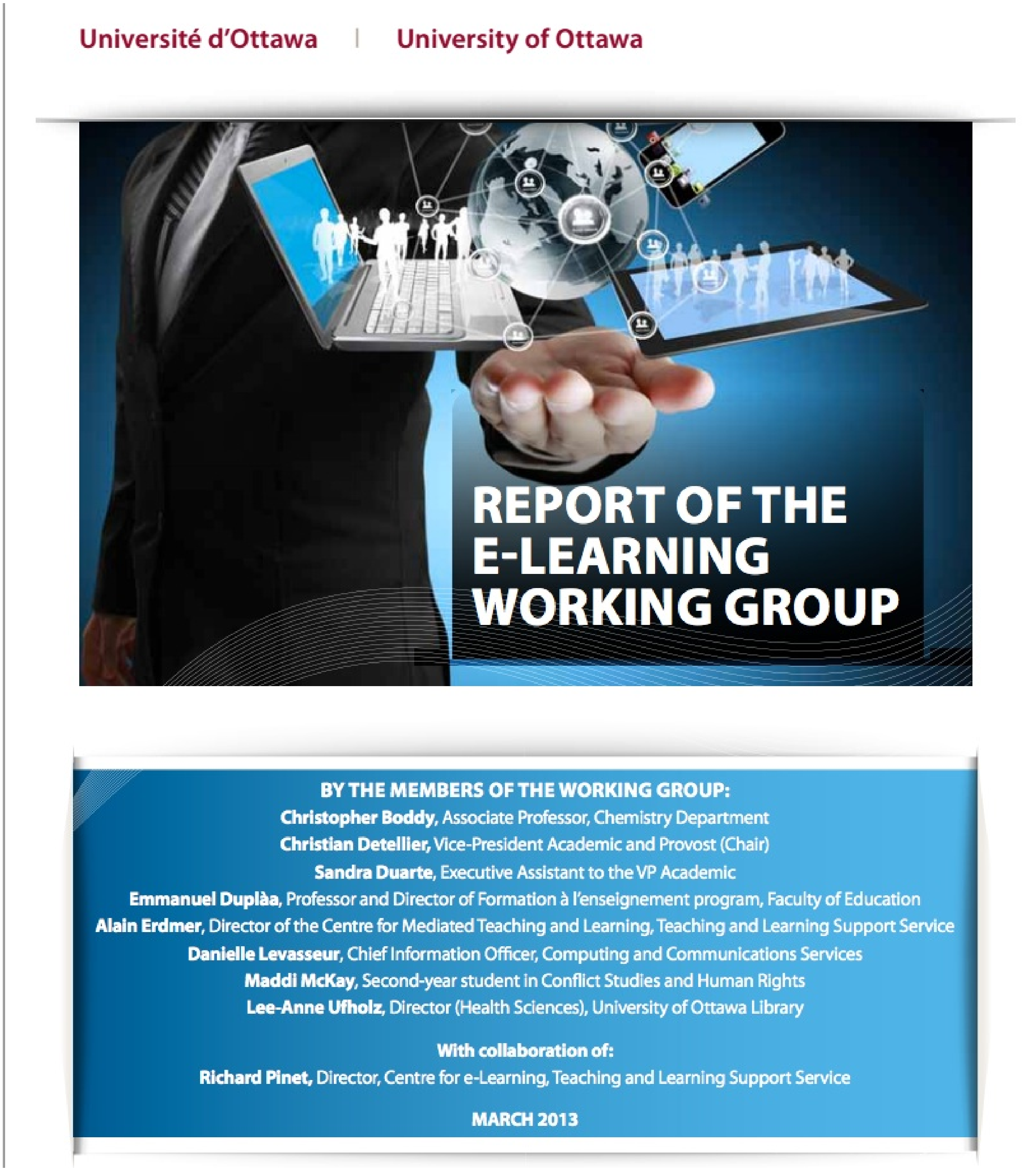


Figure 13.6.1 The University of Ottawa's e-learning plan. Click on the graphic to access the plan.

It can be seen that issues around faculty development and training, class size, hiring of contract instructors and teaching assistants, and team work will influence the organisation's capacity to do the kind of teaching that will develop the knowledge and skills needed in a digital age (or any other age, for that matter). It may be possible for you, particularly if you are tenured faculty working in a university, individually to make the necessary changes to your teaching to fit the needs of a digital age, but for the majority of teachers and instructors, the institution as a whole needs to support the necessary changes to teaching. It can do this best by having a formal plan or strategy that sets out:

- the rationale for changes;
- the goals or outcomes that such changes will lead to (for example, learners with specified skills and competencies);
- actions that will support the changes (for example, funding for new course design, re-organisation of services);
- a financial strategy to support the intended changes, such as funding for innovation in teaching;
- a way of measuring successful implementation of the strategy.

There are various ways in which such a strategy may be developed (see Bates and Sangrà, 2011), including top-down and bottom-up processes for setting overall goals, but in a university it may be through an annual academic planning process where departments/faculties must submit their plans for the next three years, including resources needed, based on meeting the overall academic goals set by the university. In such a planning cycle, it is important to include the goals for meeting the needs of learners in a digital age as 'targets' for departments when drawing up their plans. These plans should indicate not only content to be covered but also delivery and teaching methods to be used, with a rationale for them.

Many universities and colleges are in the process of developing or implementing such plans, such as the University of British Columbia's Flexible Learning Initiative and the University of Ottawa's e-learning plan. Indeed, at least in Canada, most institutions have recognised the need for a strategic plan for 'e-learning'. Donovan et al. (2019) found that 71 per cent of responding post-secondary institutions reported that online learning is very or extremely important for the institution's long-term strategic or academic plan. However, only 42 per cent actually had implemented or were implementing a strategic plan for e-learning, and it is not know how closely these plans are tied to the development of the knowledge and skills needed in a digital age, or whether they focus mainly on resources or organizational issues. Nevertheless, a good plan, preferably dynamic and continually reviewed, is essential for such developments.

Lastly, it is of course important for anyone who has read this book to make sure they are actively engaged in such processes, to help shape policy and direction. Without institutional support, it will be difficult to make significant changes.

References

Bates, A. and Sangrà, A. (2011) *Managing Technology in Higher Education: Strategies for Transforming Teaching and Learning* San Francisco: Jossey-Bass/John Wiley & Co.

Donovan, T. et al. (2019) *Tracking Online and Distance Education in Canadian Universities and Colleges: 2019 Canadian National Survey of Online and Distance* Education Halifax NS: Canadian Digital Learning Research Association

University of British Columbia (2014) Flexible Learning – Charting a strategic vision for UBC (Vancouver Campus) Vancouver BC: Flexible Learning Implementation Team

University of Ottawa (2013) *Report of the e-Learning Working Group* Ottawa ON: The University of Ottawa

Activity 13.6 Developing an institutional strategy for supporting teaching and learning

1. Does your organisation have a strategy for teaching and learning? Is it any good? Does it deal with the needs of learners in a digital age?

2. If you could design or change your organisation's strategy for teaching and learning, what would you include?

There is no feedback provided on this activity.

13.7 Building the future

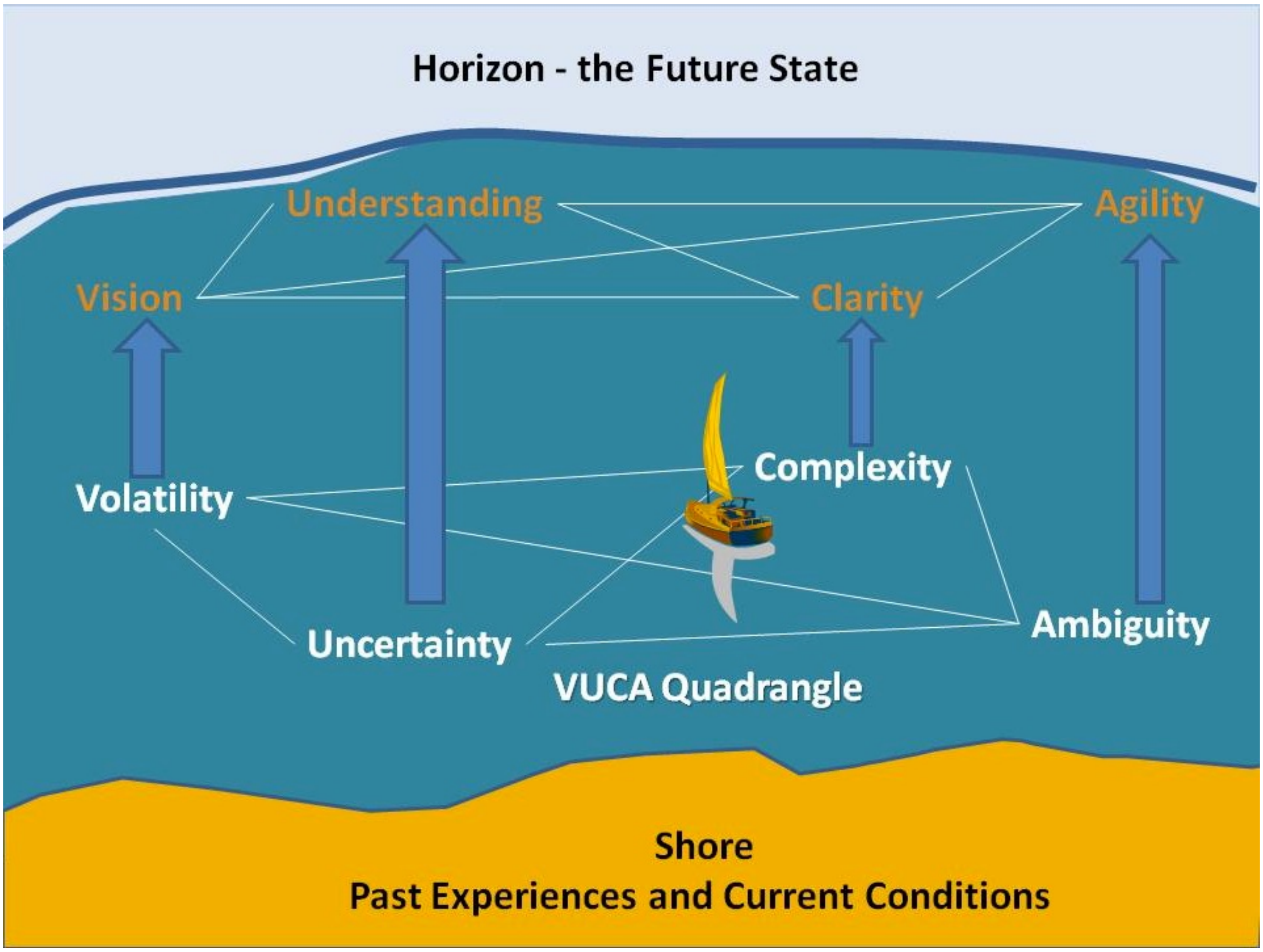


Figure 13.7.1 Navigating a volatile, uncertain, complex and ambiguous world
Image: © Carol Mase, Free Management Library, 2011, used with permission

13.7.1 The rationale for change

This book really sets out the case for increased training in teaching methods, or more accurately a different approach to training, for teachers, instructors and faculty, if students are to be fully prepared for life in a digital age. The argument goes like this:

1. There is increasing pressure from employers, the business community, learners themselves, and also

from a significant number of educators, for learners to develop the type of knowledge and the kinds of skills that they will need in a digital age.

2. The knowledge and skills needed in a digital age, where all ‘content’ will be increasingly and freely available over the Internet, requires graduates with expertise in:

- knowledge management (the ability to find, evaluate and appropriately apply knowledge);
- IT knowledge and skill;
- inter-personal communication skills, including the appropriate use of social media;
- independent and lifelong learning skills;
- a range of intellectual skills, including:
    - knowledge construction;
    - reasoning;
    - critical analysis;
    - problem-solving;
    - creativity;
- collaborative learning and teamwork;
- multi-tasking and flexibility.

These are all skills that are relevant to any subject domain, and need to be embedded within that domain. With such skills, graduates will be better prepared for a volatile, uncertain, complex and ambiguous world.

3. To develop such knowledge and skills, teachers and instructors need to set clear learning outcomes and select teaching methods that will support the development of such knowledge and skills, and, since all skills require practice and feedback to develop, learners must be given ample opportunity to practice such skills. This requires moving away from a model of information transmission to greater student engagement, more learner-centred teaching, and new methods of assessment that measure skills as well as mastery of content.

4. Because of the increased diversity of students, from full-time campus-based learners to lifelong learners already with high levels of post-secondary education to learners who have slipped through the formal school system and need second-chance opportunities, and because of the capacity of new information technologies to provide learning at any time and any place, a much wider range of modes of delivery are needed, such as campus-based teaching, blended or hybrid learning and fully online courses and programs, both in formal and in non-formal settings.

