Teaching in a Digital Age: Third Edition - General

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Guidelines for designing teaching and learning

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VANCOUVER, B.C.

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Contents

Scenario A 1: 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

Scenario A 2: A school teacher's frustration

Jenny enters the staff room and slams the door. Peter looks up from marking assignments.

Peter: '*Wow, Jenny, what's the matter?*

Jenny: '*I've just had a parent on the phone, complaining that her daughter hates my lessons.*'

Peter: '*Really? You've always been great with your classes – what's happened?*'

Jenny: '*Well, as you know, because of Covid, I'm having to teach nearly a third of my class online, so we can space out the remaining kids in the classroom, and because some parents – understandably, in my view – are unhappy with their kids coming to school while some kids remain unvaccinated. Lesley's mum is one who opted for online learning this term, but now she's complaining that Lesley feels left out of the class, and that I'm not giving her enough attention. But I've got 22 kids in front of me, and I can't ignore them, and try as hard as I can, I just can't give enough individual attention to every one of the kids online as well.*'

Peter: '*That's not your fault, Jenny. The problem is due to the idiot in the school board who decided we should be teaching both face-to-face and online at the same time. The online students should have a dedicated teacher who is trained to teach online, but that's not going to happen, because the school board didn't see this kind of situation coming.*'

Jenny: '*Well, I don't see it going away even after Covid. Raheed's mum phoned me a couple of days ago, and said she wanted Raheed also to get online learning, because he prefers it – and you know he's been the subject of quite a bit of bullying at school, so I'm not surprised.*'

Peter: '*Look, I took a short course on how to teach online – just 12 hours online from home over the holidays. I found it on the web, offered free by the local university. It was very helpful. It suggested several ways in which you can engage students online, but it does mean changing your teaching, both for the in-class students as well as those online. I'll send you the link, if you like.*'

Jenny (sighs): '*Thanks, Peter. I'll give it a try – I just can't go on the same way with this mixed class. No-one's happy, least of all me.*'

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

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

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=19#audio-19-1

About the book – and how to use it

The book in a nutshell

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.

This is the third edition of *Teaching in a Digital Age*. The first edition was published in April 2015. The second edition was published in 2019. This, the third edition, was published on 18 August, 2022. This version is for the general reader.

If you are **an instructor who has used an earlier edition** as a set text, or **a translator of an earlier version of this book** and wish to update it, you may wish to go to: https://pressbooks.bccampus.ca/teachinginadigitalagev3/ In that version, all changes to the first edition made for the second edition are in green colour text, and the changes for the third edition are in blue colour text, so you can follow the changes more easily.

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, from parents who want more flexibility, 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 teaching methods work best when teaching in a technology-rich environment?
- how do I decide what is best done online and what face-to-face in blended or hybrid courses?
- 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, open educational resources, and 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 impact of Covid-19

Covid-19 had a huge impact on education systems throughout the world. Whole schools systems, universities and colleges suddenly switched from on-campus teaching to emergency remote learning, in less than two weeks in some countries such as Canada and the USA. Before February 2020, in North America online learning constituted about 5-8% of school teaching, and about 10-12% of post-secondary education credit courses. Then in March 2020 everyone was online.

However, most online learning before 2020 was largely asynchronous and primarily text-based, using software known as learning management systems (Canvas, Moodle, D2L, etc.), although web-based video-conferencing was beginning to be increasingly used. This web-based video-conferencing, such as Zoom and Microsoft Teams, was seized on by instructors with no previous online experience desperate to get their courses online.

The attraction of web-based video-conferencing was two-fold:

- it was relatively cheap and easy-to-use technology already available to most institutions and school boards;
- instructors did not have to change their teaching method. They could just move their classroom methods (mainly lectures in higher education) online.

This approach though ignored more than 20 years of best practice in online learning. The results of the hasty move to synchronous video-conferencing were not pretty, but it did save the academic year, and more importantly, many lives. Also, lessons were learned. There were some advantages as well as disadvantages of synchronous video-conferencing. The sudden move to emergency remote learning also highlighted the critical importance of support units such as Centres for Teaching and Learning and specialists such as instructional designers. As a result, there was a huge increase in professional development and training in teaching.

These and other lessons learned require that the third edition of this book takes into account both developments during the pandemic, and the consequences for post-pandemic teaching and learning. I have a new section (Chapter 1.8) on some of the key lessons learned, and other lessons are considered in the context of the book as a whole.

Fortunately, and perhaps also surprisingly, though, earlier editions of the book stand up well to the lessons learned from Covid-19. In particular the overall structure and themes are still relevant, but this edition makes an effort to take the lessons from the pandemic into account.

iii. 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
- 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 in post-secondary institutions and 'teacher' for school or k-12 systems, so throughout the book, I've tended to follow this practice. 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.

iv. 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 12, 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, or without additional support from Contact North, Ontario.

v. 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. There are also 23 reviews of the book in BCcampus' Open Textbook Library.

vi. 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/teachinginadigitalagev3m/) 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 nine 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 activities added, 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: Fundamental Change in Education). [Note that text in blue often 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.

vii. 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,

Chapter 9 examines four emerging technologies (social media, artificial intelligence, virtual/augmented reality, and serious/educational games)

Chapter 10 offers a set of criteria and a model (SECTIONS) for making decisions about different media and technologies for teaching.

Chapter 11 addresses the question of how to determine what mode of delivery should be used: campus-based, blended or fully online.

Chapter 12 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 13-14: 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 13 suggests nine pragmatic steps for designing and delivering quality teaching in a highly digital teaching context.

Chapter 14 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.

Chapter 15: The book in a nutshell

Chapter 15 provides a brief summary of the main issues the book attempts to address

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.

viii. 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 both the second and the third 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 (now Toronto Metropolitan 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.

ix. 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 (now part of University College), the University of London.

On leaving university, I taught a class of 42 children aged between 7 and 10 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 am currently a research associate at Contact North, Ontario, a senior advisor to the Chang School of Continuing Education at Toronto Metropolitan University, and a consultant to the British Columbia Institute of Technology, helping with the implementation of their e-learning strategy

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 used to 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.

Translations – First Edition

The first edition of this book has been translated into the following languages: Chinese, Farsi, French, Japanese, Portuguese, Spanish, Turkish, and Vietnamese. The files from those translations can be downloaded below.

Chinese

- 数字化时代的教学 [PDF]

Farsi

- Farsi Translation (Chapters 1-5) [PDF]

French

- L’enseignement à l’ère numérique [PDF]

Japanese

- デジタル時代の教育 [Read online]
- デジタル時代の教育 [PDF]

Portuguese

- Educar na Era Digital [PDF]

Spanish

- Enseñanza en la Era Digital [Read online]
- Enseñanza en la Era Digital [PDF]
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  - 0 escenario A
  - 1.2
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  - 4.1
  - 4.8
  - 5.1
  - 5
  - 6
  - 8

Turkish

- Dijital Çağda Öğretim [Read online]

Vietnamese

- Dạy học trong kỷ nguyên số [PDF]

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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 third edition includes the changes made to the first and second editions.

Here I will keep track of changes, using 18 August 2022, when this third 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
- understand the implications for digital learning of Covid-19 and emergency remote learning.

What is covered in this chapter

In this chapter, I will be discussing the pressures that are mounting on educational 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:

- 1.6 Changing students, changing markets for higher education
- 1.7 From the periphery to the center: how technology is changing the way we teach
- 1.8 The impact of the Covid-19 pandemic on teaching and learning
- 1.9 Navigating new developments in technology and online learning

Also in this chapter you will find the following activities:

- Activity 1.1 Thinking about skills
- Activity 1.2 What skills are you developing in your students? Part 1
- 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 Lessons from Covid-19
- Activity 1.9 Navigating new developments in technology and online learning

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.
- The emergency response to Covid-19 resulted in changes already in the system happening more quickly

and more deeply. However, quality inevitably suffered. It will be important to ensure that the lessons learned pre-Covid about effective digital learning are not ignored, while at the same time ensuring key lessons learned during the pandemic, especially regarding access and equity, are applied.

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 for 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.

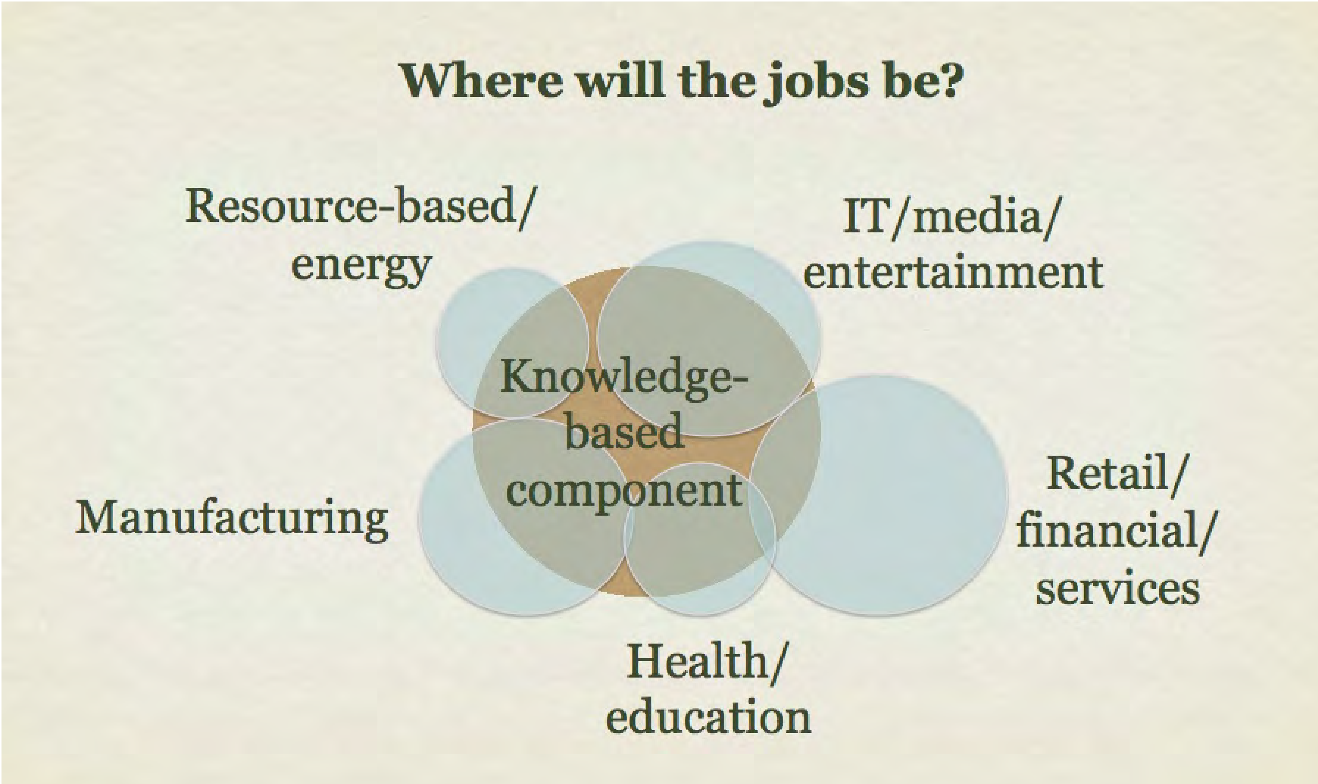

Figure 1.1.2: The knowledge component in the workforce

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.

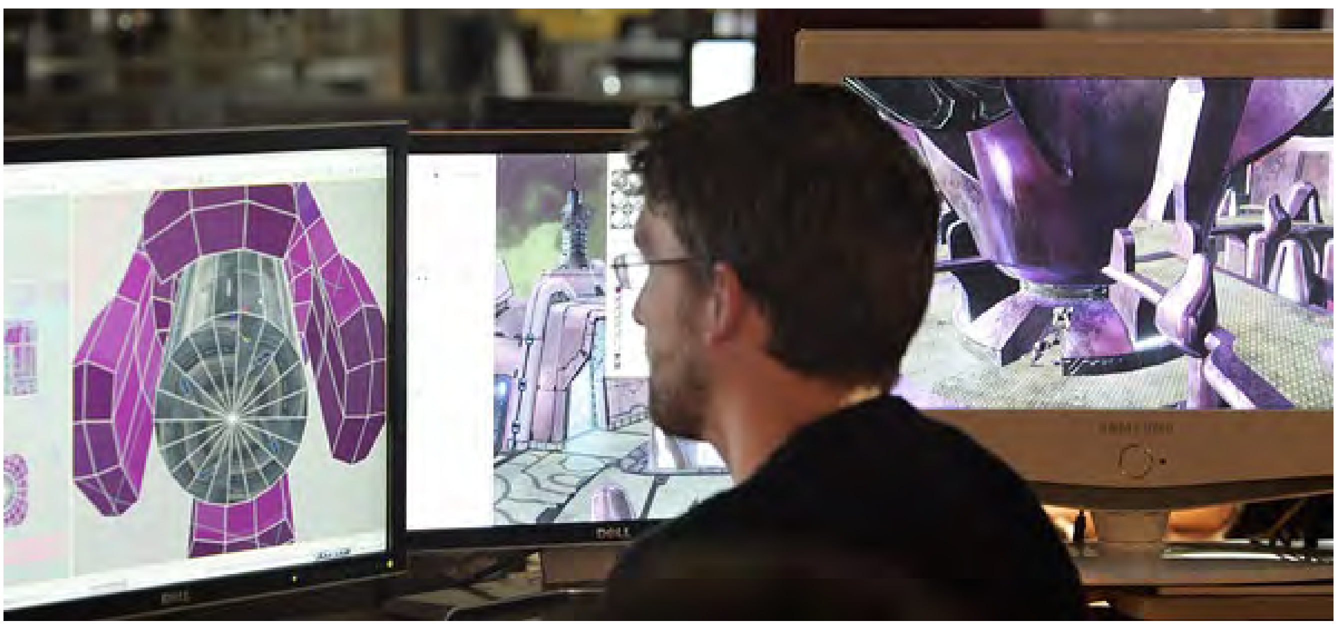

Figure 1.1.3 A video animator: a typical knowledge worker. Photograph: Elaine Thompson/Associated Press, 2007.

References

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

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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

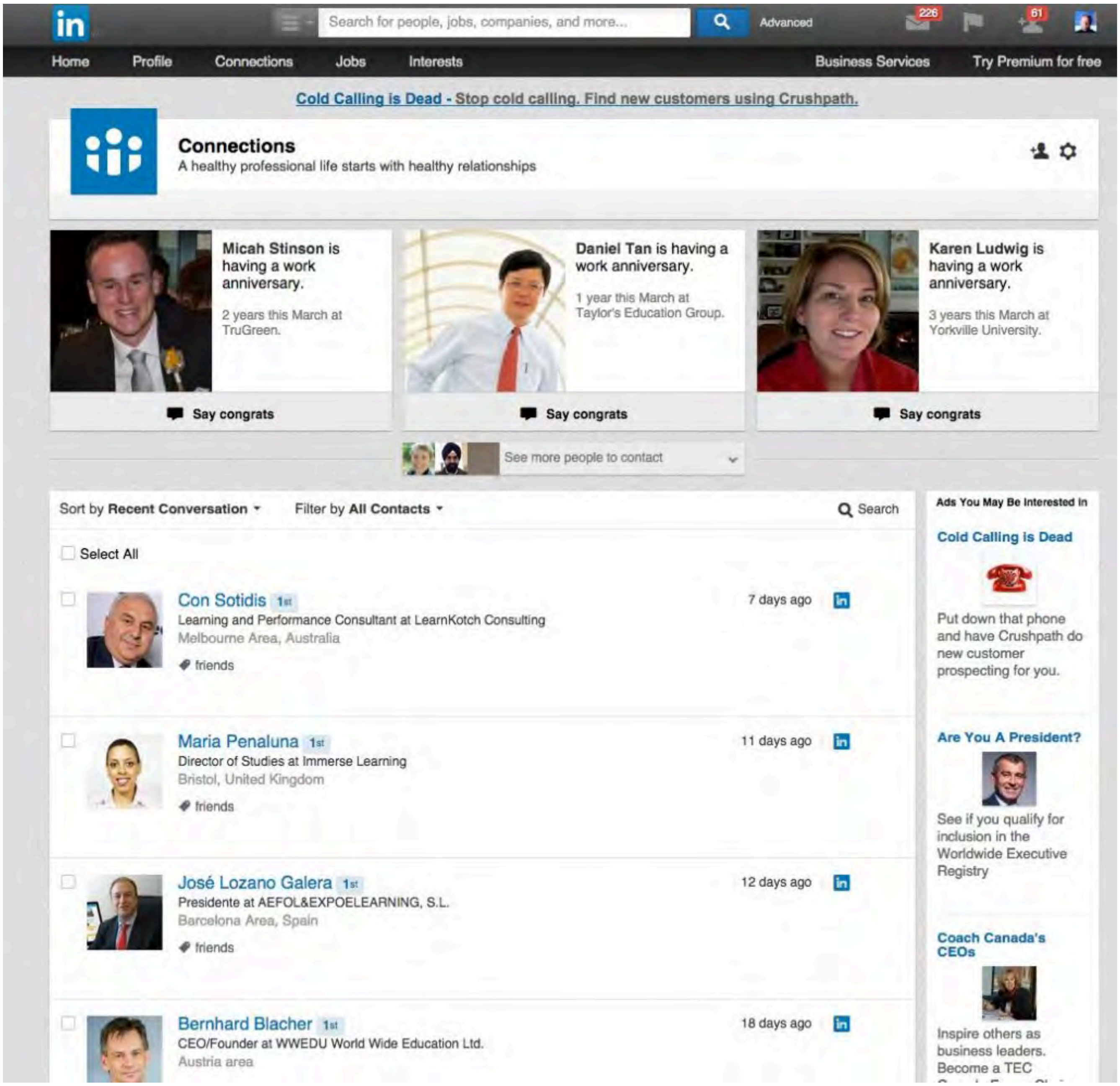

Figure 1.2.1 Using social media for communication is an essential skill for a digital age

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 and teachers 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):

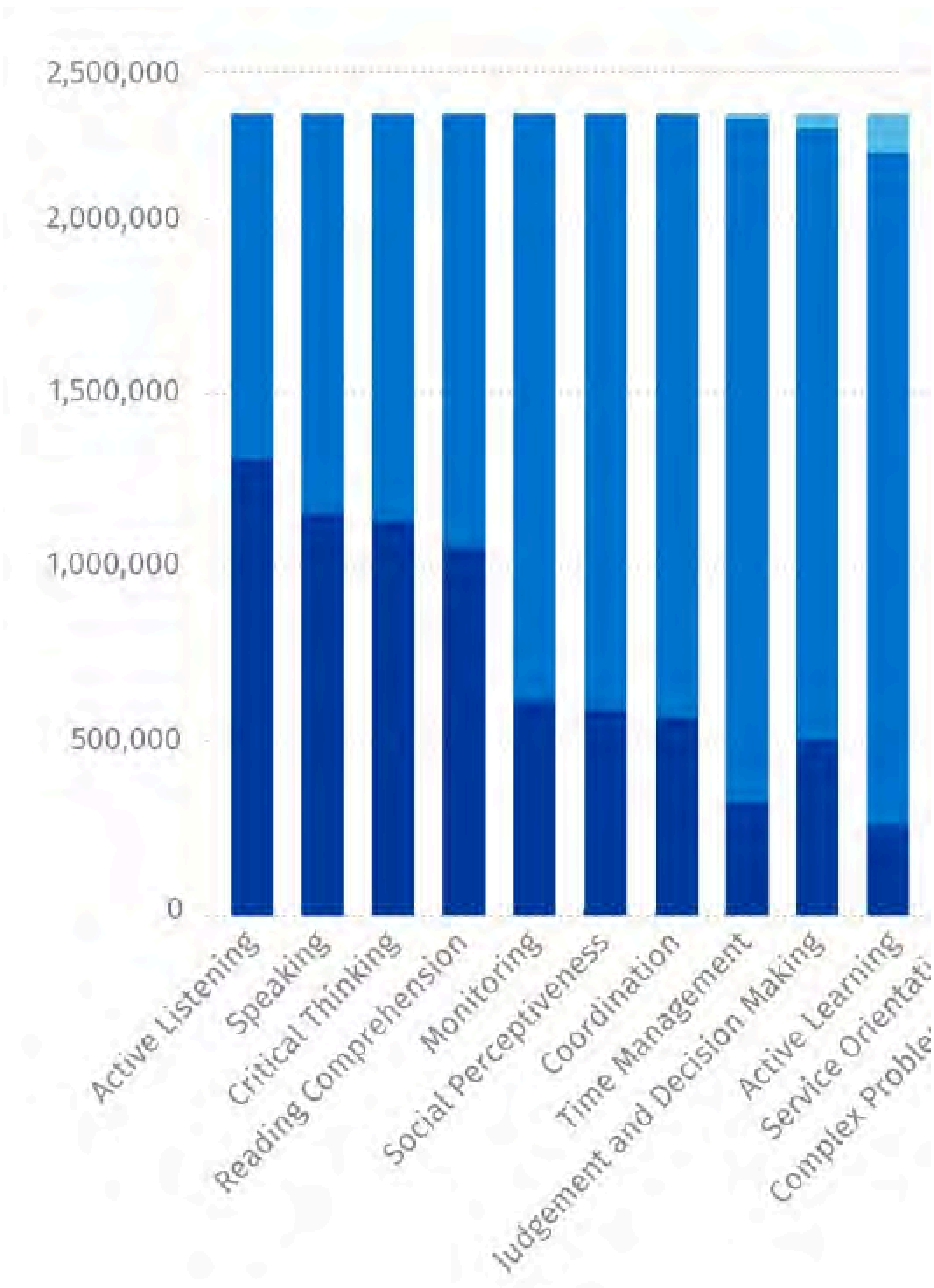

Figure 1.2.2 From 'Humans Wanted', Royal Bank of Canada, 2018

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 kept winning not because she continued to get faster and stronger than younger players, but because she continued to hone her skills (including strategy) to a level that compensated 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. But 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.