5. The move to blended, hybrid and online learning and a greater use of learning technologies offers more options and choices for teachers and instructors. In order to use these technologies well, teachers and instructors require not only to know the strengths and weaknesses of different kinds of technology, but also need to have a good grasp of how students learn best. This requires knowing about:

- the research into teaching and learning;

- different theories of learning related to different concepts of knowledge (epistemology);
- different methods of teaching and their strengths and weaknesses.

Without this basic foundation, it is difficult for teachers and instructors to move away from the only model that many are familiar with, namely the lecture and discussion model, which is limited in terms of developing the knowledge and skills required in a digital age.

6. The challenge is particularly acute in universities. There is no requirement to have any training or qualification in teaching to work in a university in most Western countries. Nevertheless teaching will take up a minimum of 40 per cent of a faculty member's time, and much more for many adjunct or contract faculty or full time college instructors. However, the same challenge remains, to a lesser degree, for school teachers and college instructors: how to ensure that already experienced professionals have the knowledge and skills required to teach well in a digital age.

7. Institutions can do much to facilitate or impede the development of the knowledge and skills required in a digital age. They need to:

- ensure that all levels of teaching and instructional staff have adequate training in the new technologies and methods of teaching necessary for the development of the knowledge and skills required in a digital age;
- ensure that there is adequate learning technology support for teachers and instructors;
- ensure that conditions of employment and in particular class size enable teaching and instructional staff to teach in the ways that will develop the knowledge and skills needed in a digital age;
- develop a practical and coherent institutional strategy to support the kind of teaching needed in a digital age.

13.7.2 Building your own future

Although governments, institutions and learners themselves can do a great deal to ensure success in teaching and learning, in the end the responsibility and to some extent the power to change lies within teachers and instructors themselves. In probably no other profession is there such an opportunity to work in the way that you choose.

To help you create the kind of teaching needed in a digital age, Chapter 6, Section 10 provides an exercise for building a rich learning environment for your students, applying the guidelines outlined in this book.

Although a sound basis of knowledge and experience is important, no other quality in teachers is more important than vision and imagination. This book attempts to provide a glimpse into the possibilities of teaching in the future, but that future still needs to be invented. The demands of the market, the ethical and moral challenges of society, changing technologies, and the diversity of learning needs are all components in a complex mix of factors that require an appropriate response from teachers and instructors.

This book attempts to provide some foundations for decision-making in this volatile, uncertain, complex and ambiguous world, and I end with Scenario I that aims to suggest one possibility for the future, but it will be the imagination of you and other teachers inventing new ways of teaching that will eventually result in the kind of graduates the world will need in the future. I hope this book in some small way will help you along this road.

Activity 13.7 Develop a future scenario for your teaching

1. Read Scenario I and/or the other scenarios in this book. Now write your own scenario for your own teaching. Do NOT take into account current resources or institutional policies.

2. What would have to change in your organisation to make your scenario possible?

There is no feedback provided for this activity.

Key Takeaways

1. There is increasing pressure from employers, the business community, learners themselves, and also from a significant number of educators, for learners to develop the type of knowledge and the kinds of skills that they will need in a digital age.

2. The knowledge and skills needed in a digital age, where all 'content' will be increasingly and freely available over the Internet, requires graduates with expertise in:

- knowledge management (the ability to find, evaluate and appropriately apply knowledge);
- IT knowledge and skills;
- inter-personal communication skills, including the appropriate use of social media;
- independent and lifelong learning skills;
- a range of intellectual skills, including:
    - knowledge construction;
    - reasoning;
    - critical analysis;
    - problem-solving;
    - creativity;
- collaborative learning and teamwork;
- multi-tasking and flexibility.

These are all skills that are relevant to any subject domain, and need to be embedded within that domain. With such skills, graduates will be better prepared for a volatile, uncertain, complex and ambiguous world.

3. To develop such knowledge and skills, teachers and instructors need to set clear learning outcomes and select teaching methods that will support the development of such knowledge and skills, and, since all skills require practice and feedback to develop, learners must be given ample opportunity to practice such skills. This requires moving away from a model of information transmission to greater student engagement, more learner-centred teaching, and new methods of assessment that measure skills as well as mastery of content.

4. Because of the increased diversity of students, from full-time campus-based learners to lifelong learners

already with high levels of post-secondary education to learners who have slipped through the formal school system and need second-chance opportunities, and because of the capacity of new information technologies to provide learning at any time and any place, a much wider range of modes of delivery are needed, such as campus-based teaching, blended or hybrid learning and fully online courses and programs, both in formal and in non-formal settings.

5. The move to blended, hybrid and online learning and a greater use of learning technologies offers more options and choices for teachers and instructors. In order to use these technologies well, teachers and instructors require not only to know the strengths and weaknesses of different kinds of technology, but also need to have a good grasp of how students learn best. This requires knowing about:

- the research into teaching and learning;
- different theories of learning related to different concepts of knowledge (epistemology);
- different methods of teaching and their strengths and weaknesses.

Without this basic foundation, it is difficult for teachers and instructors to move away from the only model that many are familiar with, namely the lecture and discussion model, which is limited in terms of developing the knowledge and skills required in a digital age.

6. The challenge is particularly acute in universities. There is no requirement to have any training or qualification in teaching to work in a university in most Western countries. Nevertheless teaching will take up a minimum of 40 per cent of a faculty member's time, and much more for many adjunct or contract faculty or full time college instructors. However, the same challenge remains, to a lesser degree, for school teachers and college instructors: how to ensure that already experienced professionals have the knowledge and skills required to teach well in a digital age.

7. Institutions can do much to facilitate or impede the development of the knowledge and skills required in a digital age. They need to:

- ensure that all levels of teaching and instructional staff have adequate training in the new technologies and methods of teaching necessary for the development of the knowledge and skills required in a digital age;
- ensure that there is adequate learning technology support for teachers and instructors;
- ensure that conditions of employment and in particular class size enable teaching and instructional staff to teach in the ways that will develop the knowledge and skills needed in a digital age;
- develop a practical and coherent institutional strategy to support he kind of teaching needed in a digital age.

8. Although governments, institutions and learners themselves can do a great deal to ensure success in teaching and learning, in the end the responsibility and to some extent the power to change lies within teachers and instructors themselves.

9. It will be the imagination of teachers inventing new ways of teaching that will eventually result in the kinds of graduates the world will need in the future.

Scenario I: Stopping the flu

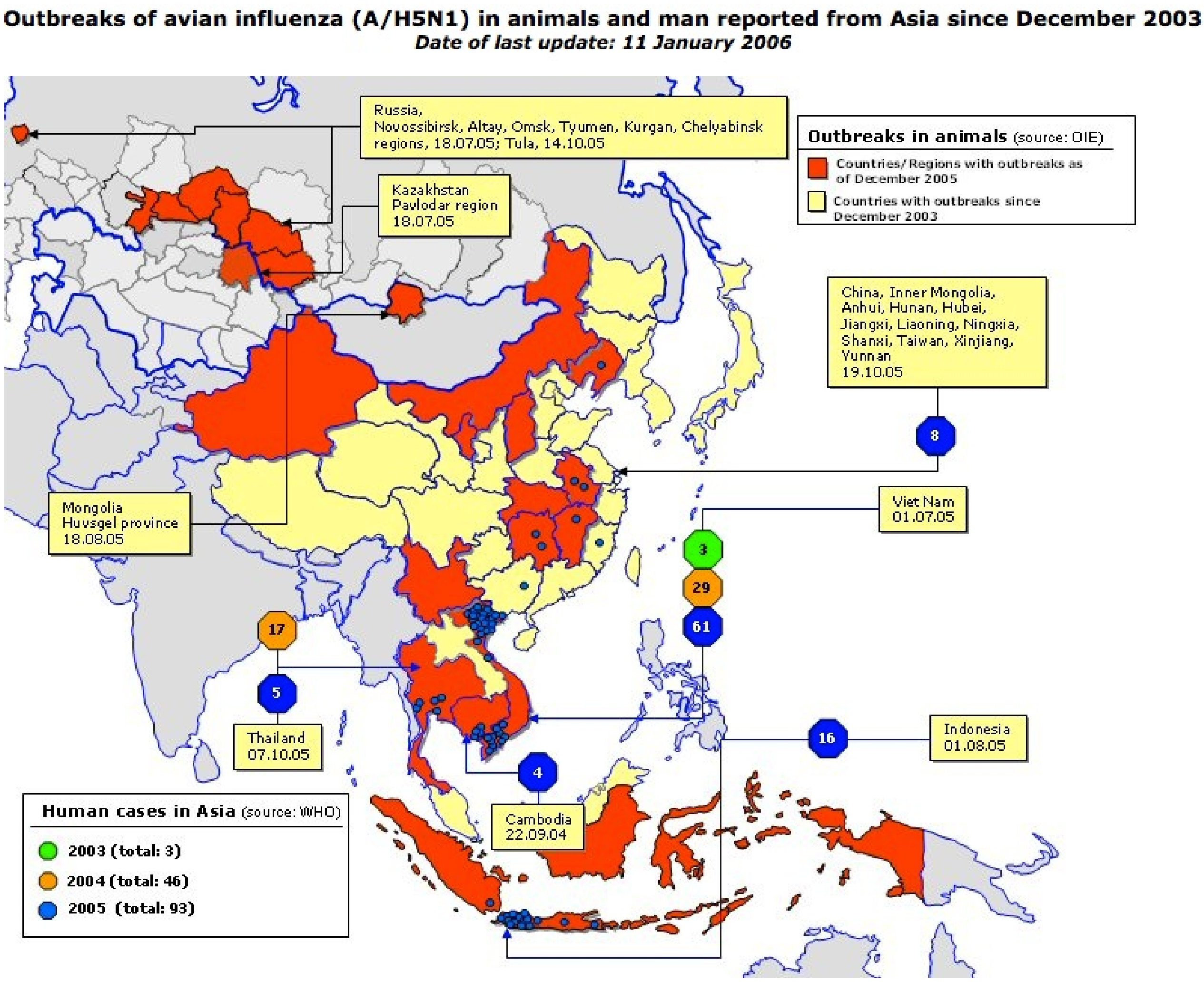


Figure 13.I Stopping the flu
Image: © European Commission, 2015

Hi, Chris, you asked for an update on what I'm studying at the University of Central Canada. Well, I'm about half-way through a really neat program called Global Science. We get to choose from about five or six problems to research. At the moment, the problem I've chosen is called 'Stopping the flu.' Basically, we're looking at the influenza virus, and how to prevent pandemics. I thought when I started it would be all medicine, but I'm having to do math, geography, agriculture, even management and communications, as well as other types of science because they are all related in *some way to the problem we are looking at. We work as a group on defining the problem, collecting data, and interpreting the results.*

I'm in a group of 25 students, and they are from all over the world. Altogether there are over 2,000 students taking the program. My main instructor, Dr. Madelaine McVicar, who is responsible for my group of 25, is based the other side of the country in a hospital in Halifax, but really she's more like a conductor of an orchestra, because the course uses experts from all over the world, some of whom come in with just short podcasts or YouTube videos, while others run webinar sessions that deal with specific questions as they come up in our research. Dr. McVicar is great at finding resources to help us, and we also occasionally get sessions online with some of the professors at UCC who helped design the program.

What threw me at the beginning was the lack of lectures or pre-determined weekly study topics. Although we all had to do a set of modules on basic research methods, and we have a sort of program guide on the web designed by the UCC profs, we choose study topics and are provided with a guide to a wide range of resources, mainly free stuff available all over the Internet, such as published papers in open access journals or stuff in MOOCs that will directly help us with the research problem we are tackling. The course web site gave us some leads as to where to look, and we had to provide an interim report early on to Dr. McVicar that listed the resources we were accessing or looking for. Some of these topics, such as the molecular structure of the flu virus, are pretty obvious, but other topics we had to identify ourselves. I was particularly interested in the link between international travel and the spread of flu. One of the things we have to do always is to provide an evaluation of the sources we use and their reliability.

Each month the group has to create our own online reports – called e-portfolios – which shows the progress we've made on the research question each month. In the end, we get 50 per cent of our marks from the monthly group e-portfolios and the other 50 per cent from an individual e-portfolio we each create summarizing the whole project and our individual contribution to the project. Dr. McVicar does the marking and grading.

There's about 20 other student groups from UCC researching the same question, and we are sharing data across the groups, so we get great help and feedback from the other groups as well, through a discussion forum and a shared web site for the monthly e-portfolios. Because of my job, I'm particularly interested in mortality rates from different kinds of flus and I was able to hook up with another student in another group who turns out to be a specialist in that subject, working for a Swiss insurance company – it might even lead to a job for me!

Because of the agreements UCC has made with many hospitals and health authorities around the world, we're getting access to some great data. We often have to go and find local data ourselves, such as the number of local hospital admissions for flu in a particular week. For instance, we were able to track the spread of a particular strain from the first week of our course, when it was identified in China, across the world over the following five months. UCC also has an agreement with IBM to load the data and use some of their analytics as well. Apparently UCC got money from one of the research councils to support some of the research on this program because of the ability to draw on so many sources of relatively raw data from around the world, which means my group sometimes get Skyped by one of the UCC profs who wants access to our data! Another group even got asked by the WHO (the World Health Organization, not the rock group) for their data.

Many of the international students are in other universities, and will transfer the credits into their own program, although a lot of the students are also sponsored by employers, such as hospitals or government agencies. You can in fact get a badge for successfully completing just one of the research problems, and a diploma for doing all three. However, the final 60 credits of the degree program requires me to do my own, individual research project, and I think I'll try and do that, because I need that to go on to grad school, although everyone says that doing the individual research project is pretty tough, as the standard is very high.

But what I really like about this program is that I'm learning so much, so quickly. We're dealing with a real problem, and you know, having so many people from such different backgrounds all working on the same problem means that I feel we are actually making a difference, as well as studying.

Acknowledgement: This scenario was originally developed for the U.K. Open University and is used with their permission. The scenario was influenced by McMaster University's integrated science program. However, the McMaster program is an on-campus program limited to a highly selected group of 50 students.

Appendix 1: Questions to guide media selection and use

The questions on the following pages should be used in conjunction with Chapter 8, and address a real context that you may be facing, such as designing a new course.

It is recommended you work through each question one by one, possibly making notes of your answers. It is also recommended that you do this in a fairly systematic manner the first two or three times when faced with a possible choice of media for a whole course or program. This could take a few days, allowing time for thinking. Some questions may need to wait until other questions have been answered. It will likely to be an iterative process.

After you have worked through the questions, give yourself a day or two if possible before thinking about what media or technology will best fit with your course or program. Discuss your thoughts about media use with other instructors and with any professionals such as an instructional designer or media designer before the design of the course. Leave yourself open to making more final decisions as you start designing/developing and delivering the course, with the option of checking back with your notes and more details in Chapter 8.

After the first two or three times of working through the questions, you will be able to be less systematic and quicker in making decisions, but the questions and answers to the questions should always be in your head when making decisions about media for teaching.

S: Who are your students?

1. What is the mandate or policy of your institution, department or program with respect to access? How will students who do not have access to a chosen technology be supported?

2. What are the likely demographics of the students you will be teaching? How appropriate is the technology you are thinking of using for these students?

3. If your students are to be taught at least partly off campus, to which technologies are they likely to have convenient and regular access at home or work?

4. If they are to be taught at least partly on campus, what is – or should be – your or your department's policy with regard to students' access to learning technologies in class?

5. What digital skills do you expect your students to have before they start the program?

6. If students are expected to provide their own access to technology, will you be able to provide unique teaching experiences that will justify the purchase or use of such technology?

7. What prior approaches to learning are the students likely to bring to your program? How suitable are such prior approaches to learning likely to be to the way you need to teach the course? How could technology be used to cater for student differences in learning?

E: Ease of use

8. How intuitively easy to use is the technology you are considering, both by students and by yourself?

9. How reliable is the technology?

10. How easy is it to maintain and up-grade the technology?

11. The company that is providing the critical hardware or software you are using: is it a stable company that is not likely to go out of business in the next year or two, or is it a new start-up? What strategies are in place to secure any digital teaching materials you create should the organisation providing the software or service cease to exist?

12. Do you have adequate technical and professional support, both in terms of the technology and with respect to the design of materials?

13. How fast developing is this subject area? How important is it to regularly change the teaching materials? Which technology will best support this?

14. To what extent can the changes be handed over to someone else to do, and/or how essential is it for me to do them myself?

15. What rewards am I likely to get for using new technology in my teaching? Will use of a new technology be the only innovation, or can I also change my way of teaching with this technology to get better results

16. What are the risks in using this technology?

C: What is the cost in money and time?

17. Which media are likely to take a lot of your time to develop? Which could you do quickly and easily?

18. How much time do you spend preparing lectures? Could that time be better spent preparing learning materials, then using the time saved from delivering lectures on interaction with students (online and/or face-to-face)?

19. Is there a possibility of extra funding for innovative teaching or technology applications? How could you best use that funding?

20. What kind of help can you get in your institution from instructional designers and media professionals for media design and development?

21. What open educational resources could be used for this course? Could you use an open textbook, thereby saving students the cost of buying textbooks? Can the library or your learning technology support group help identify potential OERs for your course?

T: Teaching and other pedagogical factors

22. What are the desired learning outcomes from the teaching in terms of content and skills?

23. What instructional strategies will be employed to facilitate the learning outcomes?

24. What unique pedagogical characteristics of text will be appropriate for this course, in terms of content presentation and skills development?

25. What unique pedagogical characteristics of audio will be appropriate for this course, in terms of content presentation and skills development?

26. What unique pedagogical characteristics of video will be appropriate for this course, in terms of content presentation and skills development?

27. What unique pedagogical characteristics of computing will be appropriate for this course, in terms of content presentation and skills development?

28. What unique pedagogical characteristics of social media will be appropriate for this course, in terms of content presentation and skills development?

29. What really must be done face-to-face on this course?

I: Interaction

30. In terms of the skills I am trying to develop, what kinds of interaction will be most useful? What media or technology could I use to facilitate that kind of interaction?

31. In terms of the effective use of my time, what kinds of interaction will produce a good balance between student comprehension and student skills development, and the amount of time I will be interacting personally or online with students?

O: Organisational issues

32. How much and what kind of help can I get from the institution in choosing and using media for teaching? Is help easily accessible? How good is the help? Do they have the media professionalism I will need? Are they up to date in the use of new technologies for teaching?

33. Is there possible funding available to ‘buy me out’ for a semester and/or to fund a teaching assistant so I can concentrate on designing a new course or revising an existing course? Is there funding for media production?

34. To what extent will I have to follow ‘standard’ technologies, practices and procedures, such as using a learning management system, or lecture capture system, or will I be encouraged and supported to try something new?

N: Networking

35. How important is it to enable learners to network beyond a course, with others such as subject specialists, professionals in the field, and relevant people in the community? Can the course, or student learning, benefit from such external connections?

36. If this is important, what's the best way to do this? Use social media exclusively? Integrate it with other standard course technology? Delegate responsibility for its design and/or administration to students or learners?

S: Security and privacy

37. What student information am I obliged to keep private and secure? What are my institution's policies on this?

38. What is the risk that by using a particular technology my institution's policies concerning privacy could easily be breached? Who in my institution could advise me on this?

39. What areas of teaching and learning, if any, need I keep behind closed doors, available only to students registered in my course? Which technologies will best allow me to do this?

These 39 questions are just suggestions. You may wish to add other questions (or ignore some of mine) depending on the context in which you will be working.

Appendix 2 Online learning quality standards, organisations and research

All sites accessible 2 October, 2019. Please report any dead or new links to tony.bates@ubc.ca

Canada

Barker, K. (2001) Creating quality guidelines for online education and training: consultation workbook Vancouver BC: Canadian Association for Community Education

BC Ministry of Education (2010) Standards for K-12 Distributed Learning in British Columbia v3.0 Victoria BC: BC Ministry of Education (still current in 2019). More about quality can be found on the BC Ministry of Education Distributed Learning web site

USA

Quality Matters http://www.qmprogram.org/rubric

Europe

European Association for Quality Assurance in Higher Education

New Zealand

Marshall, S. (2006). E-Learning Maturity Model Version Two: New Zealand Tertiary Institution E-

Learning Capability: Informing and Guiding E-Learning Architectural Change and Development Project Report. Wellington NZ: New Zealand Ministry of Education

Australia

Vocational Education and Training E-standards for Training

South Africa

Quality Assurance Toolkit: Distance Higher Education Institutions and Programmes

Quality Assurance Toolkit for Open Schools

Commonwealth of Learning

Quality Assurance Microsite
Quality Assurance Toolkit: Teacher Education

Online education services for students

There are also other conditions beyond management and teaching that contribute toward high quality e-learning and online learning systems. Flexible transfer of credits that recognise qualifications taken online as well as face-to-face, and government web sites that provide accurate and reliable information about the quality of online programs available within their jurisdiction, are also essential components of a high quality digital learning system. For examples, see:

BC Transfer Guide

Education Planner

BCCampus

Contact North

Research on quality assurance

Probably the best coverage of quality issues in both formal (for-credit) and 'post-traditional' (open, non-credit) online learning are the two papers published by Academic Partnerships:

Butcher, N. and Wilson-Strydom, M. (2013) A Guide to Quality in Online Learning Dallas TX: Academic Partnerships

Butcher, N. and Hoosen, S. (2014) A Guide to Quality in Post-traditional Online Higher Education Dallas TX: Academic Partnerships

If you use the category search on "quality" or "quality assurance" on my personal web site, tonybates.ca, you will find almost 60 articles or postings about this topic on this site.

Appendix 3: Independent reviews

The independent review process

Commercial versus open publishing

Usually, before publishing an academic book or a textbook, commercial publishers will seek independent reviews at two stages of the process: when an author submits a proposal for a book, and then when the first complete draft is sent to the publisher. As well as external reviewers, the publishing company will have an in-house specialist editor who will be the main person in the decision-making process, and but even then an editor will usually take the final proposal to an internal committee or even a board meeting for final approval. Each of these stages can take up to three months, sometimes longer for the second stage, much longer if the author is required to make substantial changes before publication. Lastly, after the book is published, it may be reviewed, again independently, in academic journals specializing in the field.

Although this lengthy approval and review process can be very frustrating for an author, the process does ensure that the author gets a lot of feedback, and above all it is part of the quality control process, which is one reason why books count so much in the academic tenure and promotion process.

Self-published books need not follow any of this process, although open textbooks, such as those from OpenStax or the BCcampus open textbook project, are nearly always independently reviewed by faculty in the jurisdiction where these books may be adopted.

However, this book is somewhat different. It was written from scratch for a different market, faculty and instructors, rather than students, and it is not part of the BC government's open textbook project that BCcampus manages. Although BCcampus offered essential technical services, they were not responsible for editing or reviewing the book.

I decided therefore to obtain three independent reviews, and, as with the BCcampus textbooks, these reviews would be published without changes as part of the book.

Criteria for selecting reviewers

In approaching potential reviewers, the following criteria were used:

Independence

Obviously, for an independent review it is necessary to find reviewers who will be as objective as possible. I needed to find professionals in the subject area who had not been closely associated with me during my 40 years working in the field and who would be seen as being objective and sufficiently 'distant' from me and my career.

Qualified or experienced in the subject domain

In terms of qualification, I needed reviewers who were also experts in the field of digital teaching and learning, instructional design, online learning or open education area. Although there are many who meet this criteria, they must also be seen to be independent.

Also, because the book is also targeted at faculty and instructors, it was important to find at least one reviewer who is a mainline faculty member interested in teaching and learning but who did not know or was not involved with my previous work, and who would judge it strictly from a faculty or instructor perspective.

Willingness and availability

The amount of work involved in reviewing a 500 page textbook is quite significant. Usually publishers pay a small fee for external reviewers, which no way compensates for the work involved, but at least it helps sweeten the pot. However, if I paid the reviewers as an author, that may have been seen as unduly influencing the independence of the reviewer.

I approached a total of four reviewers who met one or both of the two criteria above, and three immediately agreed to review the book. None of the reviewers I approached requested or even mentioned a fee. Each of the three who agreed to do a review submitted their review within one month of being asked. Brief descriptions of each reviewer is given as an introduction to the following reviews.

Guidelines for the review

Commercial publishers, when commissioning reviewers, usually send a letter or a standard document that sets out guidelines for reviewing a book in its first, full draft before printing and distribution, to ensure both consistency between reviewers, and to identify to reviewers what the publisher is looking for. Although sometimes the publishing editor will require responses to elements that are specific to a particular book, there are also a number of guidelines that are generic.

The situation is somewhat different for a self-published textbook, where it is the responsibility of the author to decide whether to get independent reviews and if so, to provide appropriate guidelines to the reviewers. Although I encouraged reviewers to use their own criteria, I sent them some suggested guidelines, set out below, adapted from the guidelines used by BCcampus for external reviewers of open textbooks:

1. To what extent is the book successful in meeting the needs of its primary market (faculty and instructors)?
2. Does the book meet the requirements of a scholarly work? Is it research and evidence-based, and does it provide a critical analysis of the key issues in the field?
3. Does it provide evidence-based, practical guidelines for faculty and instructors that will help them improve their teaching?
4. Does it cover adequately the main contemporary issues in teaching in a digital age?
5. Is the book well written? Does it read well? Is it well organized and structured? Are there errors of grammar or serious typographical errors? Are the graphics and cases appropriately chosen?

6. What major changes, if any, are needed before you can recommend this book? What minor changes would you like to see?
7. If this book were to be offered to a commercial publisher, would you recommend it for publication?

Each of the book reviews is published separately, as received, in the following sections.