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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

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=34#audio-34-1

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.

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.

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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?

For my views on these questions click on the podcast below:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=40#audio-40-1

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?

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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?

For my views on these questions click on the podcast below.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=43#audio-43-1

1.6 Changing students, changing markets for higher education

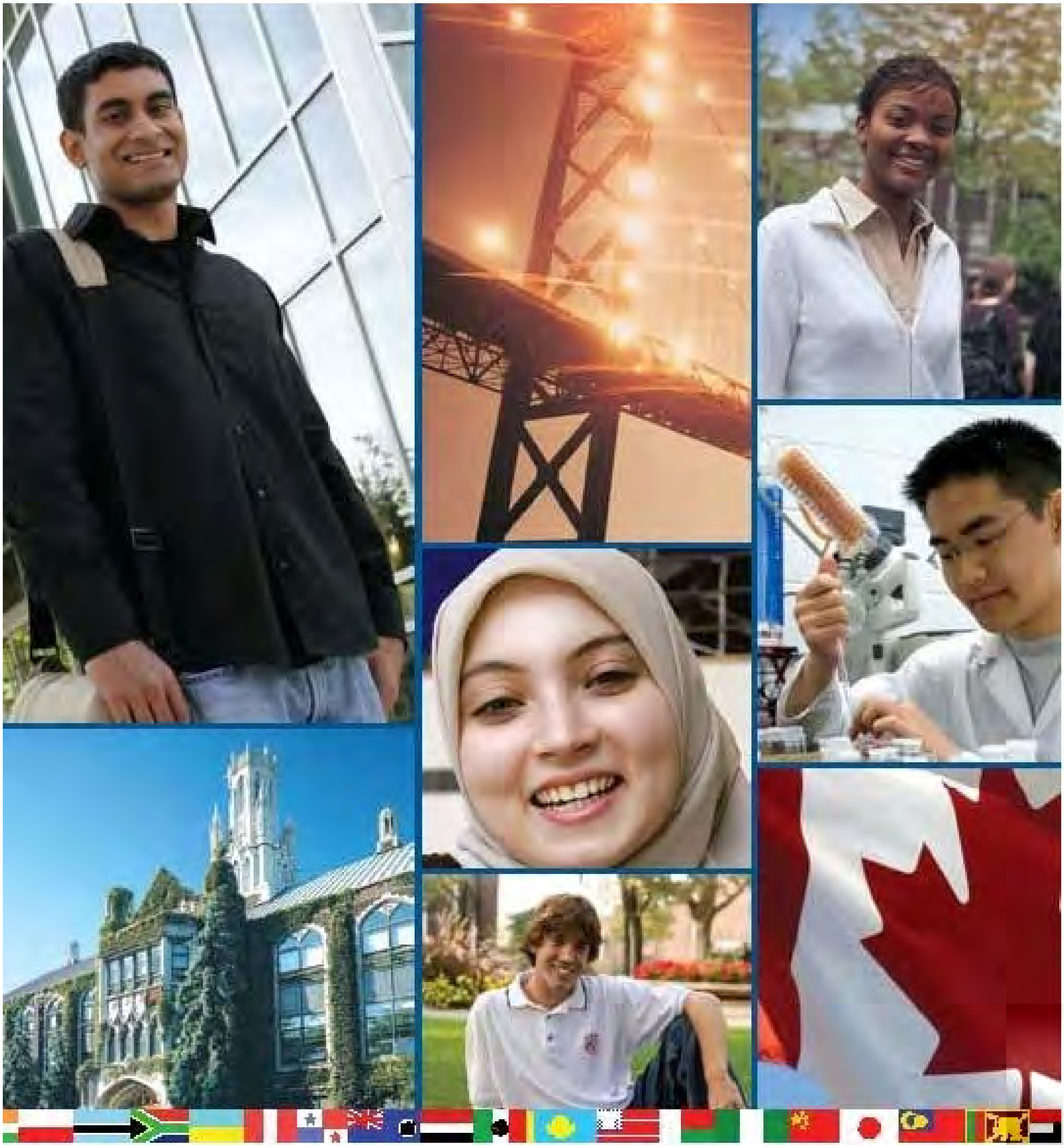

Figure 1.6.1 More diverse students
Image: © greatinternational students.blogspot.com, 2013

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), universities and colleges 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, thus coming closer to public schools in the k-12 system in the diversity of their students. 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,

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. Certainly in Canada, the number of international students on campus has increased dramatically over the last 20 years. At the University of British Columbia Vancouver campus in the academic year 2021-2022, out of a total of just over 60,000 students, 16,804 international students from a total of 148 countries constituted more than a quarter of all students (UBC, 2022).

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 graduate 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. 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.

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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?

For my response to these questions click on the podcast below

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=47#audio-47-1

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, colleges and schools. 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 had been increasing by about 10 per cent per annum pre-Covid-19 between 2002 and 2018 in North American higher education institutions, compared with an increase in campus-based enrolments of around 2-3 per cent per annum (see, for instance, Allen and Seaman, 2014; Johnson, 2019).

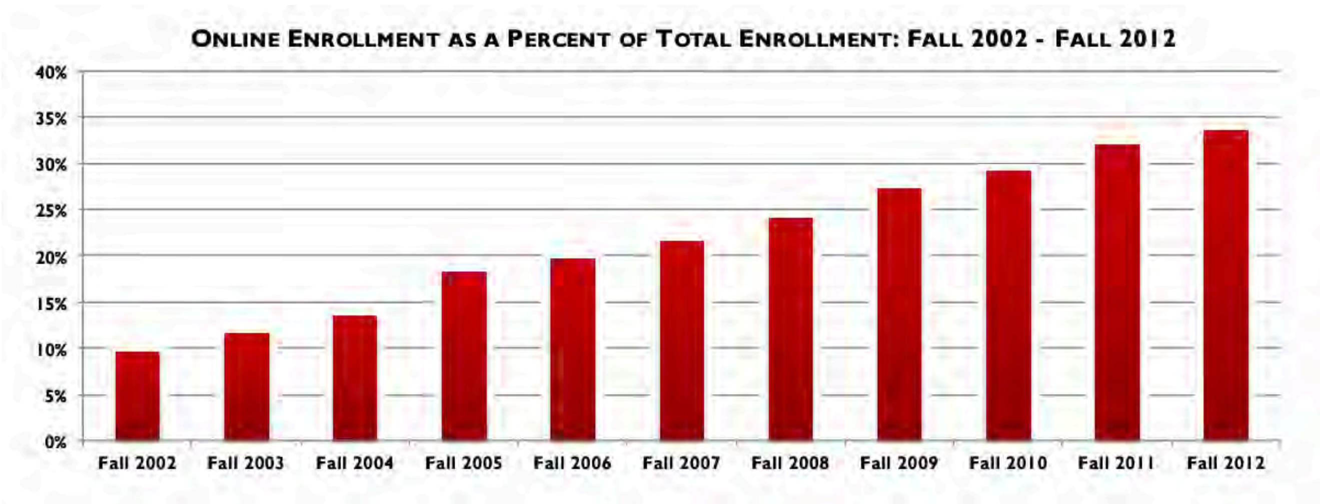

Figure 1.7.2 From Allen and Seaman, 2014

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. In 2019, nearly all Canadian universities (93%)

and most public-funded colleges outside Québec (85%) offered fully online courses for credit (Johnson, 2020). In 2018, 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).

In the k-12 system, Barbour and Labonte (2019) determined that in terms of level of distance and online learning activity across Canada, the number of students engaged in K-12 distance and online learning in 2019 was estimated at just under 300,000 or almost 6% of the overall K-12 student population.

These trends of course were shattered during Covid-19, when all students in North America went online in March, 2020. 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. With or without direction from instructors, students are increasingly going online to seek answers to questions or to find resources that will assist them with their learning. 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 (Bates, 2018). 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. Emergency remote learning during Covid-19 resulted in many instructors rethinking how they could best incorporate online learning with their classroom teaching. 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.

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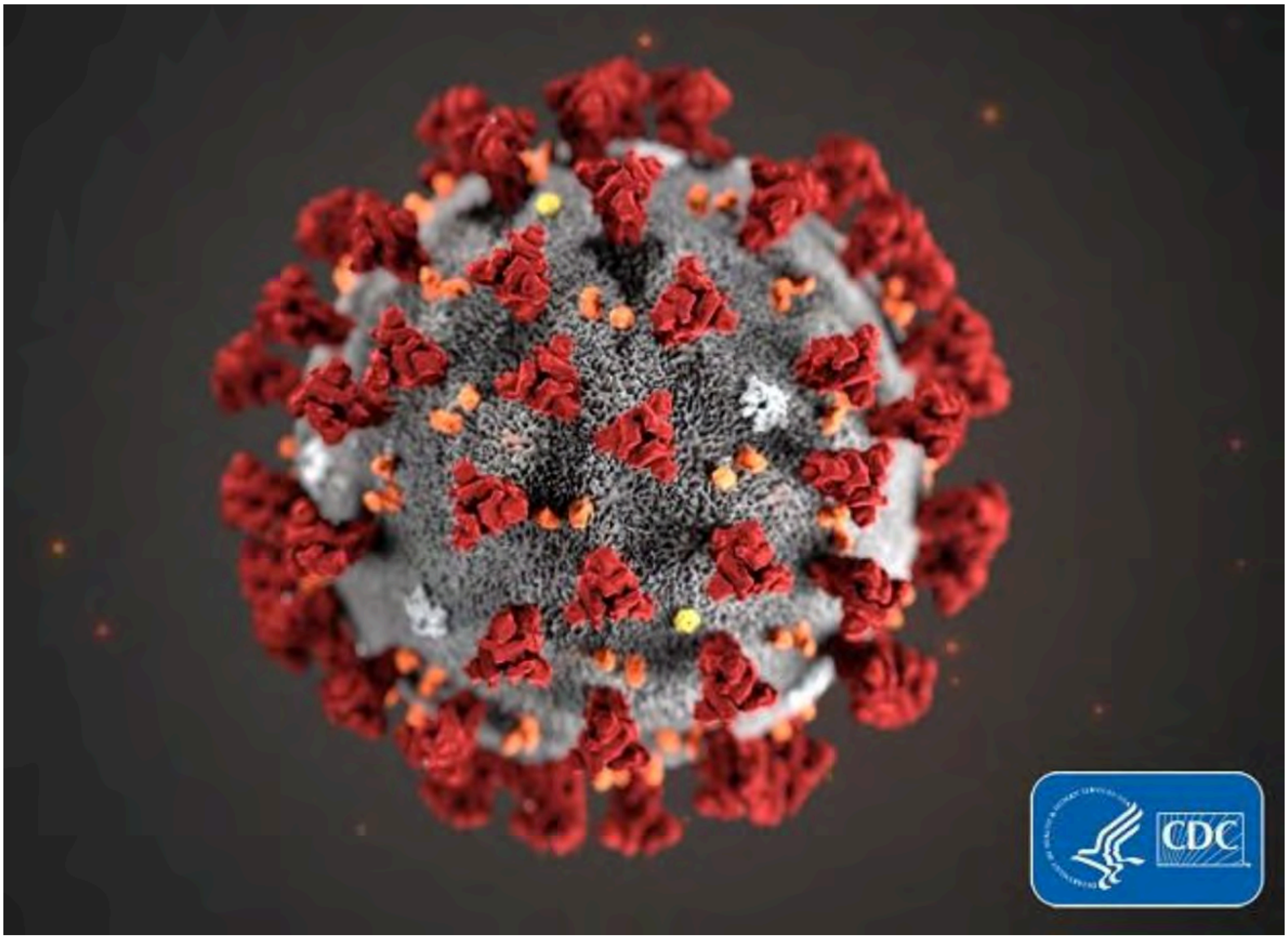
Activity 1.7 The consequences of change

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?

For my comments on this activity click on the podcast below:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=51#audio-51-1

1.8 The impact of Covid-19 on teaching and learning



1.8.1 A shock to the system

Something truly remarkable happened in March, 2020. Because of the dangers of a rampant epidemic, most schools, colleges and universities across the world were forced to close to protect students and staff from infection (OECD, 2021). But education did not stop. Certainly in North America, all post-secondary instructors, and many k-12 teachers, pivoted within two weeks to emergency remote learning, using mainly Internet-based video-conferencing technology such as Zoom, Microsoft Teams or Google Meet. This enabled teaching to continue and students to complete their courses and programs.

1.8.2 A stumble but not a fall

The results were not always pretty. Most instructors and teachers had no prior experience of teaching online. Many students did less well than they would have done in class (Cellini, 2021). Above all students missed the social aspects of school and college: being with friends; non-academic activities such as sport and drama; the routine of getting up and going to school every day (Usher and Sullivan, 2021).

However, this was not the fault of emergency remote learning; Covid-19 was forcing all activities into this pattern. And at the end of the day, most students survived. Nevertheless, there were consequences. By the end of 2021, although the pandemic is becoming endemic, important lessons have been learned. The next section is based on a review of research on emergency remote learning conducted in 2020 and 2021 (Bates, 2020).

1.8.3 The impact of Covid-19

1.8.3.1 Post-secondary education

The learning performance of students in post-secondary education certainly suffered in general as a result of emergency remote learning (Means and Neisler, 2021; Cellini, 2021). Students taking subject disciplines requiring hands-on practical work suffered particularly. Prior to 2020, research on student learning outcomes (for instance, Means, 2009; Bernard, 2004) indicated that, overall, online students do as well as students learning in-person. Where there are differences, they tend to be no more than around 5%-10% worse for online learners, but that has as much to do with the fact that most online learners are studying part-time, and have jobs and/or young children. It is perhaps not surprising that students did worse during the pandemic. It was not only emergency remote learning but the stress and isolation caused by the pandemic that made studying difficult for many students.

Nevertheless, students varied considerably in their response to emergency remote learning. While many hated it, others took to it like a duck to water. This emphasises what was known about online learning before the pandemic: students differ greatly in their response to online learning. Independent learning is a skill which some students already had but others lacked during Covid-19. More importantly, independent learning is a skill that can be taught; and well-designed online learning, and blended learning in particular, can facilitate the development of this very important '21st century' skill.

However, most instructors did not adapt their teaching methods to accommodate individual students learning alone. Most used video-conferencing for the delivery of synchronous lectures (Bates, 2021). In other words, best practices in online learning developed over the previous 20 years were ignored or not applied (see Moore et al, 2021).

Many teachers and instructors worked themselves into the ground to provide an alternative way to deliver their teaching. In an emergency, instructors will use the most convenient and easy to use tools that do not require a major shift in teaching methods. Over the long term, though, teaching methods must change to account for the specific context of online learners.

Institutions that prior to Covid 19 had extensive online programs managed better than those that did not (Fox et al., 2020; Johnson et al. 2021, Moore et al. 2021)). There was a massive effort by Centres for Teaching and Learning to provide support and guidance for instructors on the design of quality online learning in 2020 and 2021 (Naffi, 2020); this should have a long-term effect on the quality of teaching in general.

Many instructors (and students) gradually came to appreciate the value of asynchronous learning for students studying online. Lectures were often recorded and made available for students to download and replay at any time. Consequently, many institutions are beginning to question the future of in-person large lecture classes with little interaction with students. The University of Manchester in the UK [promised to end 'non-interactive' lecture classes] as part of a permanent and comprehensive move to blended learning, and Ryerson University's School of Continuing Education is moving all its classes into a fully online mode, through a mix of deliberately designed asynchronous online courses, and previously classroom-based courses moving to synchronous online learning. Given that

Covid-19 is now endemic, as is influenza, will universities and colleges be willing to take the risk of large in-person lecture classes in the future?

Equity of access is still an issue (Bates, 2020). Covid-19 revealed that even in North America, there are significant numbers of students (between 20%-25%) who have difficulties in learning online from home, for a variety of reasons, such as inadequate or no Internet access, the cost of computing equipment, or lack of space for quiet study. This is not a reason for avoiding online learning, but for ensuring that such students are properly supported (such as loan of equipment, or partnerships with community centres or public libraries with Internet access.)

Emergency remote learning highlighted the need for a more 'professional' approach to teaching in post-secondary education. As the use of technology for teaching spreads, instructors need knowledge of how to design courses using technology and how to engage students online. This has implications for both pre-service and in-service professional development. (It is also a main justification for this book).

Online proctoring (using a camera and software to monitor a student at home) during Covid-19 was highly intrusive and raised serious privacy issues (for more on this see Chapter 6.8). The transfer of methods used to assess students on-campus (supervised, 'summative' exams at a set time and place) proved inappropriate for online learning. Assessment of students needs to take account of the affordances of online learning. For instance, student online work can be tracked throughout a course (formative evaluation), and e-portfolios and video clips of practical work can be used for students to demonstrate their learning. This type of assessment is particularly appropriate for assessing 21st-century skills development.

1.8.3.2 k-12/schools

Schools and school children suffered more than those in post-secondary education (OECD, 2021), for a number of reasons.

Online learning was more limited in k-12 schools than in post-secondary education prior to Covid-19. It had been mainly focused on the older age groups in Grades 10, 11 and 12 (Barbour and LaBonte, 2018) and in Canada represented about 5% of all k-12 course enrolments. Thus there was less extensive prior experience of online learning than in the post-secondary sector.

In the post-secondary system, individual instructors were empowered to decide how best to teach online; in school systems, teachers were constrained by a hierarchy of decision-making, from principal to school board to government. Communication and decision-making as a result was often confusing and slow (Bates, 2021 b). Decisions about online learning were often made in school boards or in government by those without any knowledge or experience of online learning. Priority understandably was given to recommendations to ensure student safety, but not enough attention was paid to pedagogical issues, especially with respect to prior best practices in online learning. At the same time, many teachers were left without any support or help moving online. Many school systems did not have appropriate technology readily available or well supported by technology staff. The support of parents was crucial for student success, but often parents did not receive clear communication or appropriate advice for supporting their children in online learning.

Access issues were much more severe in the k-12 sector. Most students in post-secondary education would already have a computer for study purposes; this was not the case for many k-12 students, especially those in low-income families. It was the poor and other disadvantaged pupils who suffered the most from lack of access to online learning, reinforcing the importance of the in-person public school system for equitable access to education. At the same time, some school boards made extra efforts to provide loans of equipment, and special funding for those without Internet access.

Online learning became increasingly difficult the younger the child. In particular, younger children needed the non-academic aspects of school, such as social learning, which could not easily be substituted online. At the same time, many older students in the k-12 system enjoyed the flexibility that online learning provided.

The pandemic – and the threat of other external events such as weather or other emergencies – clearly suggest the need for school boards and government to be better prepared for online learning, including providing central support such as technology and equipment, basic training in online learning in teacher education, and more advanced in-service training in online learning . This will provide long-term resilience to cope with unexpected external events that may require temporary closure of schools.

1.8.4 Changes as a result of emergency remote learning

Although the pandemic itself was devastating, some of the educational changes resulting from emergency remote learning were positive. Students, instructors, teachers and parents all underwent significant change as a result of emergency remote learning. This resulted in most cases in a greater appreciation of the strengths and limitations of online learning. Instructors and teachers gained a better understanding of online learning, in particular the advantages and limitations of synchronous and asynchronous learning. Many instructors and teachers received extensive support and training in online learning during the pandemic. Johnson et al. (2021) found that, at least in Canada, the attitude of post-secondary instructors toward teaching online, which had been relatively stagnant since around 2000, became markedly more positive over the year.

Moore et al. (2021) argue that there can now be no return to 'normal', in the sense of what existed before Covid-19:

for those institutions that have already invested in online and blended learning, "normal" is not an idealized past but is a continuation, a process of leaning into multimodal learning ecosystems to further expand access and opportunities.

Consequently, post-pandemic, there is likely to be an increase in both fully online learning and perhaps an even greater tendency for instructors and teachers to combine elements of online learning into their on-campus teaching. In other words we are likely to see a surge in blended learning.

Perhaps the most important change though will be a greater realisation that both campus-based and online learning each have their strengths and weaknesses. It is not a question of one being better or replacing the other, but finding ways to exploit the benefits of both modalities for the benefit of learners. This is what this book is primarily about.

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Activity 1.8 Lessons from Covid-19

1. Does your experience of teaching during the pandemic match or differ from the points made in this section?
2. Many experienced instructors and designers of online learning argued that emergency remote learning was essentially different from and worse than traditional online learning, which was largely asynchronous, used primarily a learning management system, and usually resulted in a redesign of the teaching to meet the special context of online learners. Nevertheless online learning is often used to describe the teaching that occurred during Covid-19. Is the distinction between 'traditional' online learning and emergency remote learning important or is this just splitting hairs? What are your reasons for your answer?
3. Is there a future for online learning in the k-12 sector other than for just the senior grades (10,11, 12)? What are the advantages/disadvantages of online learning for younger children? Should online learning be banned for younger children?

Listen to the podcast below for my feedback on these activities:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=54#audio-54-1

1.9 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 and learning to teach online is not always included in pre-service training of school teachers. 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 1.9 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 and life in a knowledge-based, digital 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. This requires more focus on teaching methods that provide support for learners, more individualization of learning, and more flexible delivery.
4. There is now a continuum of delivery of education, from full face-to-face through blended learning to fully online; 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 the transmission of content.
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.
7. Covid-19 and emergency remote learning reinforced both the importance of online learning and the need for high quality design in online learning. All teachers and instructors now need some training in how to teach digitally.