A review from a faculty perspective: Professor James Mitchell

James Mitchell, *Professor and Director of the Architectural & Environmental Engineering Program, Drexel University, Pennsylvania, USA.*

Many of us recognize that much has changed, is changing, and will continue to change in our professional environment. Even those who are not so old depend on tools that didn't exist when we were children: Google searches; shared documents, analytic tools, simulations, videos and the not-so-lowly cell phone.   We suspect those changes should be reflected in who, what, and how we teach. *Teaching in a Digital Age* is Dr. Tony Bates' field guide for those wishing to explore this new continent. Perhaps in a hundred years there will be the same retrospective guffaws that we experience when reading of early European opinions of the Americas they'd never visited or perhaps trod lightly on a sliver of the eastern shore. It's hard, however, to imagine a better guide than Dr. Bates.

Is author credible? Can you check what he asserts? Does he present it in an organized manner? Does he have relevant experience? Has he practiced what he preached? Does this "book" exemplify the changed approach for which he argues? The answer to all of these questions is "yes." There are some splendid "no" opinions as well. Technology will not solve all problems. Critical thinking shouldn't be abandoned.

First, is Dr. Bates credible? It's difficult to imagine someone with better, experience. In a career of fifty years he's taught in elementary school, helped start the UK's Open University, developed and taught online and blended courses, consulted worldwide. He's written multiple academic papers and books. He's paid his dues.

Can you check what he asserts? Yes. Wherever possible this book cites sources with active links to make checking the source easy. He's consistent and thorough throughout.

Is the material presented in an organized manner? Yes. A review of the Table of Contents shows that he proceeds from addressing the question of change, through an examination of the nature of knowledge, on to the ways that teaching can occur both face-to-face and online, to detailed considerations of the differences between media, and finally to the methods for choosing, assessing and supporting the varied approaches. He has covered the range in a manner that allows the reader to move progressively and also to jump rapidly to an area of particular interest.

Does this document progress beyond the traditional book? Does Dr. Bates practice what he preaches? Yes. The Table of Contents (TOC) reads much like a traditional book, but he has taken advantage of the online experience. The TOC is always present in a sidebar with active links. Tony has inserted his voice in audio clips. Videos illustrate his point where appropriate. The references are links wherever possible. More subtly, but equally important, the book is a live document. It was drafted online via a blog, with readers invited to enhance the book by responding (that's how this reviewer became involved, an engineer no less). It is presented under a Creative Commons license so that anyone may use pieces of it with appropriate attribution. Further, the online version is structured so it can evolve.

Does technology answer all questions? Where Dr. Bates long experience and strong British fundamentals enhance his approach shows most beneficially in his recognition of the importance of the teacher's epistemological approach as well as the tradition of education. He values, as the book shows, the second order thinking represented by the abstractions of academic discourse. He understands that a belief in a behaviorist's tabula rasa is going to produce a very different understanding of what's important in education from that of a constructivist or connectivist. He addresses those differences and attempts valiantly to include them in the many detailed discussions of the many media now available. Although Bates doesn't mention him I suspect he'd be very sympathetic to this reviewer's favorite teaching reference, *The Art of Teaching* by Gilbert Highet (1950), written well before computer technology complicated matters.

Are There Important Topics Not Included? Yes, not surprisingly. First, there is comparatively little attention paid to what we know from good research about how the individual student learns, what motivates them, what impedes them, how to determine when they're ready for a particular approach, and the many ways to approach the same goals. Certainly the many media he presents are vehicles to address the requirements of each student, but Bates' focus is more on the delivery tools than on understanding the students' needs. Is that bad? No. Had he attempted that as well, this already ample document would have been far, far longer. *How Learning Works* (Ambrose, Bridges, DiPietro, Lovett, Norman 2010) would be a splendid companion to *Teaching in a Digital Age.*

Similarly, how to change existing institutions so that they truly embrace and act on these new modes of education is minimally addressed. The explicit audience of this document is the individual instructor or graduate student, not the person with budget power. Undoubtedly this was a conscious decision since Dr. Bates has spent many years working with academic decision makers. Here he's attempting to empower the individual, quite possibly hoping they'll become the decision maker of the next generation.

Should you read it, and will you enjoy it? Emphatically yes if you share an unease about making elegant barouches while Mr. Ford is introducing the Model-T. Most importantly, Dr. Bates' thinking is grounded, organized and inclusive. His writing is clear, the references abundant, the variety of examples edifying. Your efforts will be well rewarded.

Received: 7 June 2015

A review from an open and distance education perspective: Sir John Daniel

By Sir John Daniel, *former President of the Commonwealth of Learning, former Vice Chancellor of the UK Open University, and former Assistant Director-General, Education at UNESCO, currently Senior Advisor to Academic Partnerships International and Education Master in the Beijing DeTao Masters Academy, China.*

Tony Bates, one of the world's most knowledgeable and thoughtful commentators on educational technology, has distilled the wisdom acquired over 50 years of work into this magisterial book. Although once a sceptic about Open Education Resources, he has published *Teaching in a Digital Age* as an open textbook through BCcampus, making this admirable work available to a global readership as a dynamic, living project.

Four features make this book stand out in the growing literature on online learning. First, it addresses cogently the changing skill and content requirements for teaching and learning in the 21st century. Second, it offers direct help to academics in a variety of institutional settings who are grappling with the challenges and opportunities of integrating technology into their teaching. Third, it provides a 50-year historical perspective on the use of technology in teaching, citing research on student use of media from the 1970s onwards that is as relevant as ever. Finally, the beautiful structure and scaffolding of this e-Textbook reflect great credit on the author and his BCcampus editorial team.

Of the book's twelve chapters the first five address the purposes and requirements of teaching in a digital age. It begins with a discussion of the fundamental changes taking place in education, exploring contemporary structural changes in economies and societies in order to draw out the skills needed in a digital age, identify the right relationship between education and the job market and assess the impact of expanding enrolments on teaching methods. Is the nature of knowledge evolving and how should different views about it modify our approaches to teaching?

This first chapter, which notes that 'students are probably the most changed part of higher education in the last 50 years', sets the stage for what follows. The challenge today is to enable growing numbers of increasingly diverse students to achieve success. Attempts to reinforce elite systems by 'dialling the clock back to the 1950s' (Bates' comment on current UK policy) will not serve 21st century societies well.

Chapter 2 dives into epistemology and provides a thorough and well-researched account of theories of learning: objectivism, behaviourism, cognitivism, constructivism and connectivism. It summarises lucidly the important debate about whether knowledge is changing. The author concludes that the times require more emphasis on developing the skills of applying knowledge rather than merely teaching content. But he argues that the values and goals of academic knowledge do not – and should not – change much, although the way it is represented and applied must evolve.

The strengths and weaknesses of different methods of teaching are divided helpfully between Chapter 3 on solely campus-based instruction and Chapter 4 on fully online teaching. This is the second admirable aspect of the book: it starts where people – particularly academic faculty members – really are. Especially enjoyable are the occasional scenarios – doubtless only semi-fictional – which capture, candidly and entertainingly, the tenor of conversations at dinner parties, in staff common rooms and in the privacy of homes when academics discuss the impact of technology on their work and the latest bees in their deans' bonnets.

Bates is an acute commentator on the strengths and weaknesses of MOOCs and devotes chapter 5 to them. The ongoing media coverage of MOOCs has stimulated interest in online teaching everywhere and made them a driver of change. But they are at an early stage of maturation and have major structural limitations for developing deep or transformative learning, or for developing the high-level knowledge and skills needed in a digital age. As the design of MOOCs improves they may come to occupy a significant niche and replace some forms of traditional teaching such as large lecture classes. But the most promising applications of MOOCs may well not be in higher education but in tackling large global problems through community action.

Chapters 6 to 9 will be especially useful to those who are designing teaching for the online space. In summarising decades of research on educational technology – to which he has been a notable contributor – Bates observes that technologies are vehicles for various media, which he helps us examine in terms of their formats, symbols systems, and cultural values. Chapter 8, where he presents the SECTIONS model for media selection that he has refined over many years, is particularly compelling, while Chapter 9 explores choices of modes of delivery.

The three concluding chapters look at trends in open education, the challenge of ensuring quality and the need to support teachers and instructors in this digital age. Developments in open educational resources, open textbooks, open research and open data will be more important than MOOCs – and far more revolutionary because they will shift power from teachers to students. He defines quality as 'teaching methods that successfully help learners develop the knowledge and skills they will require in a digital age' and argues for newer concepts of quality that recognise and accommodate the affective or emotional aspects of learning. The design of many MOOCs and the high dropout rates in US two-year colleges new to online learning suggest that institutions are not yet following best practices or developing teaching methods that exploit the strengths of both classroom and online learning.

Finally, the author argues that we must get real about the need to train teachers for the digital age. 'We have to move from a system of voluntary amateurism to a professional, comprehensive system of training for teaching in post-secondary education, and a modern, up-to-date curriculum for pre-service and in-service training of school teachers'. This impressive book provides a curriculum for such training. It is a splendid work, replete with engaging scenarios and lived experiences. Tony Bates shows us how to 'walk the talk' about teaching in a digital age.

Received: 21 June, 2015

A review from a digital education perspective: Digital Education Strategies, Ryerson University

By Leonora Zefi and the team at Digital Education Strategies, the G. Raymond Chang School of Continuing Education, Ryerson University, Toronto, Ontario, Canada

As a team dedicated to supporting instructors in using educational technology as a vehicle for instruction, our collective review of Tony Bates' latest work, *Teaching in a Digital Age,* has been anchored in the practical realities of supporting pedagogical change in higher education. After decades of contributions to the evolving knowledge base and discourse around educational technology, including twelve texts related to the subject, Bates has now provided educators worldwide with the gift of a resource for moving forward in somewhat perplexing times. This book is a model in many respects. It is published in open format – an increasingly adopted, if somewhat debated, mode of knowledge dissemination with which anyone in research and education today must familiarize themselves.

Bates (2014) offers the book as a "coach" to support instructors in fostering the required "thinking and knowledge" for student success in learning environments that are increasingly impacted by technology (p. 1). The work lives up to this coaching analogy to the extent that it offers a rounded and realistic training regimen of sorts, to help strengthen the instructional design and decision making skills of instructors and educational administrators; however, just as the artifacts and content of technology-enhanced teaching must be strategically organized and presented to best support learners, Bates' ideas and commentary require further organization and clarification to optimize their benefit to his audience.

One of the greatest strengths of *Teaching in a Digital Age* is that Bates "walks the talk" of active facilitation of learning rather than the passive transmission of knowledge. From the very beginning, Bates makes clear why his selected topics and stated objectives matter and how they will make a meaningful difference in the professional practice of his intended audience. To support his own work and observations, he guides readers, through references and web links, to many valuable, supplementary resources. He brings theories and concepts alive through vignette-like scenarios, practical real-world examples, and case studies from a range of institutions of higher education. Like any good facilitator, Bates presents content in a range of formats, including text and rich media such as videos, photos, diagrams and illustrations. Learning activities and reflective questions motivate readers to immediately apply Bates' ideas to their own work and context. As such, the book is a tremendous primer in effective pedagogy for all modes of teaching and learning.

Chapters 6 to 8 of *Teaching in a Digital Age* guide the reader through the world of educational technology and new media. For instructors and course designers who are exploring different media to enhance their courses, these chapters are "must reads." Bates presents his previously published SECTIONS model as a framework for when, how and why media should be used in instruction, and realistically conveys the complications that can surround its implementation. While these chapters are comprehensive and provide varied practical supports to decision making, the book would benefit from additional examination of issues such as the impact of mobile technologies on media selection and compliance requirements for accessibility.

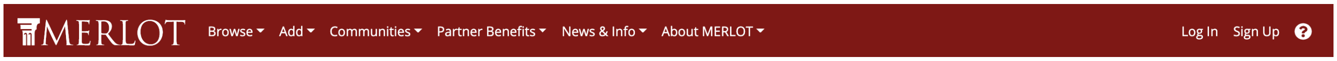
It may be that Bates' strategic choice of an open and transparent authoring process precipitated certain challenges to organization and clarity for the book. Prior to its official launch, the book was circulated for feedback among Bates' colleagues and, through his blog, the wider professional community. The type of commentary emerging from these consultations, while undeniably valuable, cannot replace the adept, professional editing that typically accompanies commercial publishing. For example, after establishing a solid theoretical and practical foundation in teaching theory and methods in Chapters 1 to 4, Bates offers a full and lengthy chapter examining the unavoidable and controversial topic of Massive Open Online Courses or MOOCs (Chapter 5). There is no question that a book such as this one should acknowledge and examine this trend, given its extensive reach and impact on the field (and Bates does so throughout many of his other chapters); however, the flow of the book would be well served if some of his key messages from Chapter 5 could be redistributed where relevant throughout the book. Similarly, Chapter 9, which looks at modes of delivery, might integrate more effectively if placed earlier in the book, i.e., adjacent to the chapters on teaching methods (Chapters 3 and 4). Additionally, the "Key Takeaways" section – a very helpful feature of the book – is provided at both the beginning and the end of each chapter. Offering just one instance of this section, at the end of each chapter, might help to streamline the content. Addressing issues of sequencing and repetition such as these will enhance the overall impact of Bates' message.