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.

Peter (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

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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 is 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.

There is no right or wrong answers here but for my views on this click on the podcast below:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=62#audio-62-2

2.2 Epistemology and theories of learning

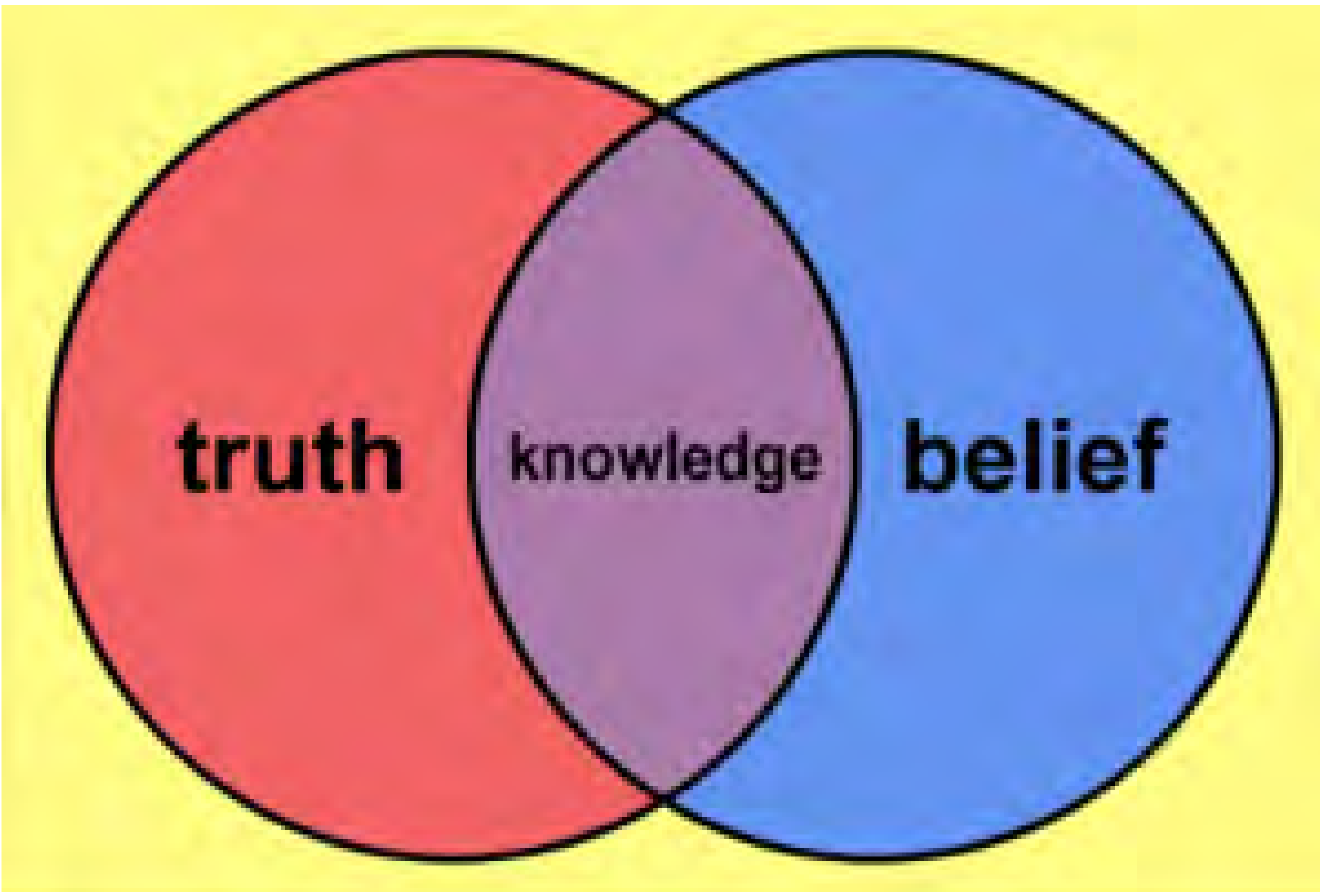

Figure 2.2.1 Image: © Freethought Kampala, 2017, via Libguides, University of Pittsburgh

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.

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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?

For my response to these questions, click on the podcast below:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=65#audio-65-1

2.3 Objectivism and behaviourism

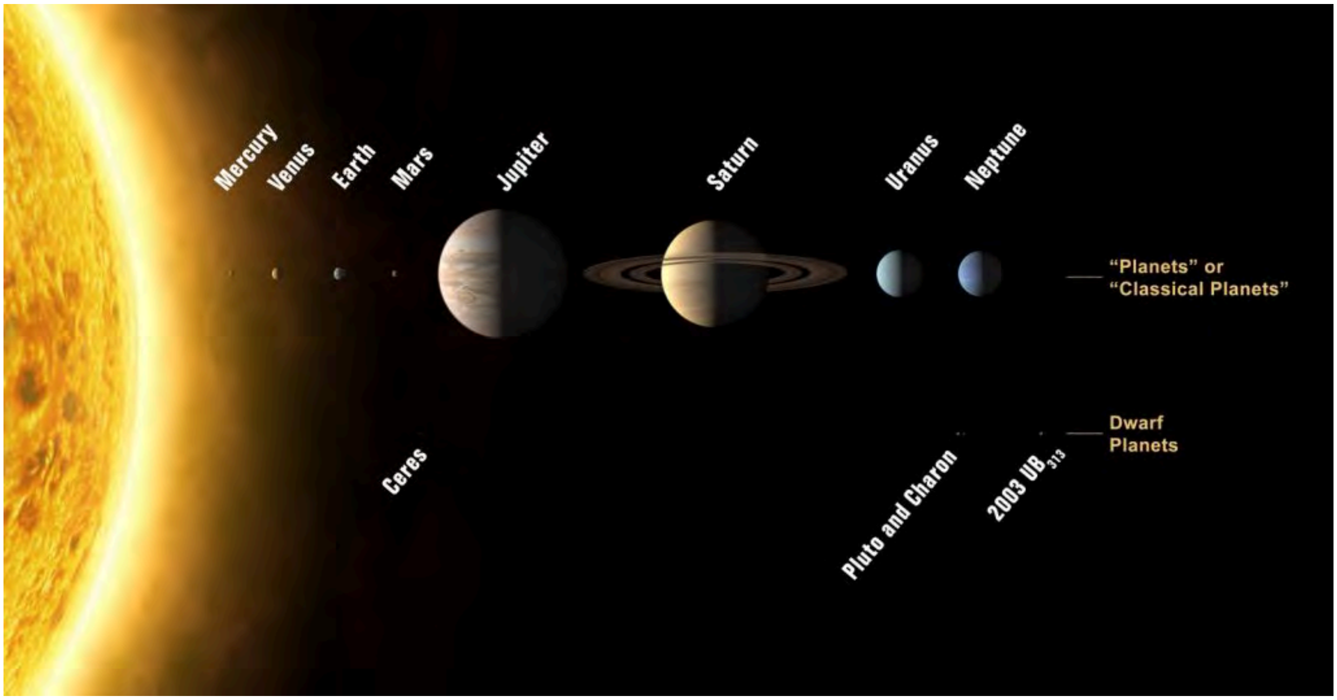

Figure 2.3.1 The solar system: an objective fact?
Image: © International Astronomical Union/Wikipedia

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. [It is worth noting that the concept of each child working at their own pace with automated feedback is the same principle incorporated in today's artificial intelligence applications of 'personalised' learning – see Chapter 8.7.c]

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?

For my comments on this activity, click on the podcast below:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=69#audio-69-1

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:

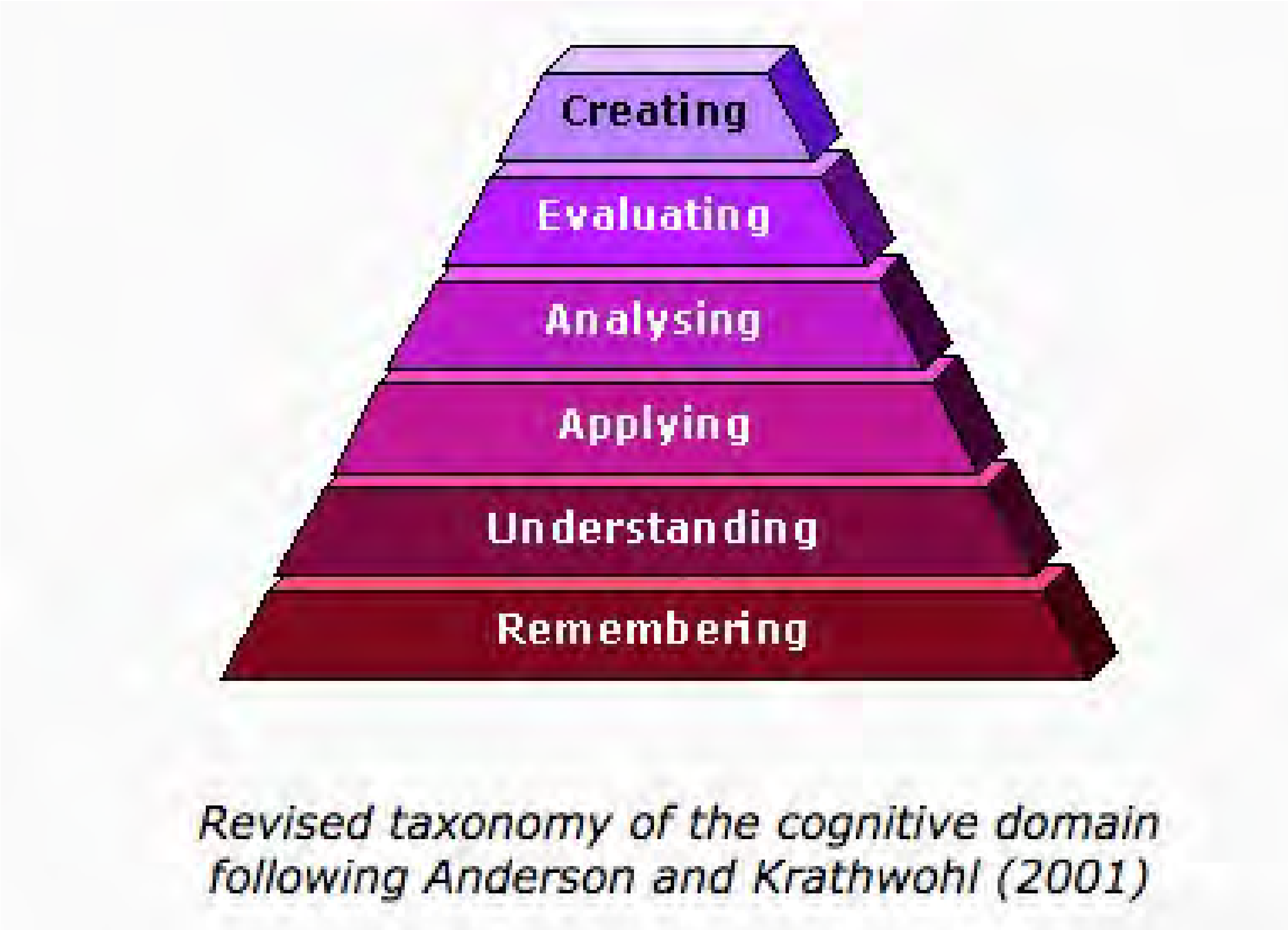

Figure 2.4.2 Cognitive domain
Image: © Atherton J S (2013) CC-NC-ND, retrieved 7 May 2019

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).

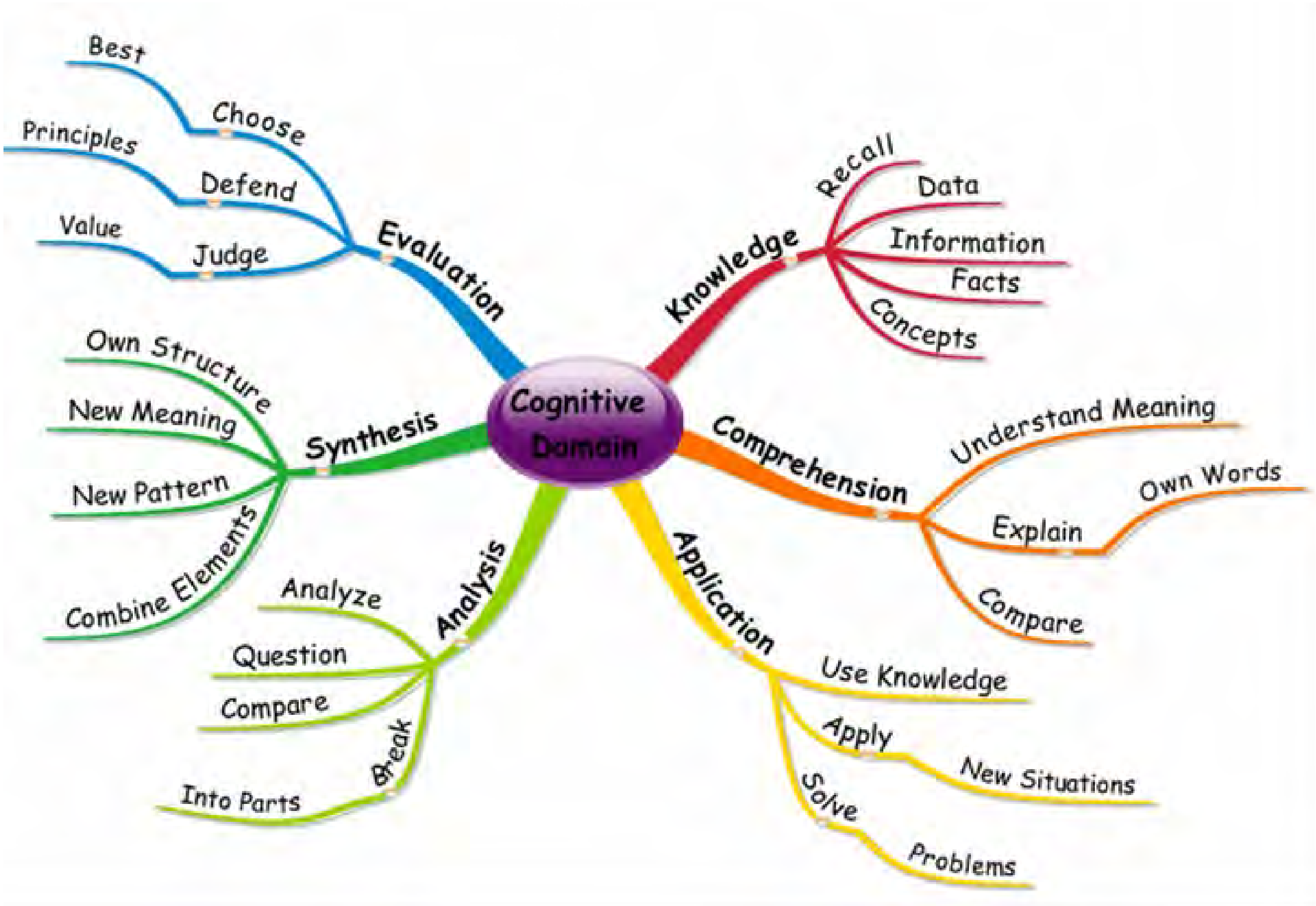

Figure 2.4.3 © Faizel Mohidin, [UsingMindMaps](), 2011.

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

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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?

Click on the podcast below for my feedback on this activity:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=74#audio-74-1

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?

For my feedback on these questions, click on the podcast below:

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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 inter-connected 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.*

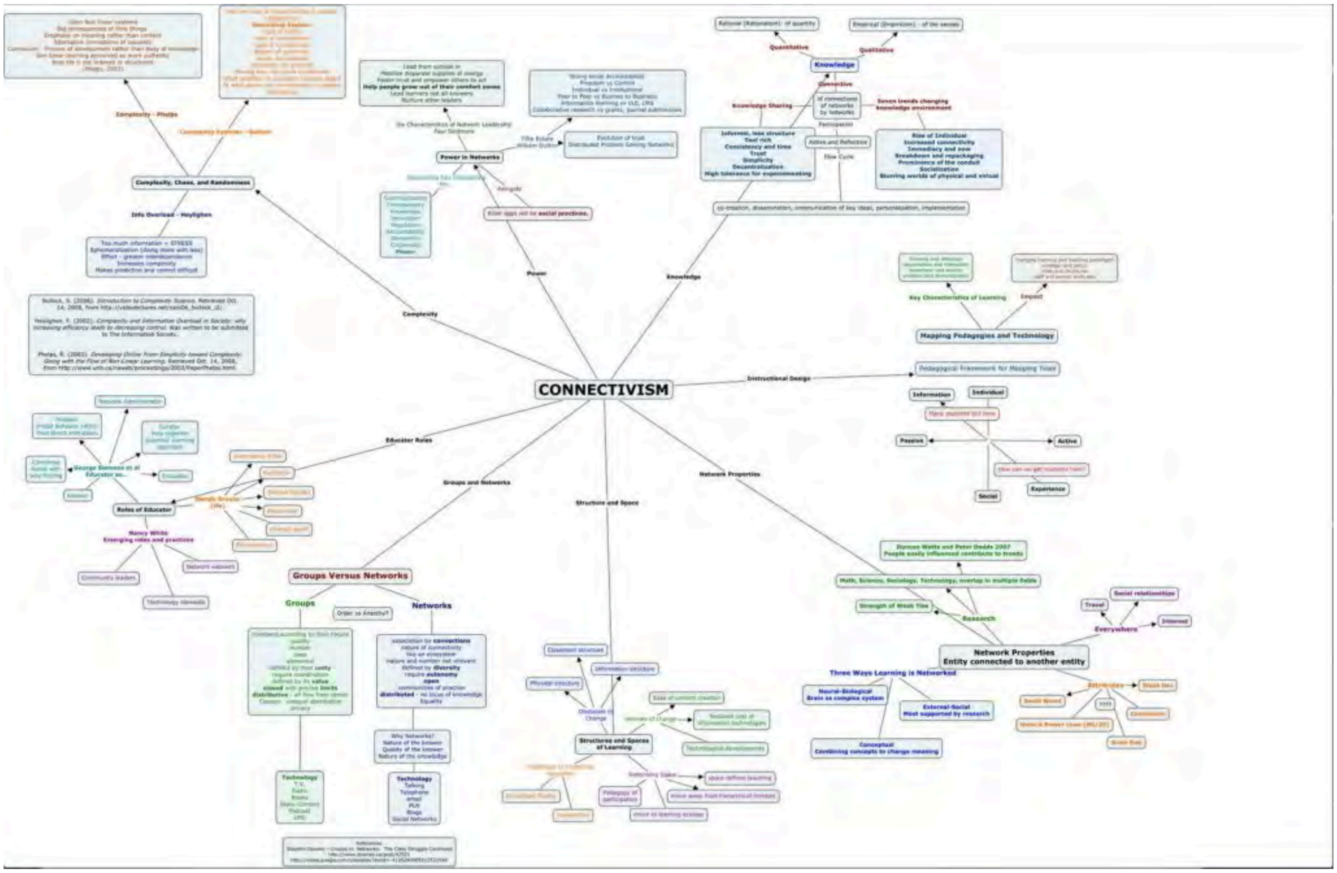

Figure 2.6.3: A map of connectivism Image: © pkab.wordpress.com. Click and drag for a larger image.

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

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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. In the meantime, click on the podcast below for my view on Connectivism.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=82#audio-82-1

2.7 Is the nature of knowledge changing?

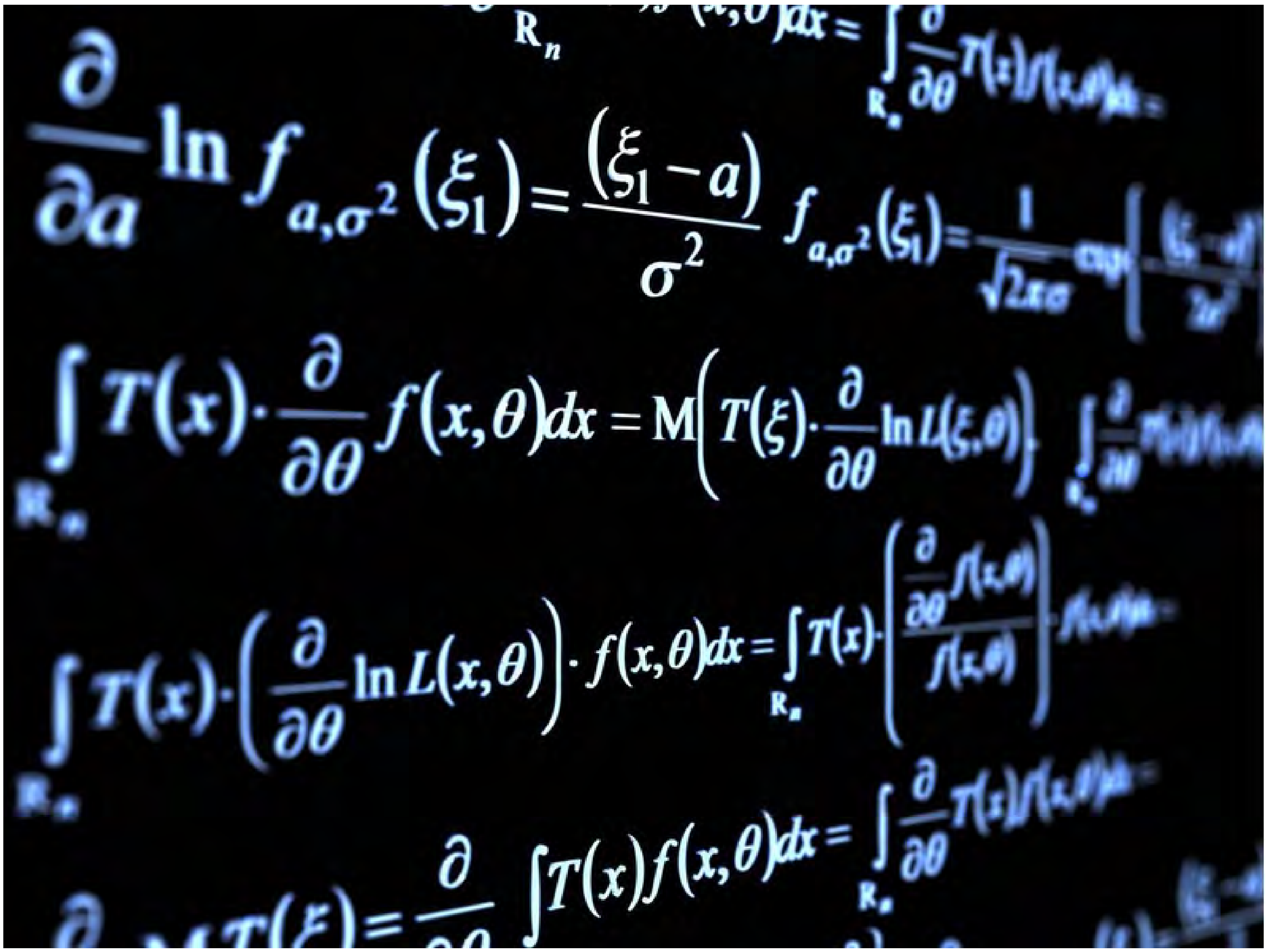

Figure 2.7 Academic knowledge is a second-order form of knowledge that seeks abstractions and generalizations based on reasoning and evidence Image: © Wallpoper/Wikipedia

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 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.

Figure 2.7.4. How is knowing how to win at poker different from academic knowledge? Image: Wikipedia, 2021

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 'academic 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.

References

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See also:

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

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?

There is no feedback for this self-reflective exercise.

2.8 Summary

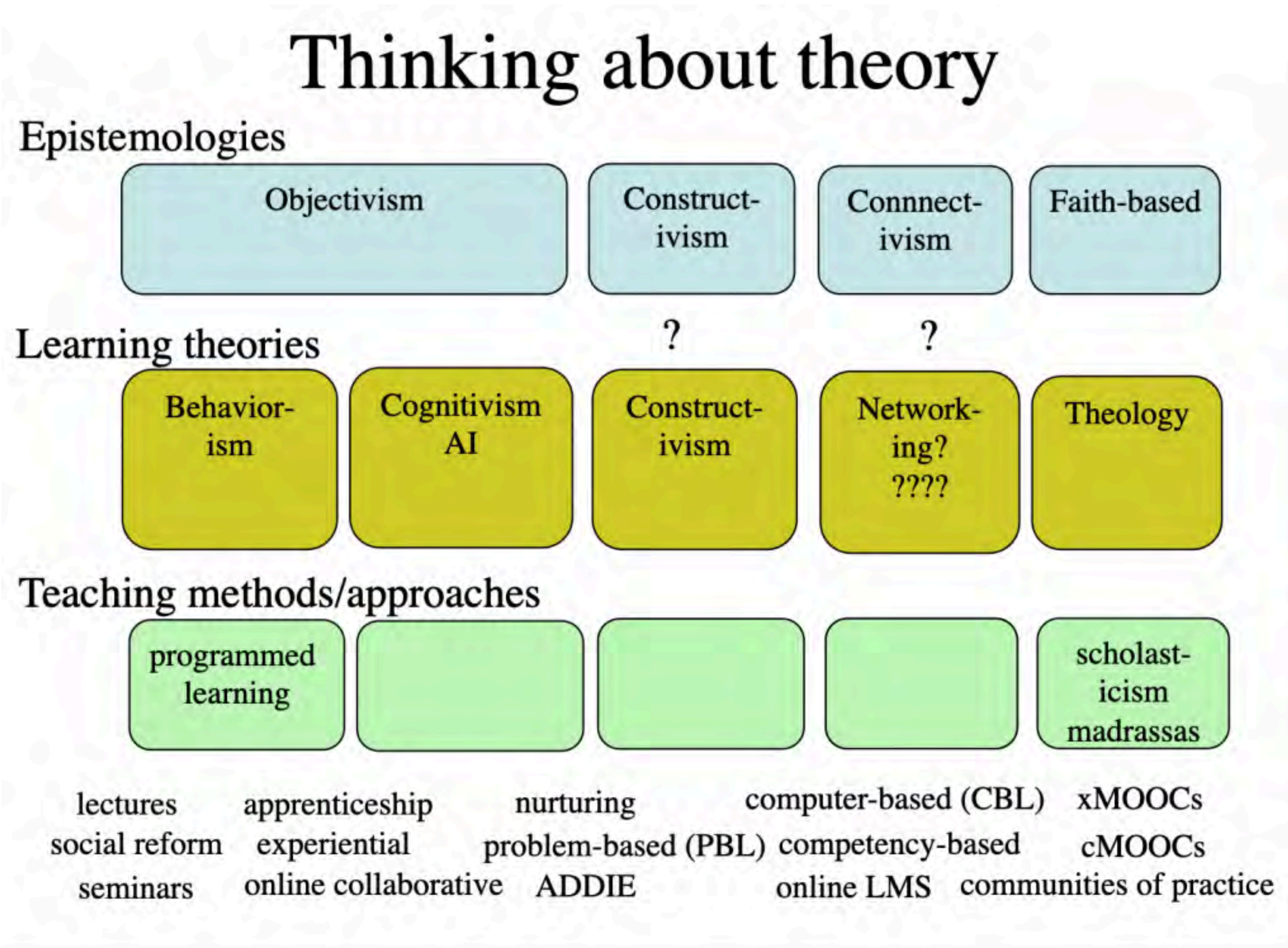

Figure 2.8.1 The green boxes are left open until we cover teaching methods (the bottom line) in Chapters 3 and 4

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

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=89#audio-89-1

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?

There is no feedback on this activity.

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 school or campus-based learning environments.

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

- describe several different methods of teaching used in school and 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:

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

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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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=98#audio-98-1

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 laptops 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 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 bringing 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 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. When teachers and instructors had to go online during the pandemic, most merely moved their lectures online. Given the inertia in the system, transmissive lectures are likely still to predominate for another ten years, but after that, in most institutions, courses based on three one-hour lectures a week over 13 weeks are likely to have disappeared. There are several reasons why this may happen:

- 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.

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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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=102#audio-102-1

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.

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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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=106#audio-106-1

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' was 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 several universities, including the University of Waterloo in Canada and Aalborg University in Denmark. The conditions needed to ensure that experiential learning is effective can be found from 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 appropriately using common scientific, engineering or trades equipment;
- 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:

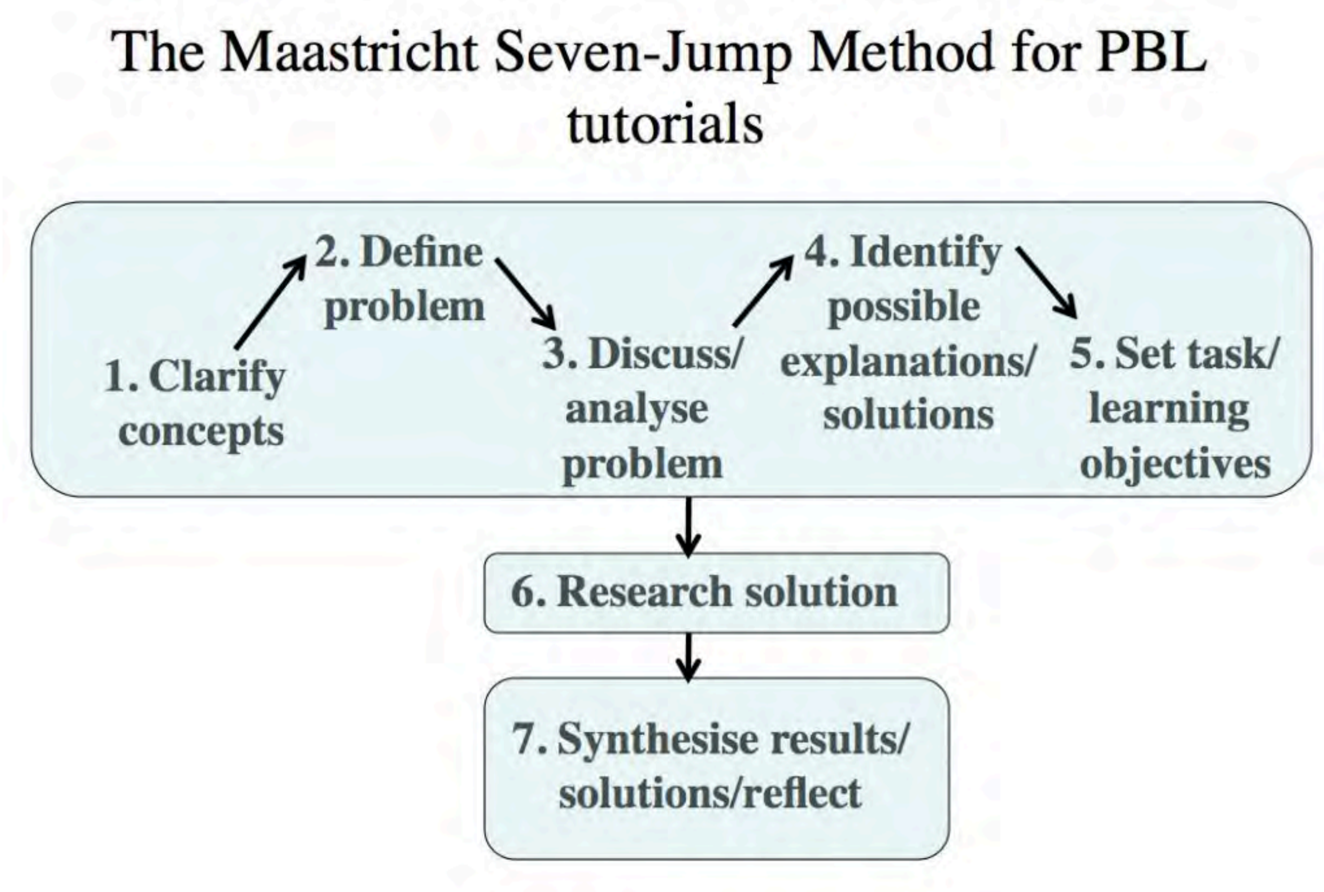

Figure 3.5.3 (derived from Gijeselaers, 1995)

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 powerful 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 some 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:

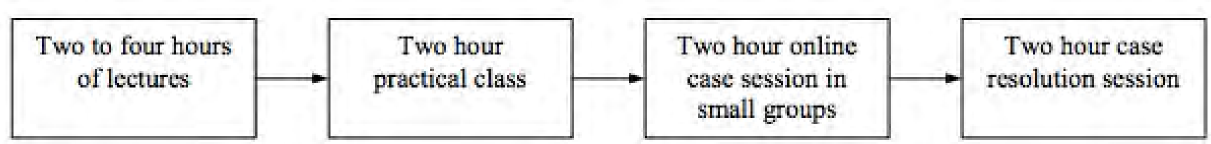

Figure 3.5.4 Blended learning sequence involving online learning resources, Marcus, Taylor and Ellis, 2004

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:

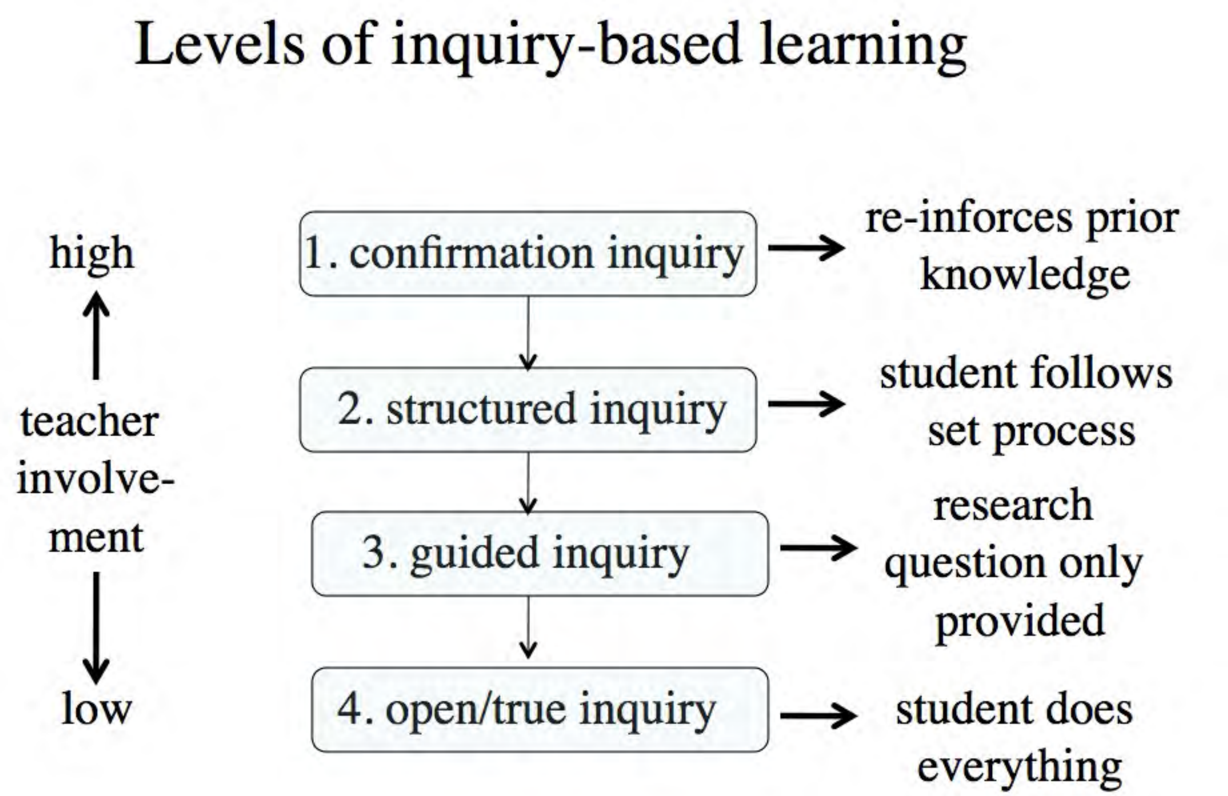

Figure 3.5.5 Inquiry-based learning, adapted from Banchi and Bell (2008)

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 in Ontario 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.

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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.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=114#audio-114-1

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 also 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 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 to:

> *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.

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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

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=118#audio-118-1

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.

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 states or 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.

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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 4.1 There is no activity for this section
- Activity 4.2 Moving the classroom model online

- Activity 4.3 Using the ADDIE model
- Activity 4.4 Evaluating online collaborative learning models
- Activity 4.5 Thinking about competency-based education
- Activity 4.6 Making communities of practice work
- Activity 4.7 Taking risks with 'agile' design
- 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.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=132#audio-132-1

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: lecture-based online learning

Figure 4.2.1 Live video streaming of lecture Image: Planet eStream, 2019

We start with lecture-based 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 wine 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 – this is sometimes called bi-modal teaching. For an example of this, see here.). The remote students may be watching on their own at home, work or in transit, or in small groups at another campus or local learning centre. There is no change in the design from an in-person lecture, although the instructor may need to make sure that the remote students are not ignored if there are questions or discussion. Because the lecture is live, and everyone attends at the same time (even though they may be in different places), the teaching is synchronous. For an example, see here.

Live streamed video 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). When the Covid-19 pandemic suddenly burst onto the scene in March, 2020, and instructors and teachers had to pivot immediately to emergency remote learning, this was the method adopted by the majority, mainly using Zoom or other online video-conferencing technologies. The advantage of Zoom or similar video-conferencing software is that it can be used from anywhere with an internet connection by instructors and students.

Some instructors require all students to be present during the live lecture in order to ensure participation, but this can be counter-productive if the aim of going online is to increase flexibility for students. This flexibility can be accommodated by also recording the lecture.

4.2.2 Recorded and streamed lectures

Lectures can be recorded in two main ways.

- if using Zoom or a similar online video-conferencing system, the session can be recorded and made available for later use by students. Depending on the licensing agreement, there is often a limit on how long the video will remain available, but it can be kept usually for at least a couple of months or to the end of a semester.
- lecture capture technology such as Panopto or Kaltura is another, older, technology that allows a 'live' classroom lecture to be recorded and stored on a server for later streaming to students. The lecture capture equipment is usually installed in the lecture theatre. This technology, which automatically records a classroom lecture

once activated by the lecturer, 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 Lecture capture: An MIT classroom lecture recorded and made available through MIT's OpenCourseWare. Click on image to see the lecture.

Lecture capture led to the development of massive open online courses (xMOOCs), such as those offered by Coursera, Udacity and edX. These MOOCs were originally classroom lectures recorded using lecture capture technology at Stanford, MIT and Harvard, and then made available to the general public over the internet.

The main advantage of recording lectures is to allow all students (those present and those that missed the lecture) to review the lecture at their leisure. Thus recording lectures is an asynchronous technology, in that the lectures can be viewed at any time and any place with Internet access. Lecture capture is a more permanent alternative to using the recording facility in video-conferencing software such as Zoom, although video-conferencing software can be used from anywhere with an Internet connection.

Recorded video can be integrated with a learning management system (see 4.2.3 below). Passwords can be used to limit access to the recorded videos to registered students only. In some cases, making recordings of lectures available to students has been shown to reduce student drop-out dramatically.

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 (for an example see here).

4.2.3 Lecture-based courses using learning management systems

Learning management systems (LMSs), such as Blackboard, Canvas, D2L and Moodle, are software that enable instructors and students to log in and work within a password protected online learning environment. LMSs can be used in a variety of ways. In this section the focus is on using an LMS to mirror a lecture-based approach to teaching. The main difference is that the student using an LMS is working asynchronously.

The software allows the instructor or teacher to organise the student work into weekly units or modules. The lecture can either be written, often in the form of Powerpoint slides, or delivered as a video. The instructor selects and presents the material to all students, a large class enrolment can be organized into smaller sections with their own instructors or adjunct faculty, 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. The learning management system is primarily an asynchronous technology, in that students can access the software at any time and any place with an internet connection.

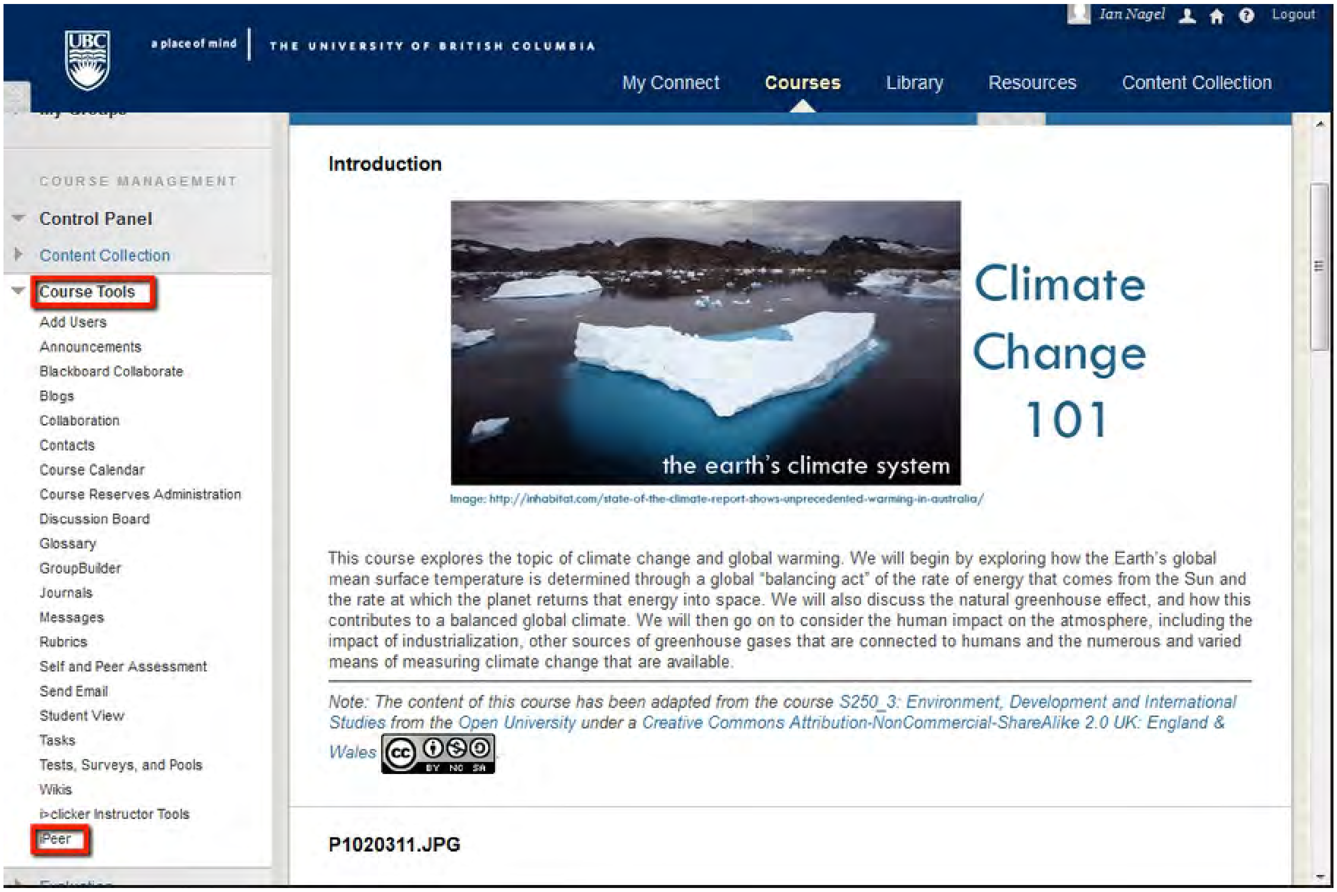

Figure 4.2.3 A screenshot of the University of British Columbia's LMS, Blackboard Connect

Originally LMSs were primarily text-based, but now they can integrate both live or recorded video, such as Zoom meetings or streamed lectures.