Having identified some highlights and drawbacks of the book, the fact remains that Bates has shared his singular abundance of knowledge in an engaging and accessible way. Readers who may not be familiar with his earlier publications are brought up to speed with key issues to consider in the area of educational technology, while loyal followers of his past work will find Bates' analysis of the current state of the field to be as helpful and practical as ever. Ultimately, because of the book's open format, readers may take from it that which best suits their own learning needs, their professional style and their teaching context. In fact, Bates states in the Introduction that there are many ways in which the book may be used. Given that Bates has acknowledged the book as a "work in progress", some additional attention to the organization and sequencing of his materials will help to ensure that readers gain equal value from each and every element of the work.

A sign of true passion for one's life's work is an unfailing commitment to the advancement and evolution of the field. Tony Bates is an outstanding example of this type of passion and demonstrates it through this book and through his dedication to its continuous improvement.

Received: 26 June, 2015

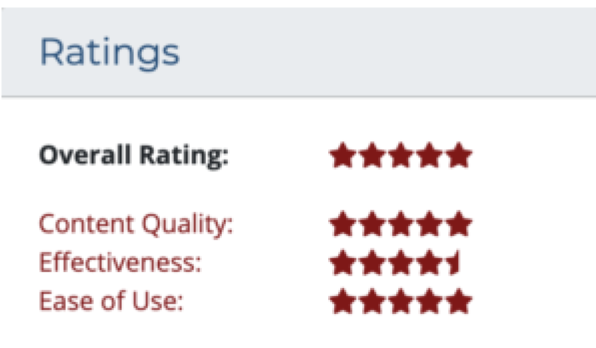
MERLOT II Peer Review



MERLOT is a curated collection of free and open online teaching, learning, and faculty development services contributed and used by an international education community. All MERLOT materials, unlike the materials in other learning materials collections, are examined in various ways to ensure that they are useful for the MERLOT community. The Peer Review process is led by an Editor, and includes editorial board members and peer reviewers.

This book was independently selected and reviewed by MERLOT. The original review can be accessed here: https://www.merlot.org/merlot/viewCompositeReview.htm?id=1356177

A shortened version of the review is reproduced here:



Reviewed: Jan 5, 2018 by Teacher Education

Type of Material: Open (Access) Textbook

Recommended Uses: Course reading and class discussions, professional development and continuing education material

Technical Requirements: Can be read online at https://opentextbc.ca/teachinginadigitalage/ or downloaded as a PDF (requiring PDF reader software, which is freely available).

Target Student Population: This book is appropriate for use by teacher educators, instructional designers, curriculum designers, practicing instructors, administration, those who support teachers, and those who are studying in the field of education.

Identify Major Learning Goals: The book examines the underlying principles that guide effective teaching in an age when everyone, and in particular the students we are teaching, are using technology. A framework and a set of guidelines are suggested for making decisions about your teaching, while understanding that every subject is different, and every teacher and instructor has something unique and special to bring to their teaching.

Prerequisite Knowledge or Skills: Familiarity with basic pedagogical theory and practice is helpful.

Content Quality

Rating: ★★★★★

Strengths: • Provides clear examples (in the form of scenarios) to illustrate concepts in the chapters. • Reviews (briefly but quite well) concepts underlying larger concepts (e.g., epistemology as a whole when addressing paradigms such as constructivism specifically). • References a wide variety of research in the field The content is timely. Students in a teacher education program are presented with how the digital skills are used by their students. The teacher candidates learn about digital skills and how to help students use those skills.

Concerns: None.

Potential Effectiveness as a Teaching Tool

Rating: ★★★★½

Strengths: One strength is the framework this text offers for making decisions about ones teaching. It is an enabling resource for the teacher to help students develop the knowledge and skills required in the 21st century digital age. The learning objectives are identified throughout the book. Concepts build on one another and the author references connections to other ideas in the book throughout.

Concerns: • The book is dense (at over 600 pages) and therefore is not concise, although it really isn't meant to be concise.

Ease of Use for Both Students and Faculty

Rating: ★★★★★

Strengths: Navigation within each chapter is very user friendly. Chapter sections scroll toward the top of the screen. To navigate to the next section, an arrow is clearly present to move forward or backward. Good use of graphics and charts to supplement the context of the section. Activities are placed throughout the text for readers to apply or reinforce the skills being taught. The book is easily accessed online or through downloading. Interactive links bring you to the exact point in the book where you wish to read. The illustrations are clear and helpful with adequate labeling.

Concerns: None

Feedback on Activities

Appendix 4: Feedback on Activity 1.8 Main conclusions from Chapter 1

Activity 1.8 Main conclusions from Chapter 1

Write down at least five conclusions you would draw as an instructor from this chapter (besides the Key Takeaways)

There are many possible conclusions one could draw, but here are mine:

1. Universities and colleges have a broader purpose than just meeting short-term labour market demands. On the other hand, there is a 'hidden contract' between the expansion of post-secondary education, and the need to create a work-force that is skilled, adaptable and competitive. I don't see a necessary conflict here. Many of the activities we consider to be central to the purpose of a university can fulfill these work-force needs with relatively little tweaking.
2. The diversity of the student body and the easy availability of content raises the importance of good quality teaching based on sound pedagogical principles and research in learning. This means professionalizing teaching in post-secondary education.
3. Technology change is constant. Indeed if anything it is accelerating. New technologies that could be applied in education are being developed all the time. So technology is not going away. It's no use shutting your eyes and hoping that you can manage without making some decisions about whether to use technology or not in your teaching. The pressure to use technology is going to increase, rather than ease up.
4. Relatively few technologies are designed specifically for education. There is more push from manufacturers and technology advocates than pull from instructors. Nevertheless it is clear that over time, many technologies have proved valuable educational tools.
5. There's a lot to choose from, and there are some major differences between tools. Researchers and instructors need to understand the educational differences, if any, between different technologies.
6. It is only in the last few years that technology has started to make major changes to the way we deliver education. Distance education and online learning were more of a fringe or peripheral activity to the main provision of learning, which was in classrooms and on campuses. But this is definitely beginning to change. Technology is forcing us to examine more fundamentally the purpose and process of teaching, what constitutes valid knowledge, and how best to acquire it.
7. All this means you need some kind of framework for making decisions about whether or not to use a technology, and how best to use it. This is the main purpose of this book.

Appendix 4: Feedback on Activity 7.1 How many technologies can you see in Figure 7.1?

Well, this is an unfair question, partly because the photo doesn't show all the technologies, and also because you wouldn't know what software or services were included, but just for the record, here's my list:

Hardware

1. Laptop computer
2. Music CD
3. Book: yes, a printed book is a technological artefact! It doesn't have to be digital to be a technology.
4. Mobile phone
5. Satellite receiver/converter
6. Television monitor
7. DVD player
8. Apple TV box
9. Audio-visual receiver/control box with 7 channels, 1080p HDMI, Dolby and DTS format support
10. Loudspeakers (3 in picture, including a woofer, back right)
11. Remote control (one: for all equipment except computer, mobile phone and book)

Software

Almost impossible to list and unobservable anyway, but would include iTunes, iPhoto (uses photos from iPhoto library as a screen saver for the TV monitor when music is playing), digital conversion in the A/V receiver, etc., etc.

Networks

Wi-fi
Internet
Telephone
Radio
Satellite TV (could have been cable, or broadband telephone, but isn't)

Services

Satellite broadcast television channels
Radio stations (global choice, via Sonos)
Apple TV (including Netflix and other streaming services)
Sonos music (including Deezer, a service similar to Netflix for music)

Necessary for integration

Single remote control (eHarmony)
Audio-visual receiver
Apple TV
Apple Mac Pro laptop computer
Mobile phone (controls Sonos and iTunes)

My wish for the future: one portable box, please!!!!!!!!

I think whoever owns this home entertainment system could do with a model for technology selection (OK, I'll admit it, it's mine). Or is it that the home entertainment industry needs to get its act together regarding standardization? But I digress. All this changed in 2016, when my Internet provider upgraded to fibre optic and 5G from coaxial cable and 2.4G and offered a ‘deal’ on integrated services. I decided at the same time to upgrade the whole system with a new TV monitor, control box, modem, speaker system, and more apps such as Amazon Prime and DAZN, but the ‘live’ cable television programs are still just as awful as before!

Appendix 4: Feedback on Activity 7.5 Broadcast or communicative

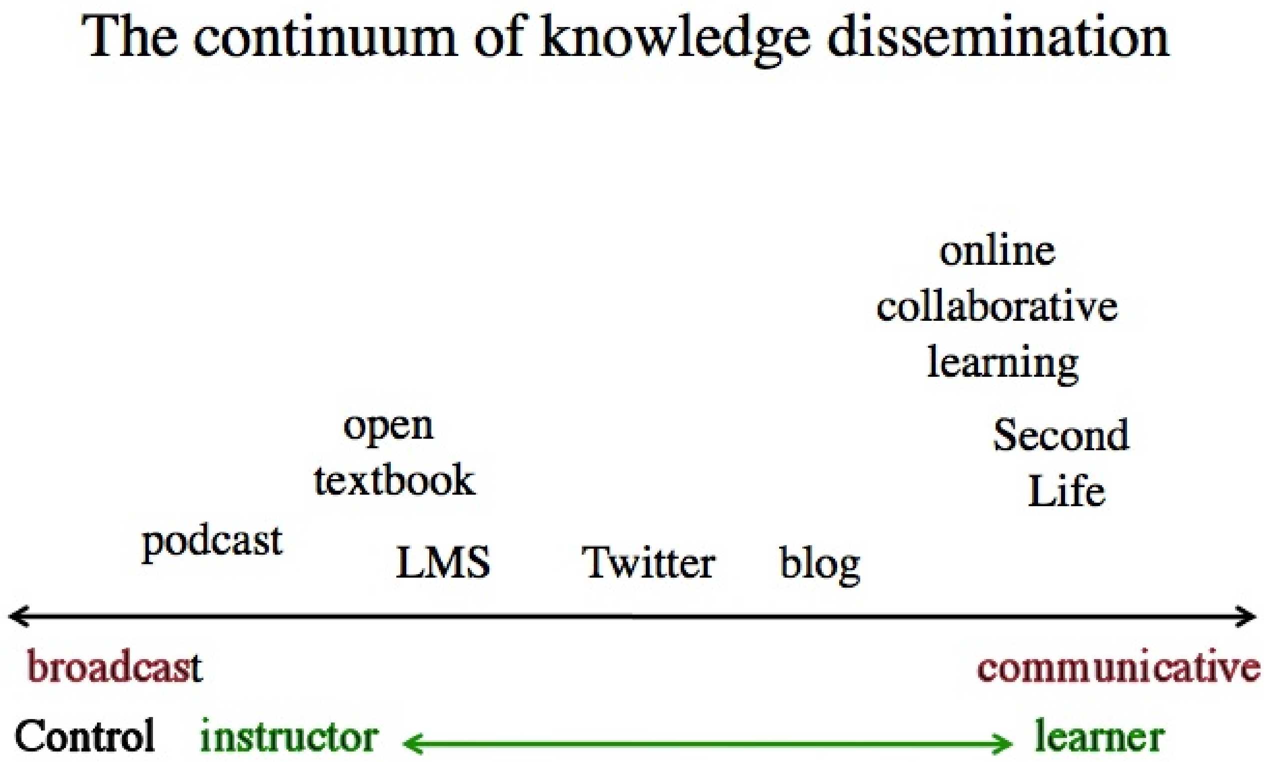
From the list below:

- a learning management system
- a blog
- online collaborative learning
- Twitter
- virtual worlds (e.g. Second Life)
- a podcast
- an open textbook

1. Determine which is a medium and which a technology, or which could be both, and under what conditions.

learning management system	either: technology as software, medium when used for course delivery
blog	medium (WordPress or other blog software is the technology)
online collaborative learning	medium
Twitter	either, but mainly a medium
Virtual worlds	medium
podcast	medium
open textbook	medium

2. Decide where, from your experience, each medium or technology should be placed on Figure 6.4.3. Write down why.



3. Which were easy to categorize and which difficult?

Difficult:

- online collaborative learning, because it is highly communicative but the teacher has a good deal of control over the medium
- Twitter, because it is definitely under the control of the learner, but it is also as much a broadcast as a communicative medium.

With both these, I gave more importance to the broadcast/communicative dimension compared with the control dimension.

4. How useful?

Understanding where different media are likely to fit on the broadcast/communicative dimension will help in choosing media, depending on my epistemological position. If I want a high level of student activity and interaction I would tend toward more communicative media. If I am more concerned with information transmission and comprehension, I would tend to use more broadcast media. However, in most cases I would want a mix of both. Knowing where each medium 'fits' on this dimension is one component I could use in my decision-making.