The main design differences with video-based or classroom lectures is that in an LMS:

- the content is primarily text based rather than oral (although increasingly video and audio are now integrated into LMSs),
- the student-teacher interaction and online discussion are mainly asynchronous rather than synchronous,
- students are assigned online work within the LMS to follow up on the instructor-provided material
- 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 (weekly modules, regular assessment, and interaction between students and with an instructor) 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 courses.

Perhaps of most importance though is that most LMSs embed good design principles, such as:

- requiring clearly stated learning objectives,
- a clear weekly work structure for students,
- opportunities for online discussion,
- opportunities for feedback from instructors, and
- continuous and/or summative assessment.

These features are built in to the software to guide instructors in their design. Other ways of designing teaching with an LMS will be discussed later in this chapter.

4.2.3 Strengths of the lecture-based model for online learning

Old wine can still be good wine, whether the bottle is new or not. If lecturing was considered good practice and effective in-person, then one might reasonably expect it to be equally effective online.

Secondly, in an emergency such as the pandemic, and with relatively easy to use tools such as online video-c0nferencing systems and lecture capture, instructors and teachers can make a rapid pivot to maintain student education even though neither students nor instructors can access a school or campus. In an emergency there is not time to re-design curricula or teaching methods, or to train teachers and faculty in alternative methods of teaching.

Third, recording and streaming lectures on demand not only allows more flexibility for students who have difficulty in getting to school or campus, but also allows students to replay, review and analyse the lecture more closely. In short it allows students to spend more time on task.

Fourth, once recorded the lecture can be used again with a different class in a different year. This can subsequently free up some of the instructors' time for more interaction with students.

4.2.4 Weaknesses of the lecture-based model for online learning

First, all of the limitations of in-person, lecture-based teaching outlined in Chapter 3.3 are carried over and if anything magnified when lectures are moved online.

The most important limitation though of lecture-based online learning 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. In particular, students are working in isolation. As a result, for motivational reasons, they need more interaction online with the instructor and other students than in an in-person lecture. It is also unhealthy for students to be watching a screen for six hours a day (see Cross, 2022), if all classes are organised around transmissive lectures. This limitation of lecture-based teaching becomes more serious the younger the student, or the less self-disciplined the student. Students who struggle in an in-person teaching context tend to struggle even more in an online context where the lecture model is used (see, for instance, Figlio et al., 2013).

The need to re-design teaching for an online environment will be discussed more fully in the rest of the book, but if online lectures are used they need to be modified, and in particular the time spent on video lectures needs to be reduced, to allow time for students to work asynchronously and for the instructor to have more time for interaction with students.

Thirdly the lecture-based online learning design fails to meet the changing needs of a digital age. It is important then to look at teaching methods that make 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 no better and more likely much worse than that of the physical classroom model which it is attempting to imitate. This is discussed more fully in Chapter 7 and Chapter 8.

Lastly, the 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.

4.2.5 Summary

Moving transmissive lectures online in March 2020 was a justifiable necessity. There was not time to do anything else. Doing the same thing in January 2022, nearly two years later, is not acceptable. There has been plenty of time to re-design online teaching to make better use of its strengths, particularly asynchronous learning that students can do online individually or in online groups.

In the school (k-12) system in particular, this requires a complete change of teaching methods for online learning. At the time of writing (January 2022) this has not occurred in most school systems, mainly because of failure to train teachers in online learning or to use specialists in online learning to help change curricula. Also younger children in particular need to be in school for a wide range of reasons. Online learning therefore needs to be used very selectively in the school system.

In the post-secondary system, the challenge has not been so great. Many universities and colleges already had experience of online learning before Covid-19, and had the specialist instructional designers and resources needed to train faculty in online learning. The main difficulty has been instructors' reluctance to move away from the tried and trusted lecture method, for reasons given in Chapter 3.3, and the difficulty of scaling up support for blended or online learning.

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 lecture-based 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 an in-person classroom model. We will look at other of ways to do this in the rest of this chapter.

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: 2017* Halifax NS: Canadian Digital Learning Research Association

Cross, J. (2022) What does too much screen time do to children's brains? *Health Matters, New York-Presbyterian*

Figlio, D., M. Rush and Yin, L. (2013) Is It Live or Is It Internet? Experimental Estimates of the Effects of Online Instruction on Student Learning *Journal of Labor Economics*, Volume 31, Number 4

Activity 4.2 Moving the lecture-based model online

1. 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?

2. What are the advantages and disadvantages of reducing online lecture time and increasing the time that students spend asynchronously online?

3. Can you think of a simple alternative to using video lectures for putting your courses online?

For my response to these three questions listen to the podcast below:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=137#audio-137-1

4.3 The ADDIE model

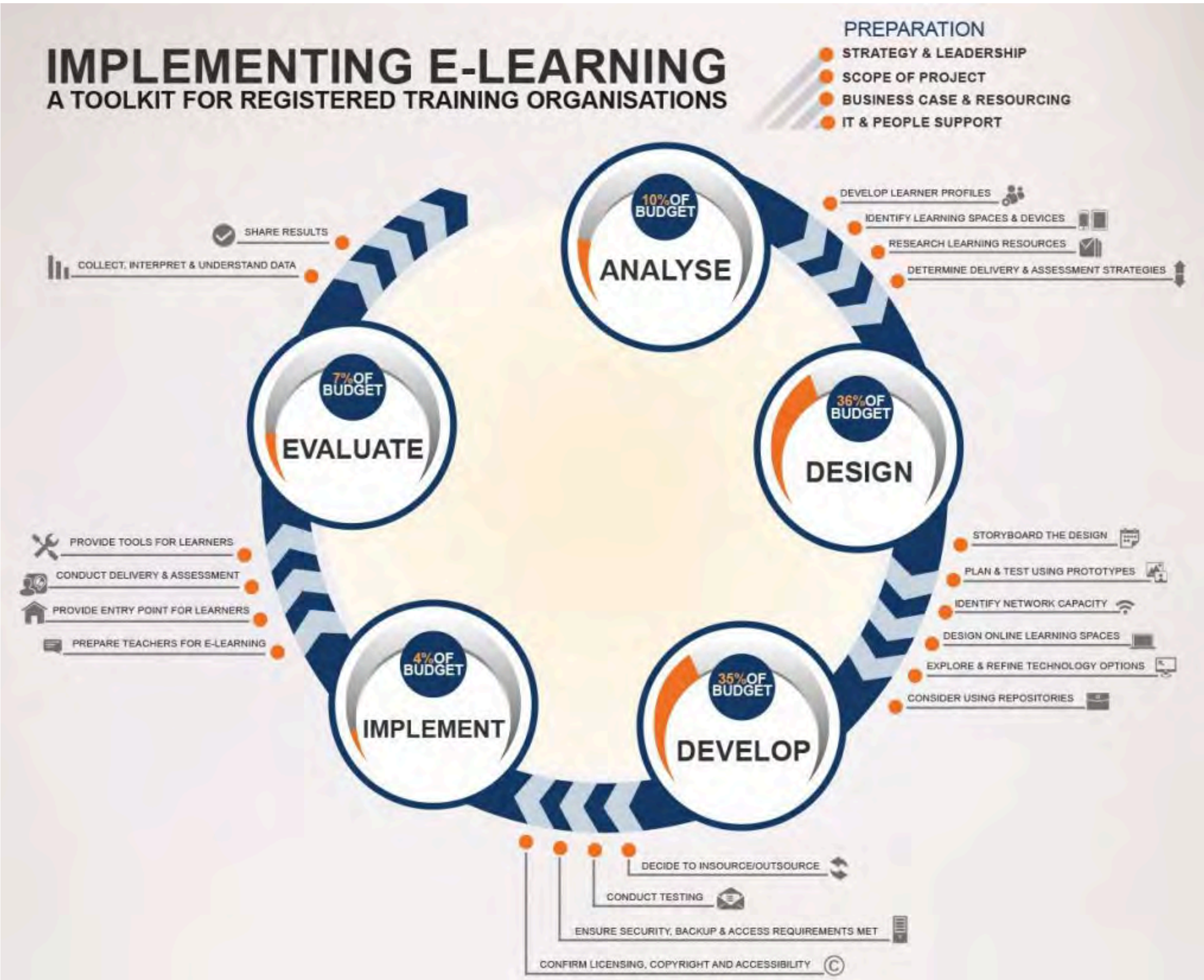

Figure 4.3.1 The ADDIE model.
© Flexible Learning Australia, 2014

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 Chapter 6 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.

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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

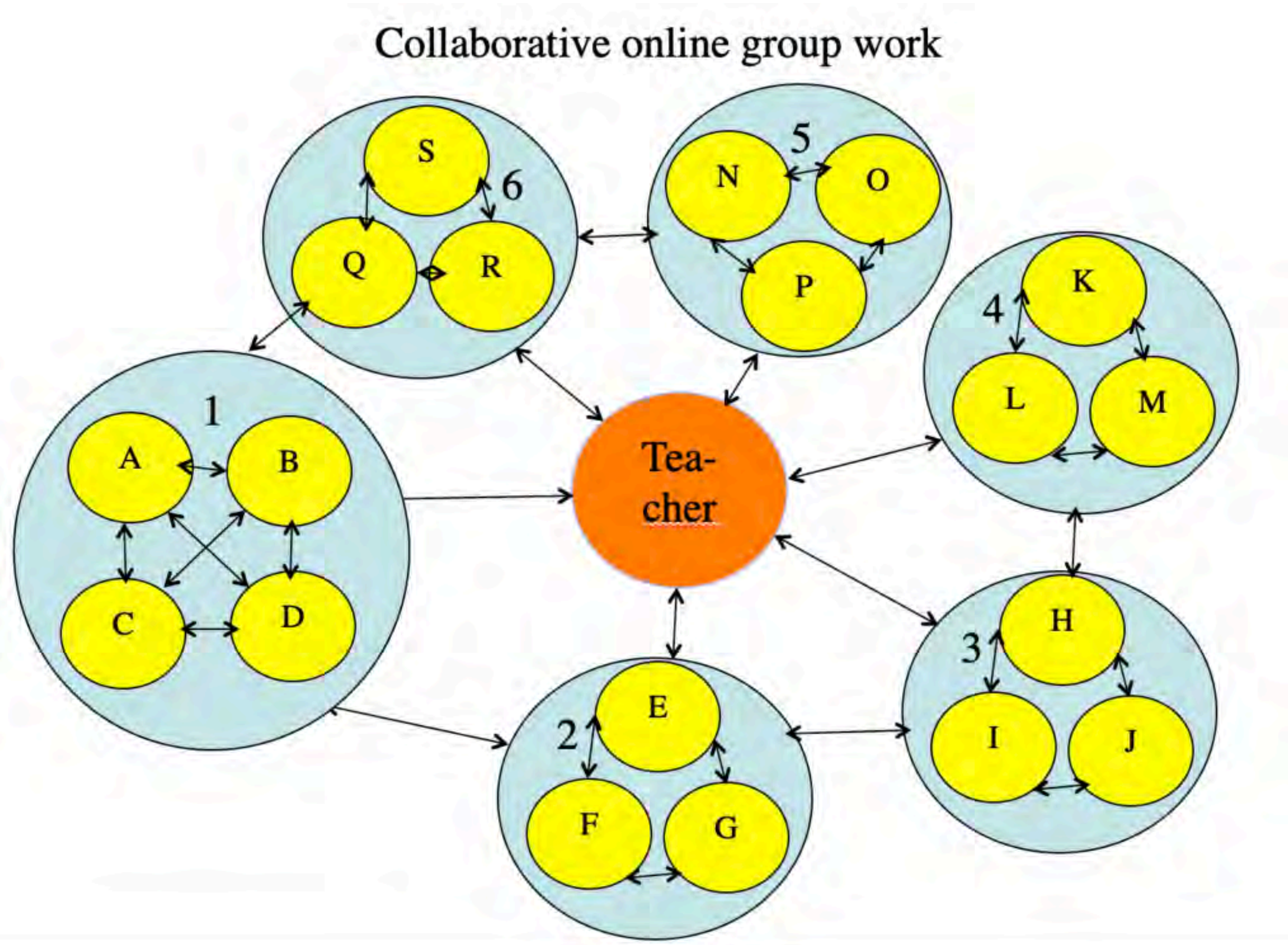

Figure 4.4.1. Collaborative group work. In this example the teacher has organized a class of 19 students into six groups. The teacher can interact with individual students or with each group as a whole. In online collaborative learning each group can have its own online discussion area which can be 'closed' (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 (which comes as standard in most LMSs). However, the model could be applied to classroom teaching, or to video-conferencing, but usually with smaller numbers of students due to bandwidth restrictions. 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 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:

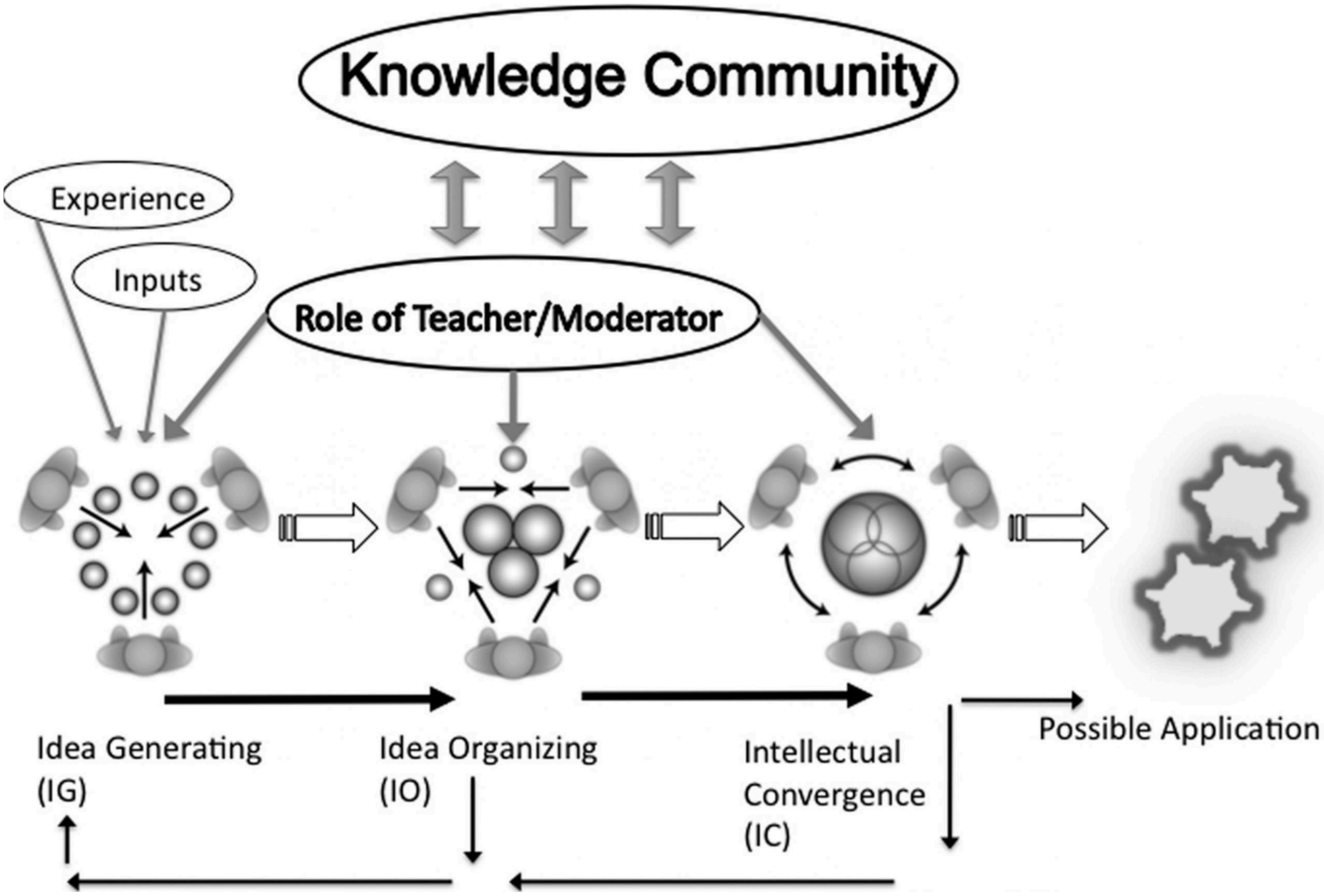

Figure 4.4.2: Harasim's pedagogy of group discussion (from Harasim, 2017, p. 95, with permission)

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 (as in 4.2.3).

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 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.

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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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=145#audio-145-1

4.5 Competency-based learning

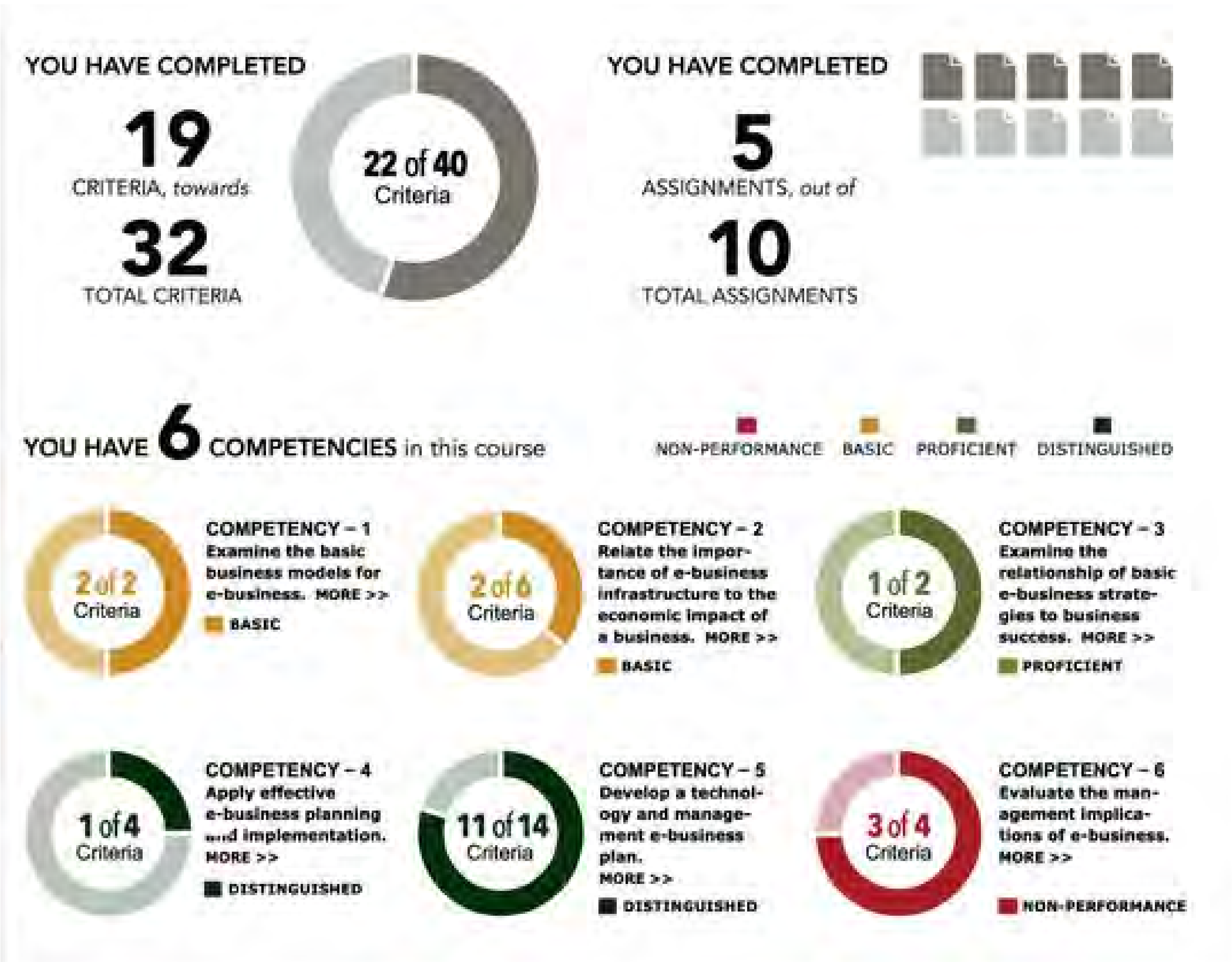


Figure 4.5.1 e-Commerce business course competencies, Capella University

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 120,000 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.

Competency-based learning is increasingly being used in (k-12) school systems, as well. West (2021) reported that between 5-10% of schools in the USA were using a competency-based learning approach in 2021.

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.

In school systems, though, competencies may be aligned with state-wide standards. The Lindsay Unified school system in California is an example (West, 2021).

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 (sometimes known as *direct* assessment).

In the Lindsay Unified school system, every teacher in the district does a personalized learning plan with each of the students at least twice a year. Instead of 90-minute block lessons, most of the teaching is in individualised mini-lessons. Within each class, students are grouped based on the learning targets they are trying to reach and their progress towards meeting those targets. Students receive feedback on their progress and receive support until they achieve those goals. They show their mastery of a subject by presenting evidence, such as a paper or project, demonstrating what they know and are able to do. Students receive grades of between 1-4 on each competency or learning outcome. A grade of 1 or a 2 does not mean students have failed, only that they have more work to do to move on to the next level (West, 2021).

4.5.3.3 Learner support

Again this varies from institution to institution. WGU currently (2022) employs approximately 1,500 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.

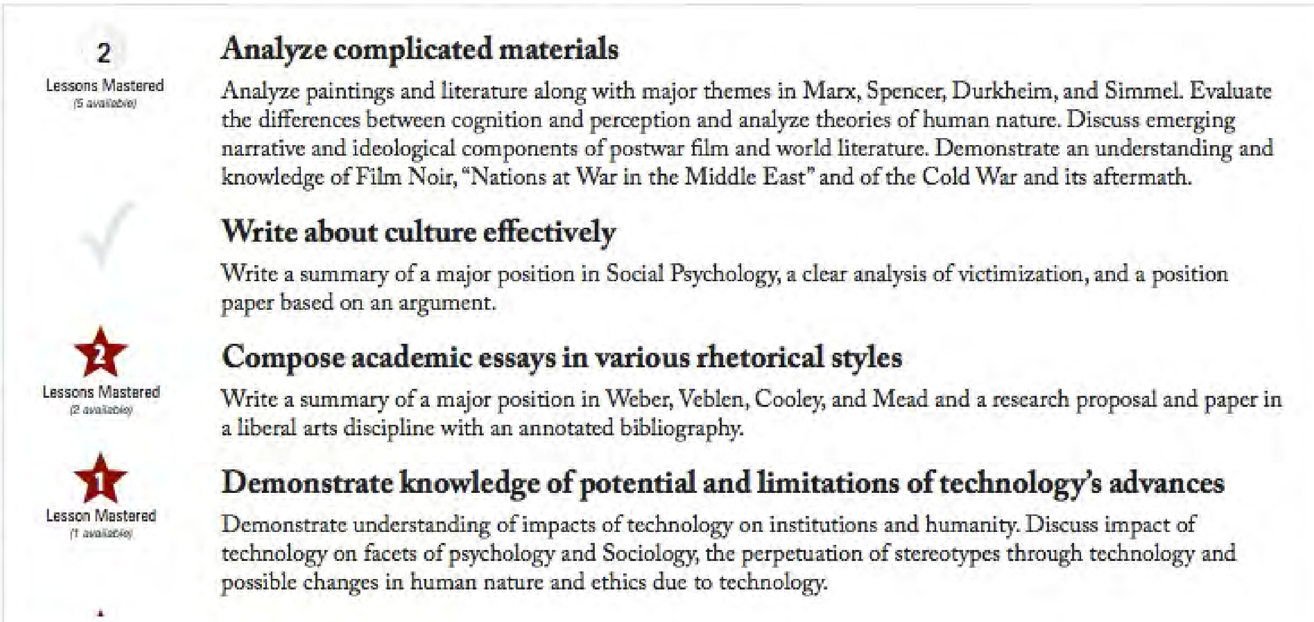
Figure 4.5.2 Remote proctoring of exams at Western Governors' University

Students will take both formative (pre-assessment) and summative (proctored) exams.

Assessments can take many forms. Here are some examples from various WGU programs:

- Assignments involving problem-solving (e.g., science or information technology).
- Computerized exams consisting of 50 multiple-choice, matching, and other question types (e.g., mathematics).
- Projects requiring the student to design a lesson plan (e.g., teaching).
- Reflection essays about case studies (e.g., MBA).
- Research papers on particular topics within the student's field.

WGU also uses 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.



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

Direct assessment, meaning students taking an exam when they feel ready, is of course de-coupled from the standard credit hour, since different students may take different times to reach proficiency. In the USA, where financial aid is generally linked to the number of credit hours in a course or program, this can cause problems with regulatory agencies. Although regulators are grappling with this issue, the uncertainty around financial aid is a major reason for the relatively low use of direct assessment in competency-based learning, despite it being one of its main advantages (see Fain, 2019, and Downs, 2020, for more on this issue).

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 gradually being recognized as eligible for Federal loans and student aid in the USA
- Capella University has found (Klein and DeSchryver, 2019) that students taking courses with direct assessment:
    - have a higher two-year persistence rate than their like peers in Capella's traditional programs.
    - progress more quickly through bachelor's and master's degree programs, compared to similar students in Capella's equivalent credit-hour programs.
    - are charged less in tuition and borrow less than like students in Capella's equivalent credit-hour programs.

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.

Because of historically poor learning outcomes and graduation rates, in 2007 the Lindsay Unified School District, which has a low income, mainly rural, Hispanic demographic, decided to switch to a 'a learner centered, personalized, competency-based' approach. The number of students proficient on California's academic standards increased from 26 percent in 2014-15 to 47 percent in 2018-19. Graduation rates rose from 69 percent in 2010-11 to 90 percent in 2017-18. College-going rates increased from 66 percent to 70 percent, and more students are going to four-year colleges, according to district data.

The main weakness of competency-based learning at the post-secondary level 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.

Nevertheless, when aligned with state-wide academic standards, and focused on specific student demographics, the model can be successfully adopted in k-12 systems, as the Lindsay Unified School District has shown.

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

Downs, L. (2020) New Regulations #3: Direct Assessment and Competency-Based Education WCET *Frontiers*, April 13

EAB (2015) *Three Myths About Competency-Based Education* Washington DC: Education Advisory Board

Fain, P. (2019) Positive returns for direct assessment *Inside Higher Education*, August 27

Garrett, R. and Lurie, H. (2016) *Deconstructing CBE: An Assessment of Institutional Activity, Goals and Challenges in Higher Education* Boston MA: Ellucian/Eduventures

Klein, J. and DeSchryver, D. (2019) *Moving competency-based education forward: lessons from five years of direct assessment implementation* Whiteboard Advisors/Capella University: Washington DC

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

West, C. (2021) How to do online learning well? A California district has some answers *The Hechinger Report*, December 19

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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=150#audio-150-1

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:

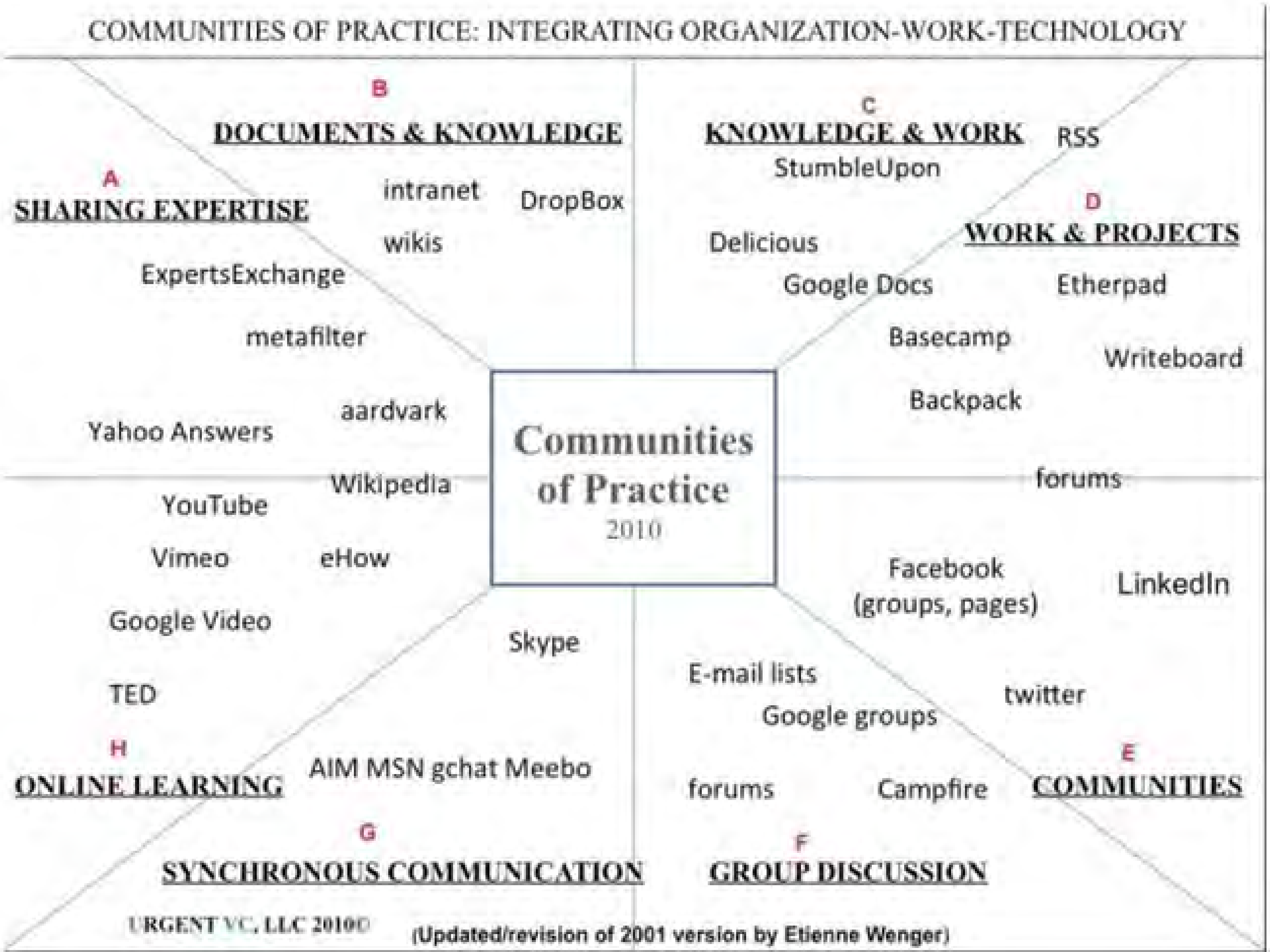


Figure 4.6.2 Tools that support communities of practice
Image: Wenger, 2014

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:

- **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.
- **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.
- **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,
    - those (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.
- **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.
- **Focus on value:** Attempts should be made explicitly to identify, through feedback and discussion, the contributions that the community most values.
- **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.
- **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.

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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.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=154#audio-154-1

4.7 'Agile' Design: flexible designs for learning

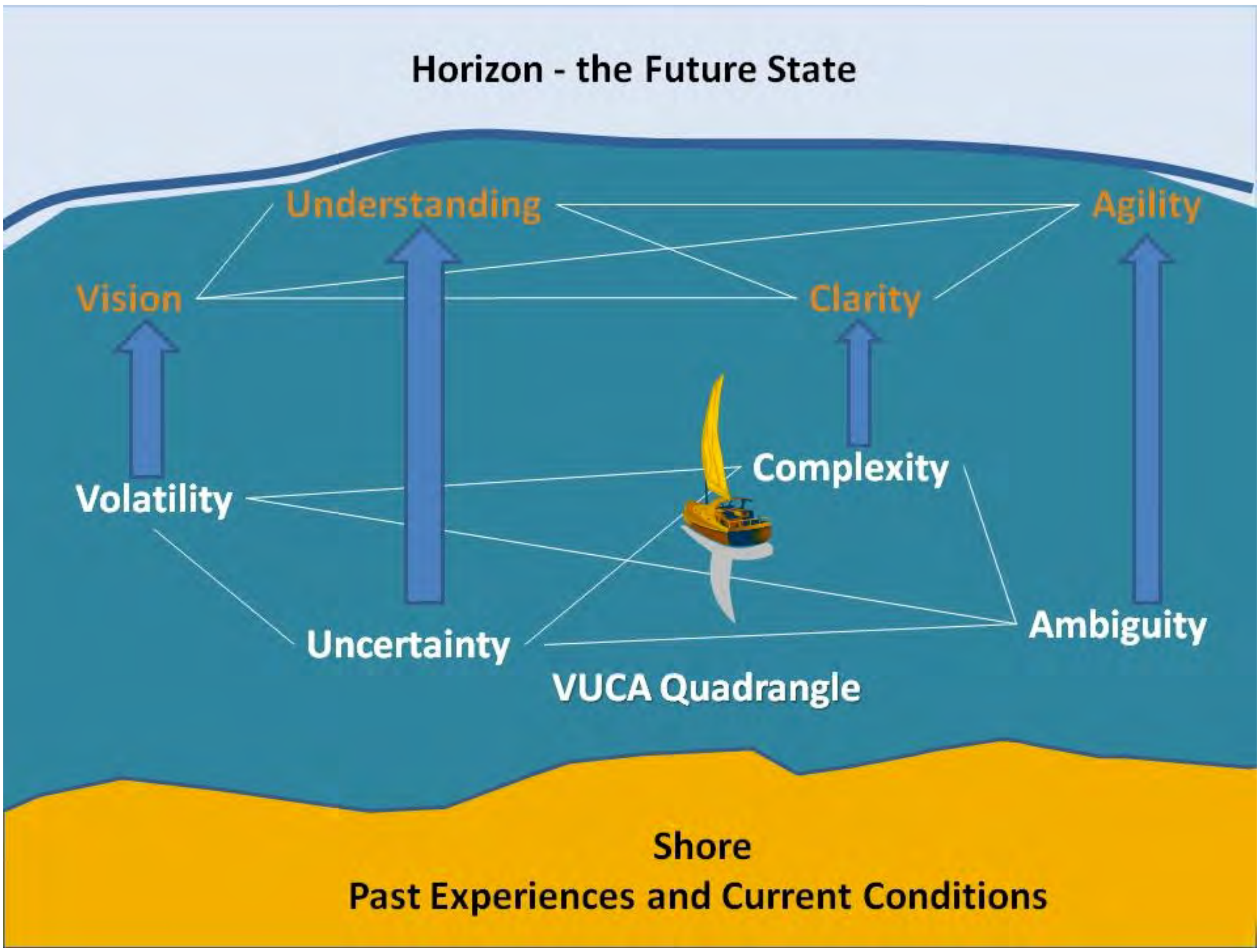

Figure 4.7.1 A volatile, uncertain, complex and ambiguous world
Image: © Carol Mase, Free Management Library, 2011, used with permission

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. In the following section, Scenario E, an example of agile design is discussed.

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 E, which follows this section, the overall objective is to develop the skills needed to be a pioneer or innovator in educational technology, 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 Chapter 6). 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.

In particular, agile design will increasingly be needed as the number of teachers and instructors moving to blended and online learning increases. The formal course team model, following an ADDIE process, works well when only a minority of courses are using online learning, but it does not scale easily. As more and more teachers move to blended and online learning, agile design offers one way to scale up the rapid development of quality digital learning.

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 components of 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 to larger classes? 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, and the rapid increase in courses using digital technologies.

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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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=157#audio-157-1

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.

4.8 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.

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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.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=166#audio-166-1

What is covered in this chapter

This chapter covers the following topics:

- 5.1 Brief history
- 5.2 What is a MOOC?
- 5.3 A taxonomy of MOOCs
- 5.4 Strengths and weaknesses of MOOCs
- 5.5 Political, social and economic drivers of MOOCs
- 5.6 Why MOOCs are only part of the answer
- Scenario F: How to cope with being old

Also in this chapter you will find the following activities:

- Activity 5.1 There is no activity provided for this section
- Activity 5.2 There is no activity provided for this section
- Activity 5.3 Thinking about MOOC design
- Activity 5.4 Assessing the strengths and weaknesses of MOOCs
- Activity 5.5. Assessing the importance of MOOCs
- Activity 5.6 Strategising about MOOCs

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

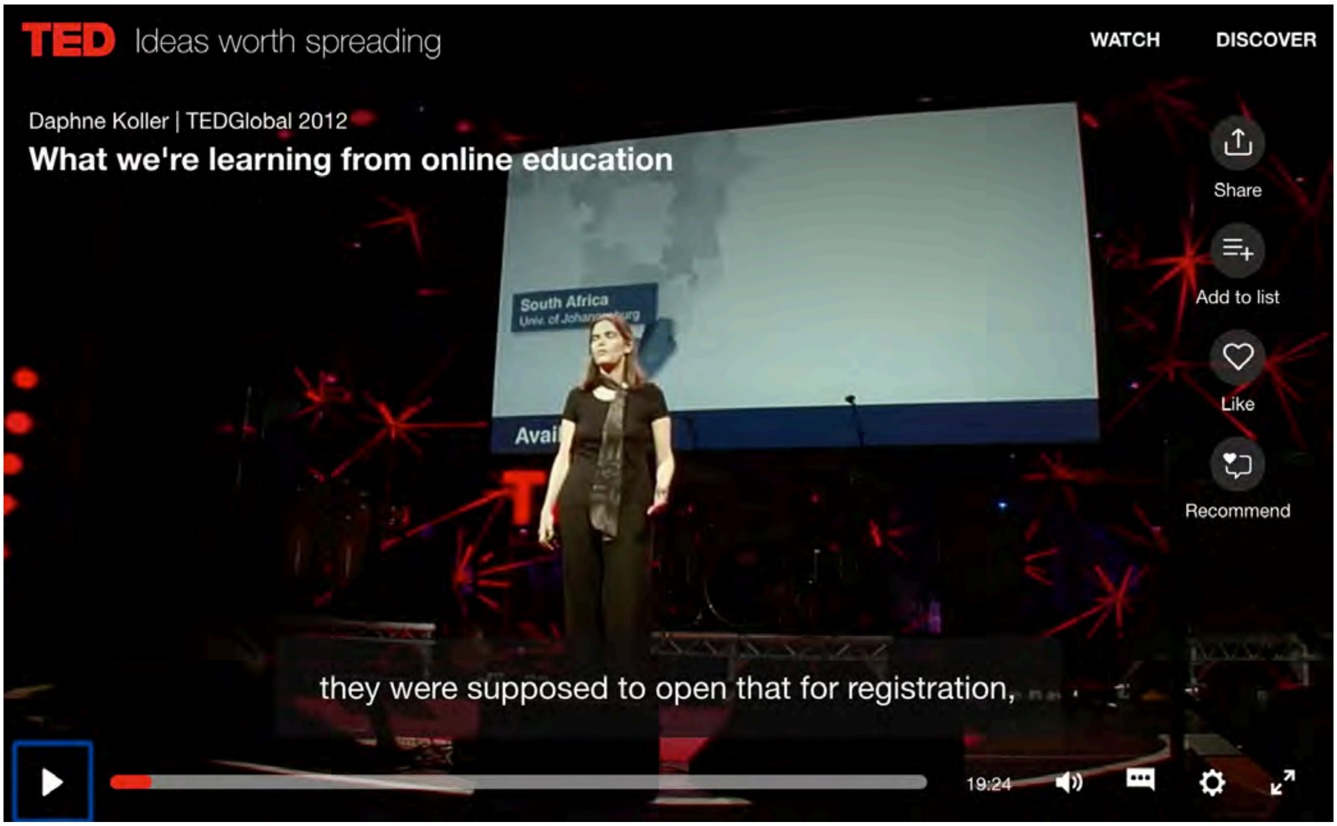

Figure 5.1.1 Daphne Koller's TED Talk, 2012
To see this YouTube video, click on the graphic. For a response to this video, see: '[What's right and what's wrong with Coursera-style MOOCs](#)'.

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 it was also offered online for free. Much to the surprise of the instructors, 2,200 students enrolled in the free online version (Siemens et al., 2011). Downes classified this course and others like it that followed as connectivist or cMOOCs, because of their design (Downes, 2018).

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 acted as a platform for online registration and teaching. edX also developed partnerships with leading universities to offer MOOCs without direct charge for hosting their courses, although some paid to become partners in edX. In 2021, edX was sold to 2U, a for-profit online course provider (Lederman, 2021). In addition to full degrees, EdX and Coursera both offer multiple micro-credentials, each with their own branding. A big change in 2017-2018 was a move to MOOC-based degrees, with seven universities announcing 15 degrees in 2017. By 2021, there were 70 MOOC-based degrees. Overall, 1,670 MOOC-based micro-credentials existed at the end of 2021 (Shah et al., 2022).

Other platforms for MOOCs, such as the U.K. Open University's FutureLearn, have also been developed. By 2021, MOOCs reached 220 million learners world wide, with over 19,000 courses and 500 microcredentials, excluding China (Shah et al., 2022). In early 2022, 24 Chinese MOOC platforms offered over 69,000 MOOCs in Chinese, around twice as many as in 2020 . One Chinese MOOC, XuetangX, reached over 80 million users in 2021 (Ma, 2022). In India, SWAYAM, a MOOC launched by India's government, is integrated within the Indian higher education system. Students in public higher education institutions in India can take up to 20% of their courses from SWAYAM for credit (Mendes, 2019).

Because the majority of MOOCs offered through these various platforms are based mainly on video lectures and computer-marked tests, Downes (2012) classified these as xMOOCs, to distinguish them from the more connectivist cMOOCs. xMOOCs have continued to develop and grow. There was a major boost during Covid-19, with many students probably supplementing their less-polished university-based Zoom lectures with the often more professionally produced MOOCs from Stanford, Harvard and MIT. However, as we shall see, MOOCs have not replaced either conventional universities, nor online courses for credit. They have instead become a very useful form of continuing education.