Bibliography

Adamson, C. (2012) Learning in a VUCA world, *Online Educa Berlin News Portal*, November 13

Agarwal, A. (2013) *The Developing World of MOOCs* Boston: MIT (Linc 2013 conference video: 1hr 34 mins in.)

Allen, I. and Seaman, J. (2014) *Grade Change: Tracking Online Learning in the United States* Wellesley MA: Babson College/Sloan Foundation

Anderson, C. (2008) The End of Theory: The Data Deluge Makes the Scientific Method Obsolete *Wired Magazine,* 16.07

Anderson, L. and Krathwohl, D. (eds.) (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* New York: Longman

Anderson, T. (ed.) (2008) *The Theory and Practice of Online Learning* Athabasca AB: Athabasca University Press

Anderson, T., Rourke, L., Garrison, R., & Archer, W. (2001) Assessing teaching presence in a computer conferencing context *Journal of Asynchronous Learning Networks*, Vol. 5, No.2

Asubel, D. et al. (1978) *Educational Psychology: A Cognitive View* New York: Holt, Reinhart and Winston

Atherton J. S. (2013) *Learning and Teaching; Bloom's taxonomy*, retrieved 18 March 2015

Atkinson, M.P. (2001) The scholarship of teaching and learning: reconceptualizing scholarship and transforming the academy *Social Forces*, Vol. 79, No. 4 (pp. 1217-1229)

AUCC (2011) *Trends in Higher Education: Volume 1-Enrolment* Ottawa ON: Association of Universities and Colleges of Canada

Baker, C. (2010) The Impact of Instructor Immediacy and Presence for Online Student Affective Learning, Cognition, and Motivation *The Journal of Educators Online* Vol. 7, No. 1

Balfour, S. P. (2013) Assessing writing in MOOCs: Automated essay scoring and calibrated peer review *Research & Practice in Assessment*, Vol. 8

Barnard, R. et al. (2014) Detecting bias in meta-analyses of distance education research: big pictures we can rely on *Distance Education* Vol. 35, No. 3

Bates, A. (1981) 'Some unique educational characteristics of television and some implications for teaching or learning' *Journal of Educational Television* Vol. 7, No.3

Bates, A. (1985) *Broadcasting in Education: An Evaluation* London: Constables

Bates, A. (1995) *Teaching, Open Learning and Distance Education* London/New York: Routledge

Bates, A.W. (2005) *Technology, e-Learning and Distance Education* London/New York: Routledge

Bates, A. and Gallagher, M. (1977) *Improving the Effectiveness of Open University Television Case-Studies and Documentaries* Milton Keynes: The Open University (I.E.T. Papers on Broadcasting, No. 77)

Bates, A. and Poole, G. (2003) *Effective Teaching with Technology in Higher Education: Foundations for Success* San Francisco: Jossey-Bass

Bates, A. and Sangrà, A. (2011) *Managing Technology in Higher Education* San Francisco: Jossey–Bass/John Wiley and Co

Bates, T. (2011) Cloud-based educational technology and privacy: a Canadian perspective, *Online Learning and Distance Education Resources*, March 25

Bates, T. (2011) Marshall McLuhan and his relevance to teaching with technology, *Online Learning and Distance Education Resources*, July 20

Bates, T. (2011) 'Understanding Web 2.0 and Its Implications for e-Learning' in Lee, M. and McCoughlin, C. (eds.) *Web 2.0-Based E-Learning* Hershey NY: Information Science Reference

Bates, T. (2012) Pedagogical roles for video in online learning, *Online Learning and Distance Education Resources,* March 10

Bates, T. (2012) What's right and what's wrong with Coursera-style MOOCs *Online Learning and Distance Education Resources*, August 5

Bates, T. (2013) UBC is going big with online and flexible learning *Online and Distance Education Resources*, March 12

Bates, T. (2103) Productivity and online learning redux, *Online Learning and Distance Education Resources*, December 23

Bates, T. (2014) Synergies between online learning, on-campus teaching and flexible learning *Online Learning and Distance Education Resources*, April 20

Bayne, S. (2014) *Teaching, Research and the More-than-Human in Digital Education* Oxford UK: EDEN Research Workshop (keynote: no printed record available)

Baytak, A. (undated) Media selection and design: a case in distance education *Academia.edu*

Beasly-Murray, J. (2008) Was introducing Wikipedia to the classroom an act of madness leading only to mayhem if not murder? *Wikipedia*, March 18

Berk, R.A. (2009) Multimedia teaching with video clips: TV, movies, YouTube and mtvU in the college classroom, *International Journal of Technology in Teaching and Learning*, Vol. 91, No. 5

Bertram, J. (2013) *Agile Learning Design for Beginners* New Palestine IN: Bottom Line Performance

Bishop, J. (2011) Facebook Privacy Policy: Will Changes End Facebook for Colleges? *The Higher Ed CIO*, October 4

Bligh, D. (2000) *What's the Use of Lectures?* San Francisco: Jossey-Bass

Bloom, B. S.; Engelhart, M. D.; Furst, E. J.; Hill, W. H.; Krathwohl, D. R. (1956). *Taxonomy of educational objectives: The classification of educational goals*. Handbook I: Cognitive domain. New York: David McKay Company

Book, P. (2103) ACE as Academic Credit Reviewer–Adjustment, Accommodation, and Acceptance *WCET Learn*, July 25

Book, P. (2014) *All Hands on Deck: Ten Lessons form Early Adopters of Competency-based Education* Boulder CO: WCET

Boswell, J. (1791), *The Life of Samuel Johnson*, New York: Penguin Classics (edited by Hibbert, C., 1986)

Brindley, J., Walti, C. and Blashke, L. (2009) Creating Effective Collaborative Learning Groups in an Online Environment *International Review of Research in Open and Distance Learning*, Vol. 10, No. 3

Brokop, F. (2008) *Accessibility to E-Learning for Persons With Disabilities: Strategies, Guidelines, and Standards* Edmonton AB: NorQuest College/eCampus Alberta

Brown, J. and Duguid, Paul (2000). Balancing act: How to capture knowledge without killing it. *Harvard Business Review*

Butcher, N. and Wilson-Strydom, M. (2013) *A Guide to Quality in Online Learning* Dallas TX: Academic Partnerships

Butcher, N. and Hoosen, S. (2014) *A Guide to Quality in Post-traditional Online Higher Education* Dallas TX: Academic Partnerships

Cambridge, D., Kaplan, S. and Suter, V. (2005) *Community of Practice Design Guide* Louisville CO: EDUCAUSE

Cañado, P. and Luisa, M. (eds.) (2013) *Competency-based Language Teaching in Higher Education* New York: Springer

Candy, P. (1991) *Self-direction for lifelong learning* San Francisco: Jossey-Bass

Carey, K. (2015) *The End of College* New York: Riverhead Books

Carey, T., & Trick, D. (2013). *How Online Learning Affects Productivity, Cost and Quality in Higher Education: An Environmental Scan and Review of the Literature*. Toronto: Higher Education Quality Council of Ontario

Castells, M. (2000) T*he Rise of the Network Society* Oxford: Blackwell

Chauhan, A. (2014) Massive Open Online Courses (MOOCS): Emerging Trends in Assessment and Accreditation *Digital Education Review*, No. 25

Chickering, A., and Gamson, Z. (1987) 'Seven Principles for Good Practice in Undergraduate Education' *AAHE Bulletin*, March 1987.

Christensen, C. (2010) *Disrupting Class, Expanded Edition: How Disruptive Innovation Will Change the Way the World Learns* New York: McGraw-Hill

Christensen Hughes, J. and Mighty, J. (2010) *Taking Stock: Research on Teaching and Learning in Higher Education* Montreal and Kingston: McGill-Queen's University Press

Clark, R. (1983) Reconsidering research on learning from media *Review of Educational Research*, Vol. 53. No. 4

Clarke-Okah, W. et al. (2014) *The Commonwealth of Learning Review and Improvement Model for Higher Education Institutions* Vancouver BC: Commonwealth of Learning

Cleveland-Innes, M. (2012) 'Teaching in an online community of inquiry: student, faculty, and institutional adjustment in the new higher education', in Akyol, Z. & Garrison, R.D. (Eds.) *Educational communities of inquiry: theoretical framework, research and practice*, (pp. 389-400). Hershey, PA: IGI Global.

Collins, E. (2013) *SJSU Plus Augmented Online Learning Environment Pilot Project Report* San Jose CA: San Jose State University

Colvin, K. et al. (2014) Learning an Introductory Physics MOOC: All Cohorts Learn Equally, Including On-Campus Class, *IRRODL*, Vol. 15, No. 4

Committee on Higher Education (1963), *Higher education: report of the Committee appointed by the Prime Minister under the Chairmanship of Lord Robbins 1961-63*, Cmnd. 2154, London: HMSO

Conference Board of Canada (2014) *Employability Skills 2000+* Ottawa ON: Conference Board of Canada

Contact North (2013) *The Colorado Community College System* Sudbury ON: Contact North

Council of Ontario Universities (2012) *Increased numbers of students heading to Ontario universities* Toronto ON: COU

Dabbagh, N. (2007). The online learner: characteristics and pedagogical implications. *Contemporary Issues in Technology and Teacher Education*, Vol. 7, No. 3, pp 217- 226.

Daniel, J. (1998) *Mega-Universities and Knowledge Media: Technology Strategies for Higher Education*. London: Kogan Page

Daniel, J. (2012) *Making sense of MOOCs: Musings in a maze of myth, paradox and possibility* Seoul: Korean National Open University

Dick, W., and Carey, L. (2004). *The Systematic Design of Instruction. 6th edition* Boston MA: Allyn & Bacon

Dillenbourg, P. (ed.) (1999) *Collaborative-learning: Cognitive and Computational Approaches*. Oxford: Elsevier

Dillenbourg, P. (2014) *MOOCs: Two Years Later*, Oxford UK: EDEN Research Workshop (keynote: no printed record available)

Downes, S. (2007) What connectivism is *Half An Hour*, February 3

Downes, S. (2012) Massively Open Online Courses are here to stay, *Stephen's Web*, July 20

Downes, S. (2014) The MOOC of One, *Stephen's Web*, March 10

Durbridge, N. (1983) *Design implications of audio and video cassettes* Milton Keynes: Open University Institute of Educational Technology

Durbridge, N. (1984) Audio cassettes, in: Bates, A. (ed.) *The Role of Technology in Distance Education* London: Routledge (re-published in 2014)

Dziuban, C. et al. (2000) Reactive behavior patterns go online *The Journal of Staff, Program and Organizational Developmen*t, Vol. 17, No.3

Earle, L. (2003) *Assessment as Learning* Thousand Oaks CA: Corwin Press

Engle, W. (2104) *UBC MOOC Pilot: Design and Delivery* Vancouver BC: University of British Columbia

Entwistle, N. (2000) *Promoting deep learning through teaching and assessment: conceptual frameworks and educational contexts* Leicester UK: TLRP Conference

Entwistle, N. and Peterson, E. (2004) Conceptions of Learning and Knowledge in Higher Education: Relationships with Study Behaviour and Influences of Learning Environments *International Journal of Educational Research*, Vol. 41. pp. 407-428

Entwistle, N. (2010) 'Taking Stock: An Overview of Research Findings' in Christensen Hughes, J. and Mighty, J. (eds.) *Taking Stock: Research on Teaching and Learning in Higher Education* Montreal and Kingston: McGill-Queen's University Press

Evans, T., Haughey, M. and Murphy, D. (2008) *International Handbook of Distance Education* Bingley UK: Emerald Publishing

Falchikov, N. and Goldfinch, J. (2000) Student Peer Assessment in Higher Education: A Meta-Analysis Comparing Peer and Teacher Marks *Review of Educational Research*, Vol. 70, No. 3

Falconer, I. et al. (2013) *Overview and Analysis of Practices with Open Educational Resources in Adult Education in Europe* Seville, Spain: European Commission Institute for Prospective Technological Studies

Fallow, S. and Stevens, C. (2000) *Integrating key skills in higher education* Sterling VA/London: Routledge

Farrar, D. (2014) Flexible Learning: September 2014 Update *Flexible Learning*, University of British Columbia (accessed 20 February, 2015, but no longer available)

Figlio, D., Rush, N. and Yin, L. (2010) *Is it Live or is it Internet? Experimental Estimates of the Effects of Online Instruction on Student Learning* Cambridge MA: National Bureau of Economic Research

Finnie, R. et al. (2018) *Measuring Critical-thinking Skills of Postsecondary Students* Toronto ON: HEQCO

Firmin, R. et al. (2014) Case study: using MOOCs for conventional college coursework *Distance Education*, Vol. 35, No. 2