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5.2 What is a MOOC?

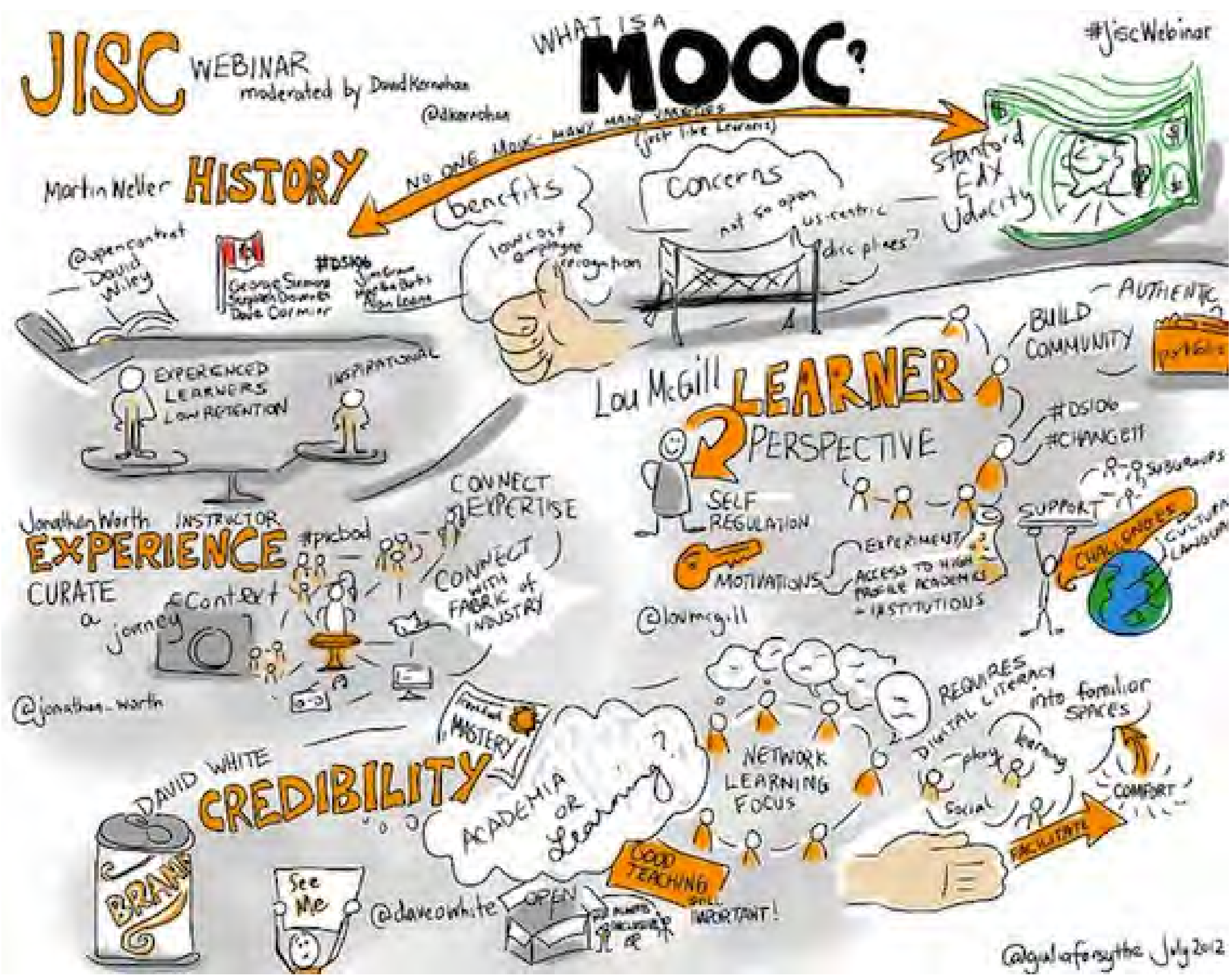

Figure 5.2.1 Making sense of MOOCs © Giulia Forsythe, 2012 and JISC, 2012

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). The writer Thomas Friedman wrote in the New York Times in [2013](#):

> *…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 (2016) 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 educational broadcasting, 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. More importantly, 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 was an open source platform, so any institution that joined edX could develop their own MOOCs with their own rules regarding rights to the material. This is probably no longer the case now that edX has been merged with 2U. 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). Other 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 fall 2019, there were 7,313,623 students enrolled in distance education courses (which then were nearly all online) at degree-granting postsecondary institutions in the USA. Of all American post-secondary students, 37% were taking at least one distance education course (US Department of Education, 2020). Although students can count these online courses towards a degree, these 'for-credit' online courses though are not free or even open to anyone. MOOCs are.

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).

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US Department of Education (2020) *Digest of Education Statistics 2020*, Washington DC: National Center for Education Statistics. Table 311.15.

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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=171#audio-171-1

5.3 A Taxonomy of MOOCs

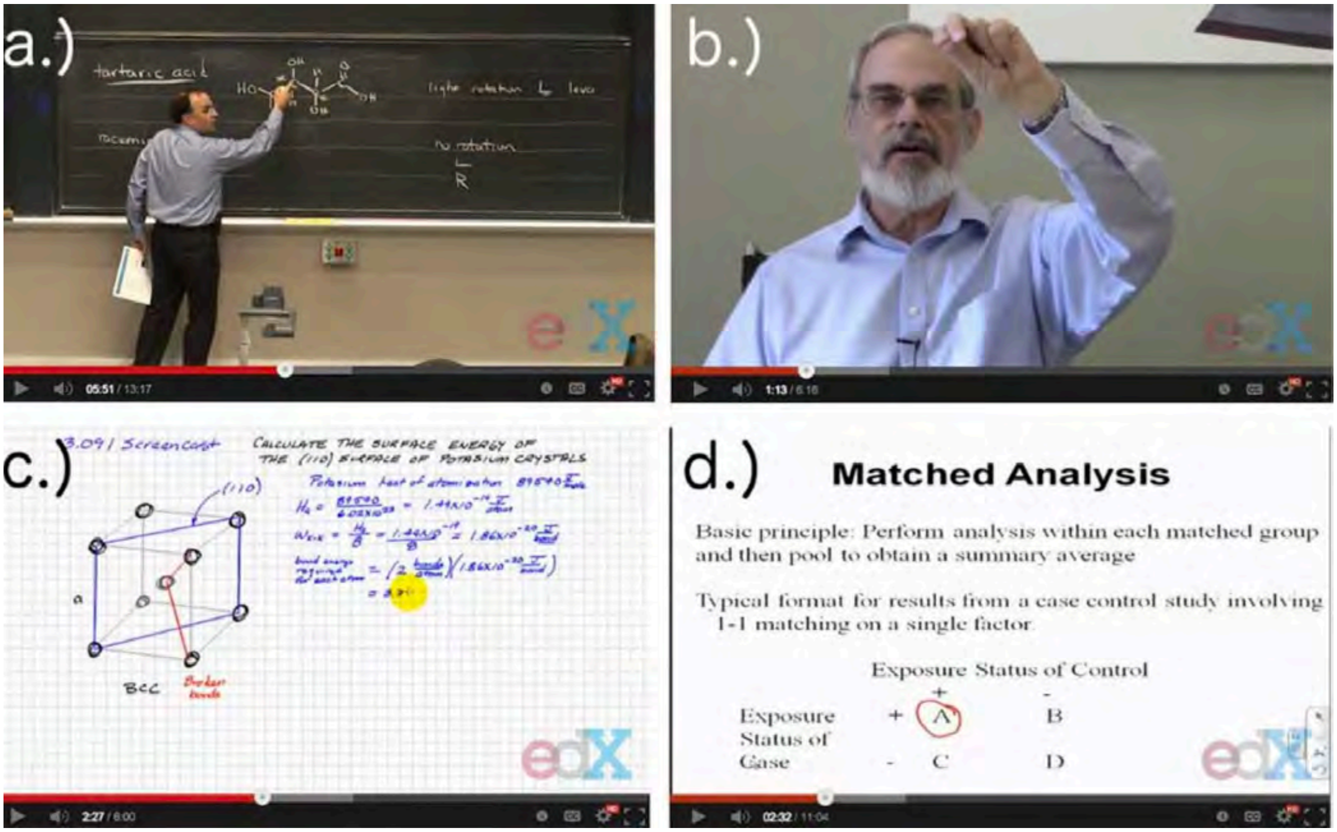

Figure 5.3.1: A screen shot from an edX MOOC – an xMOOC

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.

At the time of writing (2022) 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, smaller institutions are increasingly 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 desktop 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 by the instructor(s) offering the MOOC of comments by individual learners 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.

Some MOOCs now use automated chatbots, software which identifies key terms or questions from students and summarises them for the instructor, who then takes account of this in future lectures (see Chapter 8.7.c.4.4 for more details).

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. Between a single course and a full degree, all the major MOOC providers have created at least one multi-course microcredential (Pickard et al., 2018). However, 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). Rivas et al. (2020) found that employers overwhelmingly preferred applicants with a traditional degree to those that had completed MOOCs, but also preferred those with MOOC certificates to those without formal post-secondary qualifications. However, with the increasing development of partnerships between major employers and MOOC providers to develop microcredentials, this is changing. Companies such as Google and Microsoft are now offering professional certificates on MOOC platforms such as Coursera at around US$300 per course – not free, by any means, but open to all, and more importantly, carrying credibility with employers.

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

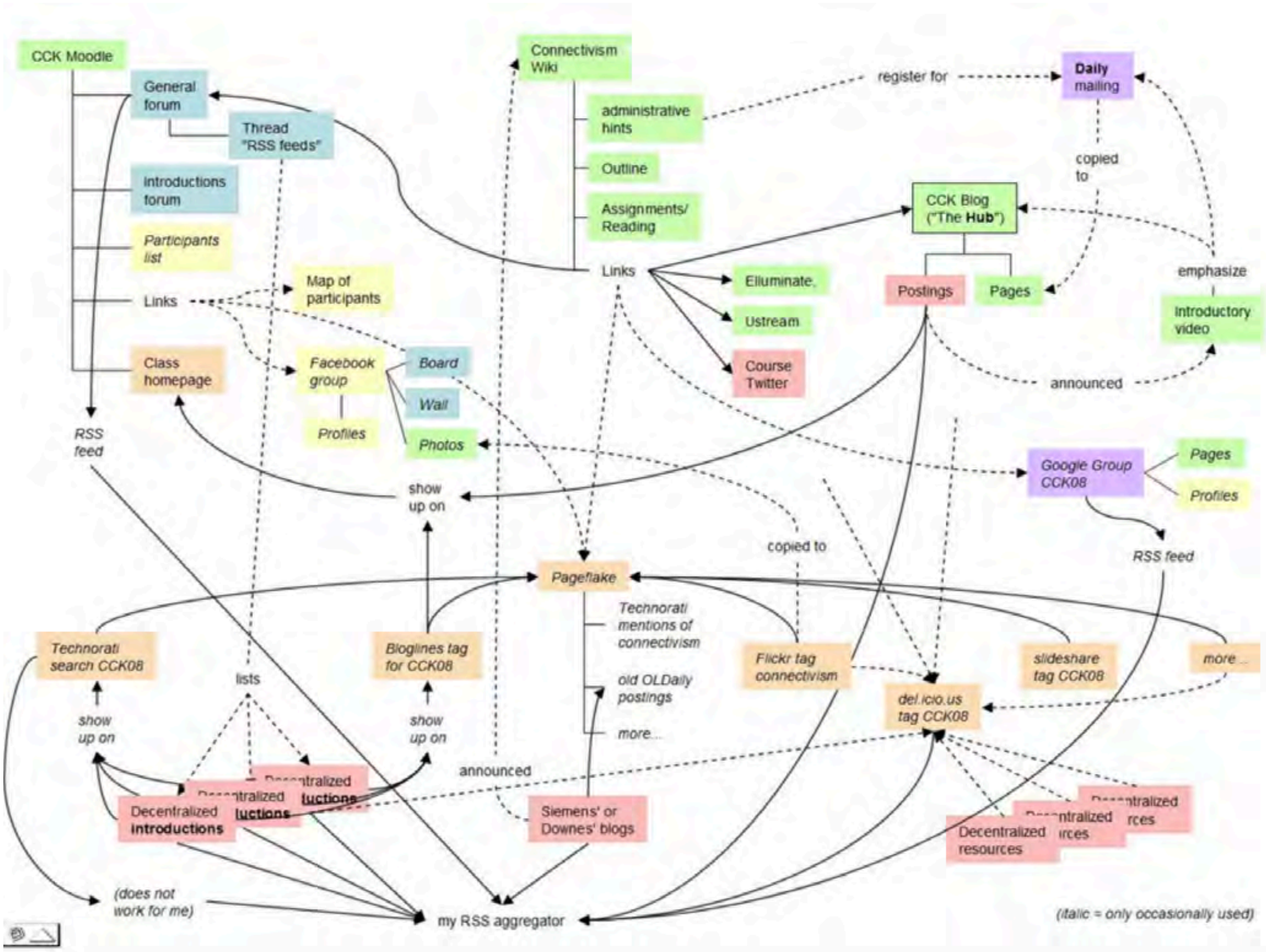

Figure 5.3.2 A connectivist MOOC Image: Melcher, 2008

cMOOCs, the first of which was developed by three instructors for a course at the University of Manitoba in 2008, are based on networked 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 open social media that enable networking among all participants. Although usually there are some experts who initiate and participate in cMOOCs, this type of MOOC is 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 streamed video or audio files, blogs, wikis, 'open' learning management systems such as Moodle, Twitter, LinkedIn, Instagram 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 (see Chapter 4.6).

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:

- *c*MOOCs;
- *x*MOOCs;
- 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.

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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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=175#audio-175-1

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

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, have conducted 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, eliminate the need for it altogether, or bring effective higher education to the masses.

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;
- developing locally produced MOOCs that are recognised by and integrated with existing educational systems, such as India's SWAYAM MOOCs
- ensuring that the necessary student 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:

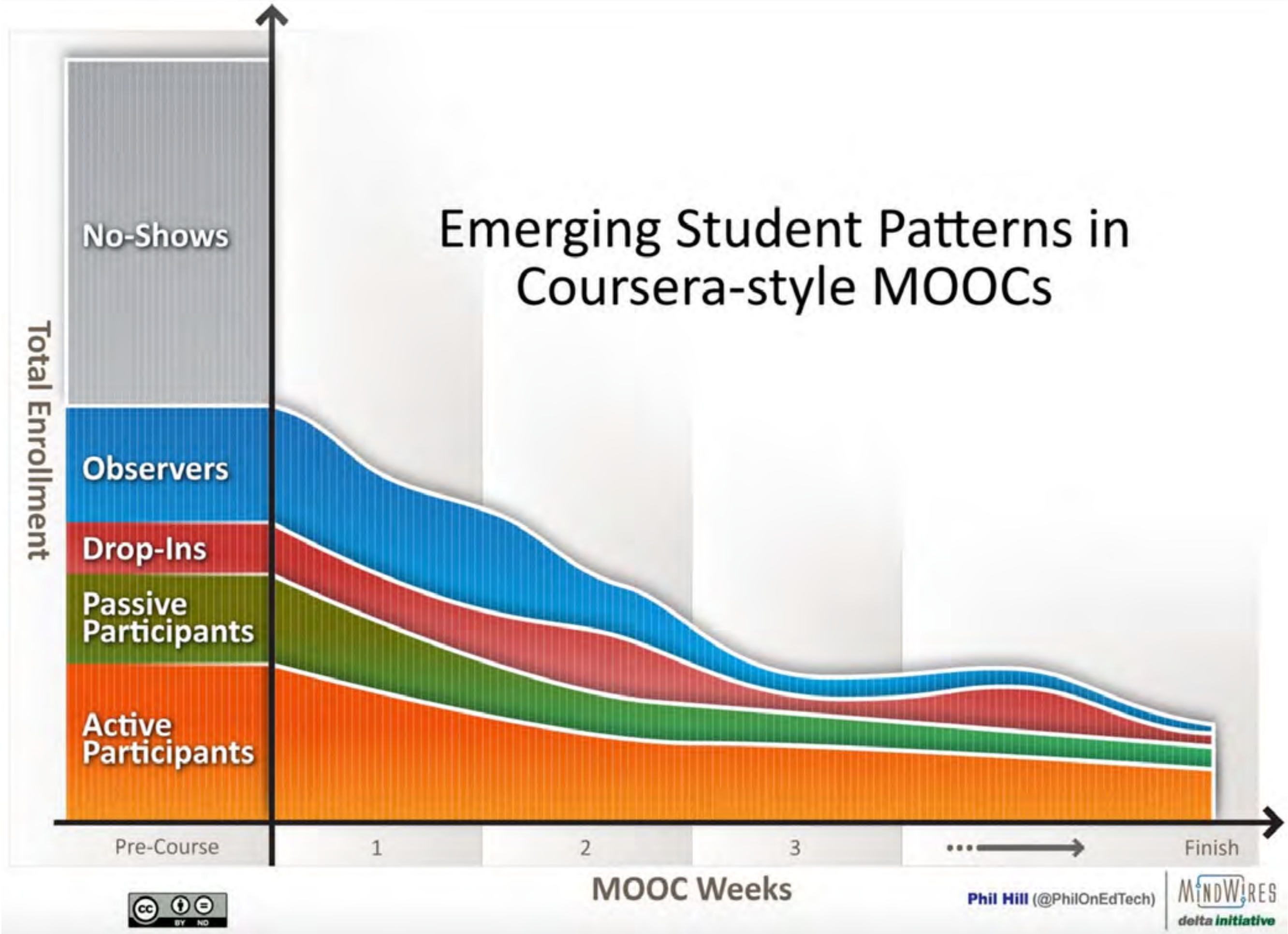

Figure 5.4.2 Image: Phil Hill, 2013

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.

Reich and Ruipérez-Valiente (2019) in their study of edX MOOCs reported that:

..after promising a reordering of higher education, we see the field instead coalescing around a different, much older business model: helping universities outsource their online master's degrees for professionals. The vast majority of MOOC learners never return after their first year, the growth in MOOC participation has been concentrated almost entirely in the world's most affluent countries, and the bane of MOOCs—low completion rates—has not improved over 6 years.

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:

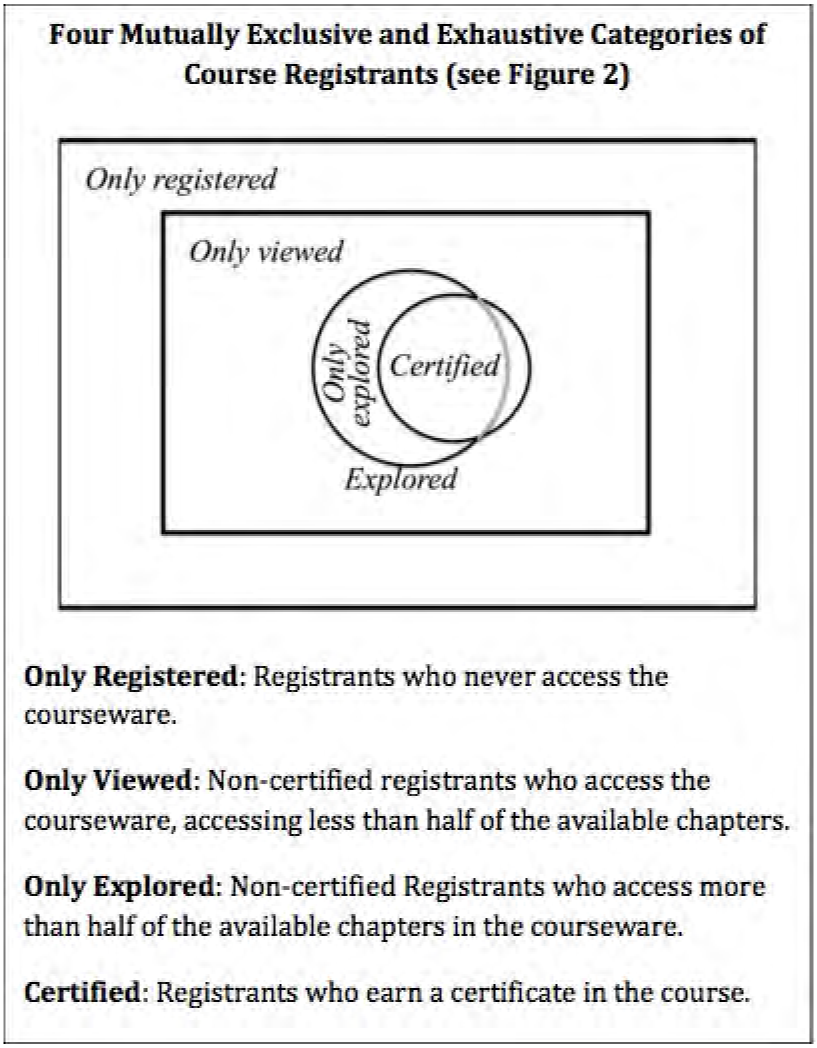

Figure 5.4.3 Level of participation in MOOCs © Ho et al., 2014

This is remarkably similar to my 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 (2022) 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 xMOOC, 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 xMOOC 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 xMOOCs 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. 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. 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 yet 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 initially 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

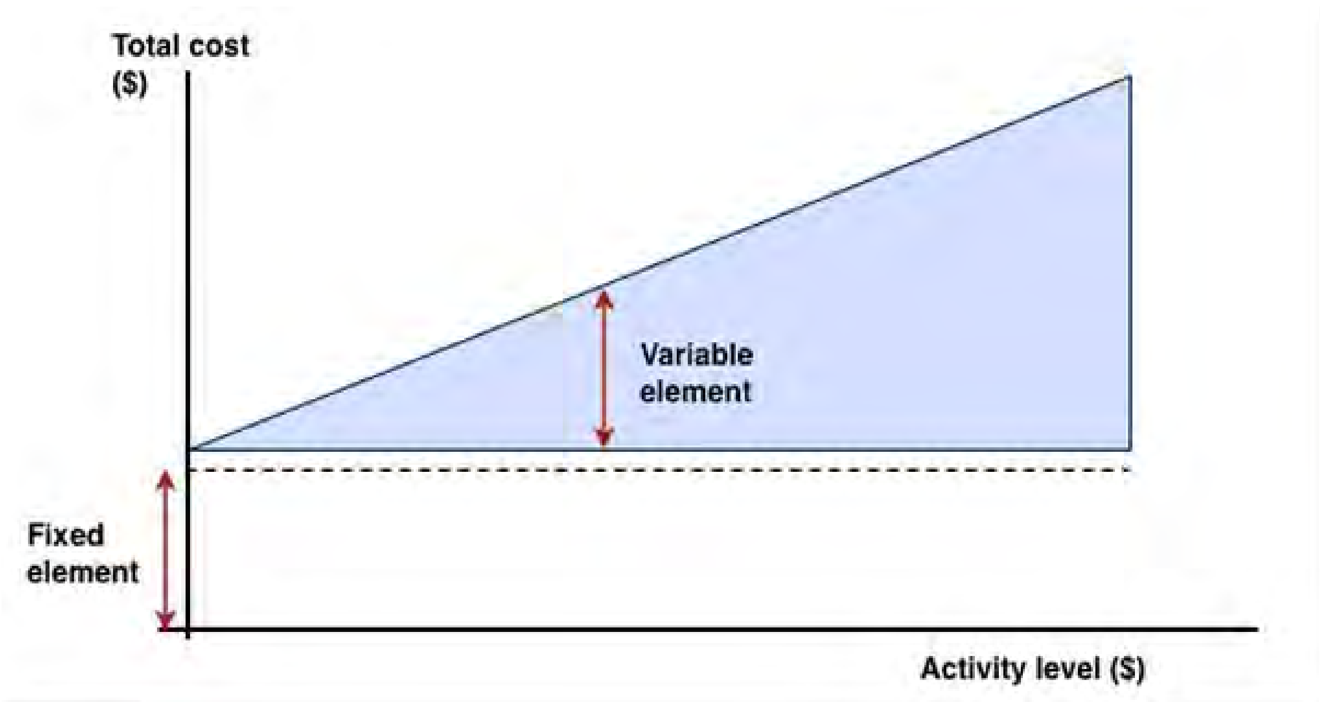

Figure 5.4.8 The MOOC value proposition is that MOOCs can eliminate the variable costs of course delivery. Image: © OpenTuition.com, 2014

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.