Fischer, K. (1980) A Theory of Cognitive Development: The Control and Construction of Hierarchies of Skills, *Psychological Review*, Vol. 87, No. 6

Fontana, D. (1981) *Psychology for Teachers* London: Macmillan/British Psychological Society

Frenette, M. (2017) *Postsecondary Enrolment by Parental Income: Recent National and Provincial Trends* Ottawa: Statistics Canada

Friedland, T. (2013) Revolution Hits the Universities *New York Times*, January 26

Freire, P. (2004) *Pedagogy of Indignation* Boulder CO: Paradigm

Fukuyama, F. (2011) *The Origins of Political Order: From Prehuman Times to the French Revolution* New York: Farrar Strauss and Giroux

Fukuyama, F. (2014) P*olitical Order and Political Decay: From the Industrial Revolution to the Globalisation of Democracy* New York: Farrar Strauss and Giroux

Gardner, H. (1983) *Frame of Mind: The Theory of Multiple Intelligences* New York: Basic Books

Gardner, H. (2006) *Multiple Intelligences: New Horizons and Theory in Practice* New York: Basic Books

Garrison, R., Anderson, A. and Archer, W. (2000) Critical Inquiry in a Text-based Environment: Computer Conferencing in Higher Education *The Internet and Higher Education*, Vol. 2, No. 3

Garrison, D. R. & Cleveland-Innes, M. (2005). Facilitating cognitive presence in online learning: Interaction is not enough. *American Journal of Distance Education*, Vol. 19, No. 3

Gibson, J.J. (1979) *The Ecological Approach to Visual Perception* Boston: Houghton Mifflin

Gilbert, J. (2005) *Catching the Knowledge Wave: the Knowledge Society and the Future of Education* Wellington, NZ: New Zealand Council for Educational Research

Golding, W. (1954) *The Lord of the Flies* London: Faber and Faber

Graham, C. et al. (2001) Seven Principles of Effective Teaching: A Practical Lens for Evaluating Online Courses *The Technology Source*, March/April

Green, C. (2013) *Open Education, MOOCs, Student Debt, Textbooks and Other Trends* Vancouver BC: COHERE 2013 conference

Green, K. (2013) Mission, money and MOOCs *Association of Governing Boards Trusteeship*, No. 1, Volume 21

Grundin, H. 1981) *Open University Broadcasting Times and their Impact on Students' Viewing/Listening* Milton Keynes: The Open University Institute of Educational Technology

Guhlin, M. (2011) Education Experiment Ends, *Around the Corner – MGuhlin.org*, September 22

Gunawardena, C., Lowe, C. & *Carabajal*, K. (2000). Evaluating Online Learning: models and methods. In Willis, D. et al. (eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2000* (pp. 1677-1684). Chesapeake, VA: AACE.

Guo, P. (2013) Optimal video length for optimal student engagement, *edX*, 13 November

Halverson, L. R., Graham, C. R., Spring, K. J., & Drysdale, J. S. (2012). 'An analysis of high impact scholarship and publication trends in blended learning' *Distance Education*, Vol. 33, No. 3

Hampson, K. (2013) *The next chapter for digital instructional media: content as a competitive difference* Vancouver BC: COHERE 2013 conference

Harasim, L. (2012) *Learning Theory and Online Technologies* New York/London: Routledge

Haynie, D. (2014). State Department hosts 'MOOC Camp' for online learners *US News*, January 20

Hernandez, R. et al. (2014) *Promoting engagement in MOOCs through social collaboration* Oxford UK: Proceedings of the 8th EDEN Research Workshop

Heslop, J. (2016) *Education Pathways for High School Graduates and Non-Graduates* Victoria BC: Student Transitions Project, Government of British Columbia

Hill, P. (2012) Four Barriers that MOOCs Must Overcome to Build a Sustainable Model *e-Literate*, July 24

Hill, P. (2013) Some validation of MOOC student patterns graphic, *e-Literate*, August 30

Hilton, J., Wiley, D., Stein, J., & Johnson, A. (2010). The four R's of openness and ALMS Analysis: Frameworks for open educational resources. *Open Learning: The Journal of Open and Distance Learning*, Vol. 25, No. 1

Hiltz, R. and Turoff, M. (1978) *The Network Nation: Human Communication via Computer* Reading MA: Addison-Wesley

Hofer, B. and Pintrich, P. (1997) 'The development of epistemological theories: beliefs about knowledge and knowing and their relation to learning' *Review of Educational Research* Vol. 67, No. 1, pp. 88-140

Ho, A. et al. (2014) *HarvardX and MITx: The First Year of Open Online Courses Fall 2012-Summer 2013 (HarvardX and MITx Working Paper No. 1)*, January 21

Hollands, F. and Tirthali, D. (2014) *MOOCs: Expectations and Realities* New York: Columbia University Teachers' College

Holmberg, B. (1989) *Theory and Practice of Distance Education* New York: Routledge

Hülsmann, T. (2000) *The Costs of Open Learning: A Handbook* Oldenburg: Bibliotheks- und Informationssytem der Universität Oldenburg

Hülsmann, T. (2003) Costs without camouflage: a cost analysis of Oldenburg University's two graduate certificate programs offered as part of the online Master of Distance Education (MDE): a case study, in Bernath, U. and Rubin, E., (eds.) *Reflections on Teaching in an Online Program: A Case Study* Oldenburg, Germany: Bibliothecks-und Informationssystem der Carl von Ossietsky Universität Oldenburg

Illich, I. (1971) *Deschooling Society*, (accessed 6 August, 2014)

Jamison, D. and Klees, S. (1973) *The Cost of Instructional Radio and Television for Developing* Countries Stanford CA: Stanford University Institute for Communication Research

Jaschik, S. (2013) MOOC Mess, *Inside Higher Education*, February 4

Jaschik, S. and Letterman, D. (2014) *The 2014 Inside Higher Ed Survey of Faculty Attitudes to Technology* Washington DC: Inside Higher Ed

Johnson, H. and Mejia, M. (2014) *Online learning and student outcomes in California's community colleges* San Francisco CA: Public Policy Institute of California

Jones, C. and Shao, B. (2011) *The Net Generation and Digital Natives: Implications for Higher Education* Milton Keynes: Open University/Higher Education Academy

Jonker, L. and Hicks, M. (2014) *Teaching Loads and Research Outputs of Ontario University Faculty: Implications for Productivity and Differentiation* Toronto: Higher Education Quality Council of Ontario

Jung, I. and Gunawardena, C. (eds.) (2014) *Culture and Online Learning: Global Perspectives and Research* Sterling VA: Stylus

Jung, I. and Latchem, C. (2012) *Quality Assurance and Accreditation in Distance Education and e-Learning* New York/London: Routledge

Kamenetz, A. (2010) *DIY U: Edupunks, Edupreneurs, and the Coming Transformation of Higher Education* White River Junction VT: Chelsea Green

Kao, J. (2019) Ontario's 2019 budget reveals plan to significantly tie university funding to performance outcomes *The Varsity*, University of Toronto

Kaplan, A. and Haenlein, M. (2010) Users of the world, unite! The challenges and opportunities of social media, *Business Horizons*, Vol. 53, No. 1, pp. 59-68

Keegan, D. (ed.) (1990) *Theoretical Principles of Distance Education* London/New York: Routledge

Keen, A. (2007) *The Cult of the Amateur: How Today's Internet is Killing our Culture* New York/London: Doubleday

Kennepohl, D. (2010) *Accessible Elements: Teaching Science Online and at a Distance* Athabasca AB: Athabasca University Press

Klassen, V. (2011) *Privacy and Cloud-Based Educational Technology in British Columbia* Vancouver BC: BCCampus

Knapper, C. (2010) 'Changing Teaching Practice: Barriers and Strategies' in Christensen-Hughes, J. and Mighty, J. eds. *Taking Stock: Research on Teaching and Learning in Higher Education* Toronto ON: McGill-Queen's University Press

Knowles, M. (1984) *Andragogy in Action. Applying modern principles of adult education* San Francisco: Jossey Bass.

Knox, J. (2014) Digital culture clash: 'massive' education in the e-Learning and Digital Cultures *Distance Education*, Vol. 35, No. 2

Koller, D. (2102) What we're learning from online education *TED talks*, June 2012

Kolb. D. (1984) *Experiential Learning: Experience as the source of learning and development* Englewood Cliffs NJ: Prentice Hall

Kop, R. (2011) The Challenges to Connectivist Learning on Open Online Networks: Learning Experiences during a Massive Open Online Course *International Review of Research into Open and Distance Learning*, Vol. 12, No. 3

Kop, R, and Hill, A. (2008) Connectivism: Learning theory of the future or vestige of the past? *International Review of Research into Open and Distance Learning*, Vol. 9., No. 3

Koumi, J. (1994). Media comparisons and deployment: a practitioner's view. *British Journal of Educational Technology*, Vol. 25, No. 1.

Koumi, J. (2006) *Designing video and multimedia for open and flexible learning* London: Routledge.

Koumi, J. (2015) Learning outcomes afforded by self-assessed, segmented video-print combinations *Academia.edu*

Kozma, R. (1994) 'Will Media Influence Learning? Reframing the Debate', *Educational Technology Research and Development*, Vol. 42, No. 2, pp. 7-19

Krathwohl, D.R. (2002) *A Revision of Bloom's Taxonomy: An Overview.* In *Theory into Practice,* Vol. 41, No. 4 College of Education, The Ohio State University. Retrieved from http://www.unco.edu/cetl/sir/stating_outcome/documents/Krathwohl.pdf

Lambert, S. and Williams R. (1999) *A model for selecting educational technologies to improve student learning* Melbourne, Australia: HERDSA Annual International Conference, July

Large, L. (2015) Rebundling College *Inside Higher Ed*, April 7

Larman, C. and Vodde, B. (2009) *Scaling Lean and Agile Development* New York: Addison-Wesley

Laurillard, D. (2001) *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies* New York/London: Routledge

Lave, J. and Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation* Cambridge: Cambridge University Press

Lee, M. and McCoughlin, C. (eds.) *Web 2.0-Based E-Learning* Hershey NY: Information Science Reference

Leitonen, T. (2010) *Designing Learning Tools: Methodological Insights* Aalto, Finland: Aalto University School of Art and Design

Lewin, K. (1951) *Field theory in social science; selected theoretical papers.* D. Cartwright (ed.). New York: Harper & Row

Li, Y, MacNeill, S., and Kraan, W. (undated) *Open Educational Resources – Opportunities and Challenges for Higher Education* Bolton UK: JISC-CETIS

Lumina Foundation (2014) *A stronger nation through higher education* Indianapolis IN: The Lumina Foundation

Lyotard, J-J. (1979) *La Condition postmoderne: rapport sur le savoir:* Paris: Minuit

Lyotard, J-J. (1984) *The Post-Modern Condition: A Report on Knowledge* Manchester: Manchester University Press

Mackenzie, W. (2002) *Multiple Intelligences and Instructional Technology: A Manual for Every Mind*. Eugene, Oregon: ISTE

Mackness, J. (2013) cMOOCs and xMOOCs – key differences, *Jenny Mackness*, October 22

Manguel, A. (1996) *A History of Reading* London: Harper Collins

Marron, D. Missen, C. and Greenberg, J. (2014) "*Lo-Fi to Hi-Fi": A New Way of Conceptualizing Metadata in Underserved Areas with the eGranary Digital Library* Austin TX: International Conference on Dublin Core and Metadata Applications

Marshall, K. (2011) Employment patterns of post-secondary students, *Ontario Undergraduate Student Alliance*, November 11

Marshall, L. and Rowland, F. (1993) *A Guide to Learning Independently* Buckingham UK: Open University Press

Marshall, S. (2007). *eMM Version Two Process Assessment Workbook Version 2.3* Wellington NZ: Victoria University of Wellington

Marton, F. and Saljö, R. (1997) Approaches to learning, in Marton, F., Hounsell, D. and Entwistle, N. (eds.) *The experience of learning* Edinburgh: Scottish Academic Press

Mayer, R. E. (2009) *Multimedia learning* (2nd ed). New York: Cambridge University Press

Mayfield, E. (2013) Six ways the edX Announcement Gets Automated Essay Grading Wrong, *e-Literate*, April 8

McCoughlin, C. (1999) The implictions of the research literature on learning styles for the design of instructional material *Australian Journal of Educational Technology*, Vol. 15, No. 3

McCoughlin, C. and Lee, M. (2011) 'Pedagogy 2.0: Critical Challenges and Responses to Web 2.0 and Social Software in Tertiary Teaching', in Lee, M. and McCoughlin, C. (eds.) *Web 2.0-Based E-Learning* Hershey NY: Information Science Reference

McKeachie, W. and Svinicki, M. (2006) *McKeachie's Teaching Tips: Strategies, Research and Theory for College and University Teachers* Boston/New York: Houghton Mifflin

Means, B. et al. (2009) *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies* Washington, DC: US Department of Education

Meier, D. (2000) *The Accelerated Learning Handbook* New York: McGraw-Hill

Milligan, C., Littlejohn, A. and Margaryan, A. (2013) Patterns of engagement in connectivist MOOCs, *Merlot Journal of Online Learning and Teaching*, Vol. 9, No. 2

Moore, M.G. (1989) Three types of interaction *American Journal of Distance Education*, Vol.3, No.2

Moore, M. and Kearsley, G. (1996) *Distance Education: A Systems View* Belmont CA: Wadsworth

Moore, M. and Thompson, M. (1990) *The Effects of Distance Education: A Summary of the Literature* University Park, PA: American Center for Distance Education, Pennsylvania State University

Morrison, Gary R. (2010) *Designing Effective Instruction, 6th Edition*. Hoboken NJ: John Wiley & Sons.

Murphy, E. (2103) *Day 2 panel discussion* Vancouver BC: COHERE 2013 conference (video: 4'40" from start)

Nel, C., Dreyer, C. and Carstens (2001) Educational Technologies: A Classification and Evaluation *Journal for Language Teaching* Vol. 35, No. 4

Ng, A. (2013) Learning from MOOCs *Inside Higher Education*, January 24

O'Donoghue, M. (2014) *Producing video for teaching and Learning* New York: Routledge

OECD (2013a) *OECD Skills Outlook 2013 First results From the Survey of Adult Skills* Paris: OECD

OECD (2013b) *Competition Policy and Knowledge-Based Capital: Key Findings* Paris: OECD

Olson, D. and Bruner, J. (1974) 'Learning through experience and learning through media', in Olson, D. (ed.) *Media and Symbols: the Forms of Expression* Chicago: University of Chicago Press

Ontario (2011) *Fact Sheet Summary of Ontario eLearning Surveys of Publicly Assisted PSE Institutions* Toronto: Ministry of Training, Colleges and Universities

Ontario (2012) *Strengthening Ontario's Centres of Creativity, Innovation and Knowledge* Toronto ON: Provincial Government of Ontario

Page-Bucci, H. (2002) Developing an Evaluation Model for a Virtual Learning Environment: accessed at http://www.hkadesigns.co.uk/websites/msc/eval/index.htm

Paloff, R. and Pratt, K. (2005) *Collaborating Online: Learning Together in Community* San Francisco: Jossey-Bass

Paloff, R. and Pratt, K. (2007) *Building Online Learning Communities: Effective Strategies for the Virtual Classroom* San Francisco: Jossey-Bass

Parachuri, V. (2013) On the automated scoring of essays and the lessons learned along the way, *vicparachuri.com*, July 31

Pask, G. (1975) *Conversation, Cognition and Learning* Amsterdam/London: Elsevier (out of press, but available online)

Patsula, P. (2002) Practical guidelines for selecting media: An international perspective *The Useableword Monitor*, February 1

Perry, W. (1970) *Forms of intellectual development and ethical development in the college years: a scheme* New York: Holt, Rinehart and Winston

Perry, W. (1976) *The Open University* Milton Keynes: Open University Press

Peters, O. (1983) Distance education and industrial production, in Sewart et al. (eds.) *Distance Education: International Perspectives* London: Croom Helm

Peters, O. (2002) *Distance Education in Transition: New Trends and Challenges* Oldenberg FGR: Biblothecks und Informationssystemder Carl von Ossietzky Universität Oldenberg

Piaget, J. and Inhelder, B., (1958) *The Growth of Logical Thinking from Childhood to Adolescence* New York: Basic Books, 1958

Picciano, A., Dziuban, C. and & Graham, C. (eds.), *Blended Learning: Research Perspectives, Volume 2*. New York: Routledge, 2013

Piech, C., Huang, J., Chen, Z., Do, C., Ng, A., & Koller, D. (2013) *Tuned models of peer assessment in MOOCs*. Palo Alto, CA: Stanford University

Pratt, D. (1998) *Five Perspectives on Teaching in Adult and Higher Education* Malabar FL: Krieger Publishing Company

Pratt, D. and Johnson, J. (1998) The Apprenticeship Perspective: Modelling Ways of Being in Pratt, D. (ed.) *Five Perspectives on Teaching in Adult and Higher Education* Malabar FL: Krieger Publishing Company

Prensky, M. (2001) Digital natives, Digital Immigrants *On the Horizon* Vol. 9, No. 5

Puzziferro, M., & Shelton, K. (2008). A model for developing high-quality online courses: Integrating a systems approach with learning theory *Journal of Asynchronous Learning Networks*, Vol. 12, Nos. 3-4

Rawsthorne, P. (2012) *Agile Instructional Design* St. John's NF: Memorial University of Newfoundland

Rhoades, G. (2000) 'The changing role of faculty' in Losco, J. and Fife, B. (eds.) *Higher Education in Transition: the challenges of the new millennium* Westport CT: Bergin and Garvey

Richardson, J. C., & Swan, K. (2003) Examining social presence in online courses in relation to students' perceived learning and satisfaction *Journal of Asynchronous Learning Networks*, Vol. 7, No. 1

Ries, E. (2011) *The Lean Start-Up* New York: Crown Business/Random House

Rivera, C. (2012) Survey offers dire picture of California's two-year colleges *Los Angeles Times*, August 28

Robbins, L. (1963) *Higher Education Report* London: Committee on Higher Education, HMSO

Robinson, B. and Moore, A. (2006) Virginia Tech: the Math Emporium, in Oblinger, D. (ed.), *Learning Spaces*, Louisville CO: EDUCAUSE

Robinson, J. (1982) *Broadcasting Over the Air* London: BBC

Rogers, C. (1969) *Freedom to Learn* Columbus, OH: Charles E. Merrill Publishing Co

Rothwell, W. and Graber, J. (2010) *Competency-Based Training Basics* Alexandria VA: ADST

Rousseau, J.-J. (1762) *Émile, ou de l'Éducation* (Trans. Allan Bloom. New York: Basic Books, 1979)

Royal Bank of Canada (2018) *Humans Wanted* Toronto ON: Royal Bank of Canada

Rugg, G. (2014) Education versus training, academic knowledge versus craft skills: Some useful concepts *Hyde and Rugg*, February 23

Rumble, G. (2001) The costs and costing of networked learning, *Journal of Asynchronous Learning Networks*, Vol. 5, No. 2

Russell, T. L. (1999) *The No Significant Difference Phenomenon* Raleigh, NC: North Carolina State University, Office of Instructional Telecommunication

Saettler, P. (1990) *The Evolution of American Educational Technology* Englewood CO: Libraries Unlimited

Salmon, G. (2000) *e-Moderating: The Key to Teaching and Learning Online* London: Taylor and Francis

Salomon, G. (1979) *Interaction of Media, Cognition and Learning* San Francisco: Jossey-Bass

Salomon, G. (1981) *Communication and Education* Beverley Hills CA/London: Sage

Scardamalia, M. and Bereiter, C. (2006) Knowledge Building: Theory, pedagogy and technology, in Sawyer, K. (ed.) *Cambridge Handbook of the Learning Sciences* New York: Cambridge University Press

Shapiro, D., et al. (2016) *Time to Degree: A National View of the Time Enrolled and Elapsed for Associate and Bachelor's Degree Earners (Signature Report No. 11)*. Herndon, VA: National Student Clearinghouse Research Center.

Schmidt, S. and Shea, P. (2015) NANSLO Web-based Labs: Real Equipment, Real Data, Real People! *WCET Frontiers*

Schön, D. (1983) *The Reflective Practitioner: How Professionals Think in Action* New York: Basic Books

Schramm, W. (1972) *Quality in Instructional Television* Honolulu HA: University Press of Hawaii

Schramm, W. (1977) *Big Media, Little Media* Beverley Hills CA/London: Sage

Schroeder, C. (1993) New students – new learning styles, *Change,* Sept.-Oct

Schunk, D. (2011) *Learning Theories: An Educational Perspective* (6th edition) New York: Pearson

Searle, J. (1996) *The construction of social reality*. New York: Simon & Shuster

Selwood, D. (2014) What does the Rosetta Stone tell us about the Bible? Did Moses read hieroglyphs? *The Telegraph*, July 15

Sharma, S. (2013) *The Magic of the Campus* Boston MA: LINC 2013 conference (recorded presentation)

Sheridan, K. and Kelly, M. (2010) The Indicators of Instructor Presence that are Important to Students in Online Courses *MERLOT Journal of Online Learning and Teaching*, Vol. 6, No. 4

Siemens, G. (2004) Connectivism: a theory for the digital age *eLearningSpace*, December 12.

Siemens, G., Downes, S., and Cormier, D. (2011) *Connectivism and Connective Knowledge* (a MOOC)

Skinner, B. (1968) *The Technology of Teaching*, 1968. New York: Appleton-Century-Crofts

Smith, M. K. (2003) 'Communities of practice', *The encyclopedia of informal education*, accessed 26 September, 2014

Suen, H. (2104) Peer assessment for massive open online courses (MOOCs) *International Review of Research into Open and Distance Learning*, Vol. 15, No. 3

Surowiecki, J. (2004) *The Wisdom of Crowds: Why the Many Are Smarter Than the Few and How Collective Wisdom Shapes Business, Economies, Societies and Nations* New York: Random House

Sweller, J. (1988) Cognitive load during problem solving: Effects on learning, *Cognitive Science*, Vol. 12

Tamim, R. et al. (2011) 'What Forty Years of Research Says About the Impact of Technology on Learning: A Second-Order Meta-Analysis and Validation Study' *Review of Educational Research*, Vol. 81, No. 1

Tapscott, D. (2008) *Grown Up Digital* New York: McGraw Hill

Tapscott, D. (undated) The transformation of education *dontapscott.com*

To, K. (2014) UC Regents announce online course expansion, *The Guardian*, UC San Diego, undated, but probably February 5

Trenaman, J. (1967) *Communication and Comprehension* London: Longmans

UBC Wikis (2014)*Documentation: Design Principles for Multimedia* Vancouver BC: University of British Columbia

University of Ottawa (2013) *Report of the e-Learning Working Group* Ottawa ON: University of Ottawa

Usher, A. (2013) Financing Canadian Universities: A Self-Inflicted Wound (Part 5) *Higher Education Strategy Associates One Thought a Day Blog*, September 13

Valenti, M. (2013), in Williams, L., AV trends: hardware and software for sharing screens, *University Business*, June

van Zundert, M., Sluijsmans, D., van Merriënboer, J. (2010). Effective peer assessment processes: Research findings and future directions. *Learning and Instruction*, No. 20, 270-279

Vygotsky, L. (1978) *Mind in Society: Development of Higher Psychological Processes* Cambridge MA: Harvard University Press

Vygotsky, L.S. (1987) Thinking and speech, in R.W. Rieber & A.S. Carton (eds.), *The collected works of L.S. Vygotsky, Volume 1: Problems of general psychology (pp. 39–285)*. New York: Plenum Press. (Original work published 1934)

Watters, A. (2012) Top 10 Ed-Tech Trends of 2012: MOOCs *Hack Education*, December 3

Wedemeyer, C. (1981) *Learning at the Back Door: Reflections on Non-traditional Learning in the Lifespan* Madison: University of Wisconsin Press

Weiner, B. (2009) A theory of organizational readiness for change *Implementation Science*, Vol. 4, No. 67

Weingarten, H. et al. (2018) *Measuring Essential Skills of Postsecondary Students: Final Report of the Essential Adult Skills Initiative* Toronto ON: HEQCO

Weise, M. (2014) Got Skills? Why Online Competency-Based Education Is the Disruptive Innovation for Higher Education *EDUCAUSE Review*, November 10

Wenger, E. (2000) *Communities of Practice: Learning, Meaning and Identity* Cambridge UK: Cambridge University Press

Wenger, E. (2014) *Communities of practice: a brief introduction*, accessed 26 September, 2014

Wenger, E., McDermott, R., and Snyder, W. (2002) *Cultivating Communities of Practice* Harvard Business Press

Woodley, A. and Simpson, O. (2014) 'Student drop-out: the elephant in the room' in Zawacki-Richter, O. and Anderson, T. (eds.) (2014) *Online Distance Education: Towards a Research Agenda* Athabasca AB: AU Press, pp. 508

Yousef, A. et al. (2014) *MOOCs: A Review of the State-of-the-Art* Proceedings of 6th International Conference on Computer Supported Education – CSEDU 2014, Barcelona, Spain

Zaied, A. (2007) A Framework for Evaluating and Selecting Learning Technologies *The International Arab Journal of Information Technology*, Vol. 4, No. 2

Zawacki-Richter, O. and Anderson, T. (eds.) (2014) *Online Distance Education: Towards a Research Agenda* Athabasca AB: AU Press, pp. 508

Index

There is no need for an index in a digital textbook.

Use the search engine [Search in book (Q)] located at the top right of each section. Type in the term or name you are looking for. It will provide a list of the sections where this term or name is used.