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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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=181#audio-181-1

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 the first large-scale MOOCs 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 taking online courses for credit (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 in-person 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 xMOOCs 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 xMOOCs 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 2008 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 10 years between 2008 and 2018, compared with an inflation rate of 4 per cent per annum. In 2011, MOOCs were seen 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

The Covid-19 pandemic gave another boost to MOOC activity, with a total of around half a million MOOC users worldwide in 2021 alone (Shah et al., 2022). MOOCs continue to evolve. For a start, there has been a steady growth in complete degrees that can be offered through MOOCs. In 2018 there were 45 degrees on offer. By 2021, there were 7 MOOC bachelor's degrees and 71 MOOC master's degrees (Ledwon and Ma, 2022). While this is a significant development, though, the number of MOOC degrees is still quite small, given the number of conventional degrees available worldwide. MOOC microcredentials though are another matter. In 2021 there were over 1,500 microcredentials available as MOOCS (Shah, 2021a). The other main market is corporate training. Udacity alone in 2020 had 14 million users, 1.5 million projects completed, and over 170,000 Nanodegree certificates awarded, with over 50,000 graduates. Business models are also evolving with revenues continuing to increase into 2021, with Coursera expected to generate $400 million in revenues in 2021 (Shah, 2021b). 2U reported revenues of $230 million in 2020.

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 or instructors providing MOOCs are getting any direct financial returns for their investments as distinct from the platform providers. What is clear though is that MOOCs are a big revenue generator for the MOOC platforms such as Coursera and 2U.

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. xMOOCs can at present teach basic conceptual learning, comprehension and in a narrow range of activities, application of knowledge. cMOOCs 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.

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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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=184#audio-184-1

5.6 Why MOOCs are only part of the answer

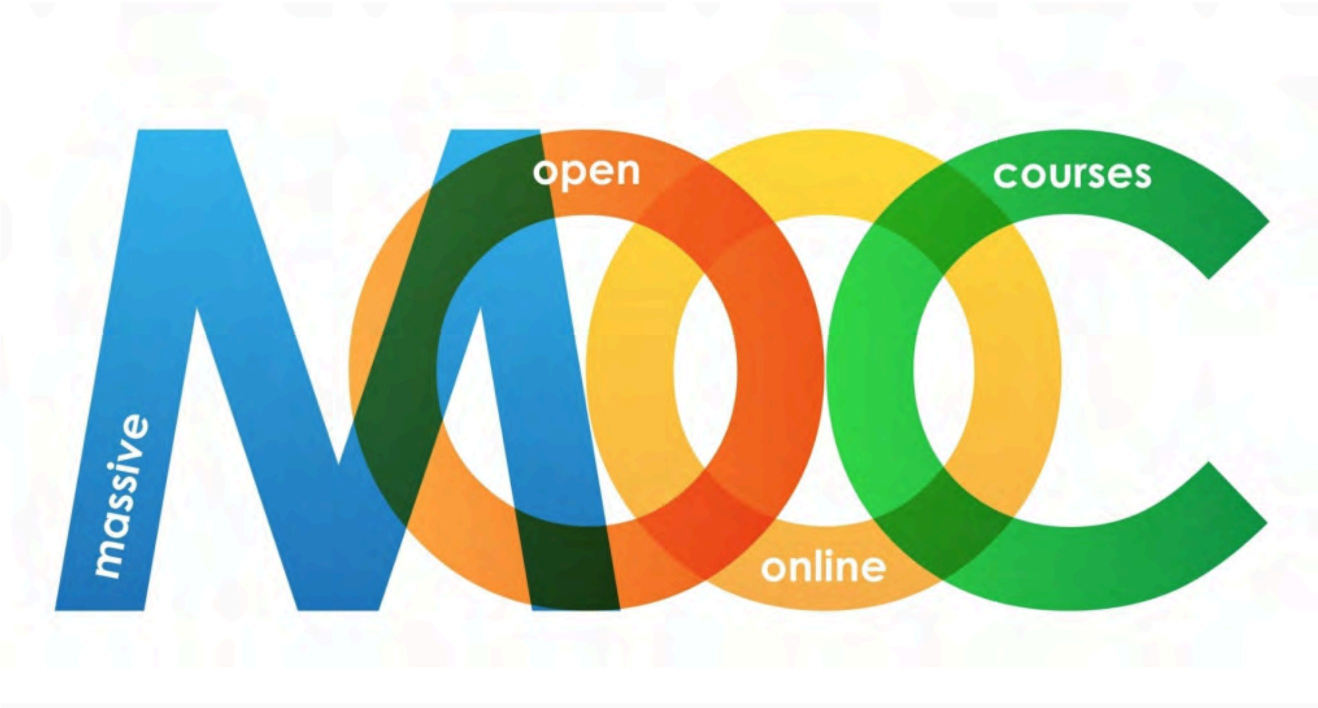

Image: Your Training Edge, 2015

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 potential of cMOOCs

Although xMOOCs are currently much more popular and more readily available, 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.

5.6.3 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 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.

5.6.4 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.

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.

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, seniors 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 is based on a 'what if?' scenario for the U.K. Open University as part of its planning for teaching and learning in 2014. At the time, the UK OU had recently launched its own MOOC provider, called FutureLearn, which was founded two years earlier, in 2012, and is now one of the main MOOC platforms like Coursera or 2U. FutureLearn MOOCs though are somewhat different from those other MOOC platforms, in that, in general, FutureLearn MOOCs are highly structured, with built-in assessments, videos, emailed prompts and a very strong emphasis on a social constructivist approach to education. Student comments and discussion are very much encouraged, so that the people on courses are able to learn from each other (see Freedman, 2017)].

Reference

Freedman, T. (2017) Behind the scenes at FutureLearn *Tech&Learning*, May 18

Activity F.1

1. What are the differences between the MOOC on Aging in this scenario and (a) an xMOOC; and (b) a cMOOC?
2. Why do you think the OU went in the direction of FutureLearn, rather than the type of MOOC in the scenario?
3. What would be required to create a successful MOOC such as the one in this scenario?

For me feedback of these questions click on the podcast below:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=190#audio-190-1

CHAPTER 6: BUILDING AN EFFECTIVE LEARNING ENVIRONMENT

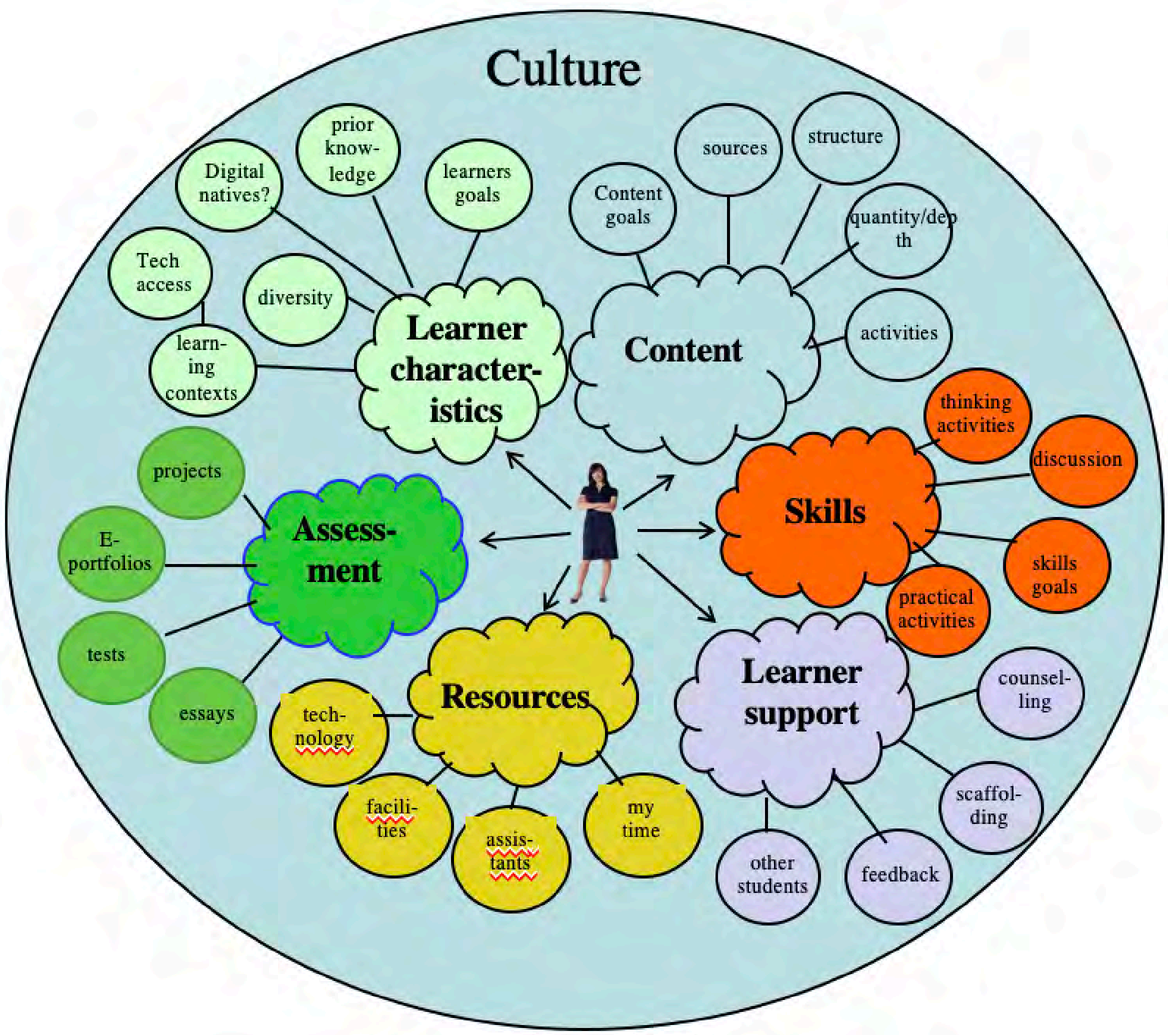

Figure 6.1: One learning environment

The purpose of this chapter

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 student

Building a comprehensive and effective learning environment is an important condition for implementing teaching and learning for the digital age. This chapter 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:

Also in this chapter you will find the following activities:

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. Digital technology allows for the creation of significantly different learning environments from the traditional classroom environment.
4. All effective learning environments need a number of different components, and these components will vary, depending on context and the epistemology that drives teaching.

6.1 Integrating design principles within a rich learning environment

Figure 6.1.1 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 once learned, but continually develops. 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. Furthermore, in a knowledge-based society, the *sum* of knowledge is constantly developing and growing, and thus our understanding is also 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?

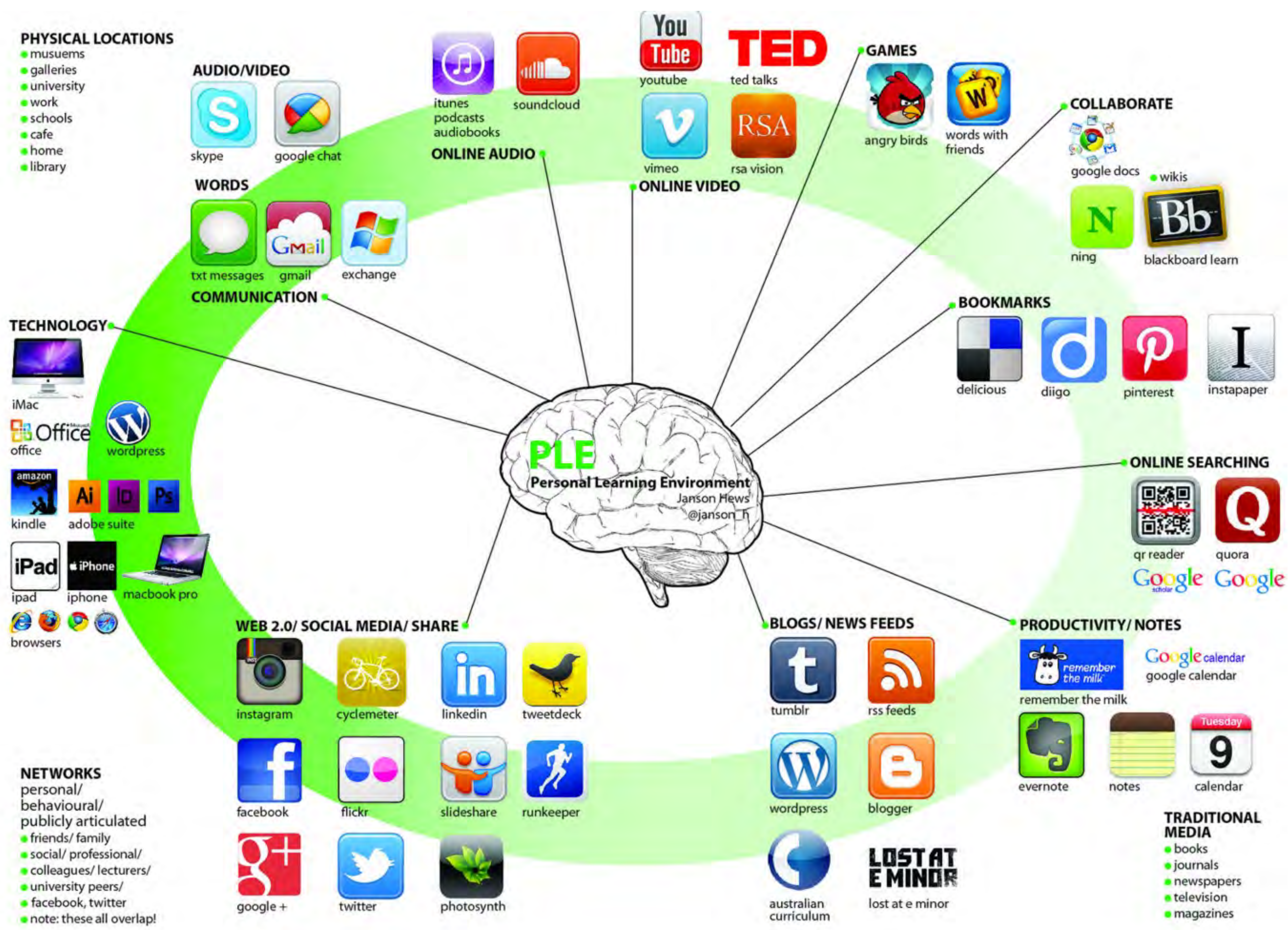

Figure 6.2.1 A technology-based personal learning environment
Image: Jason Hews, Flikr

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, learning spaces, and human support (teachers, librarians, etc.);
- the assessment strategies that will best measure and drive learning;
- the culture that infuses the learning environment.

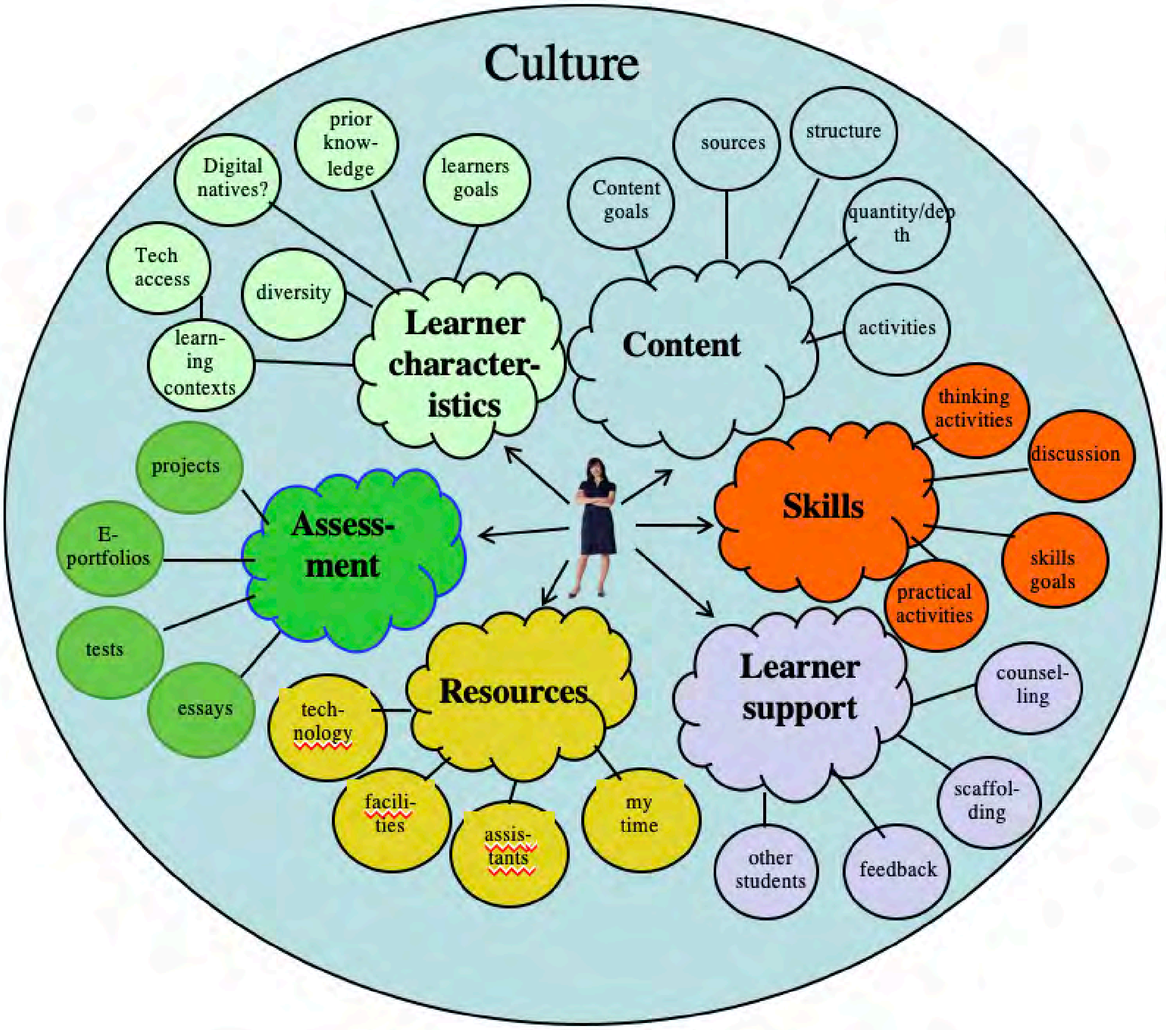

Figure 6.2.2: One learning environment

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 it should be recognised that there are other components of a learning environment as well as content or curriculum. Each of the key components of the learning environment I have chosen is 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 (Chapter 4), 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.

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6.3 Learner characteristics

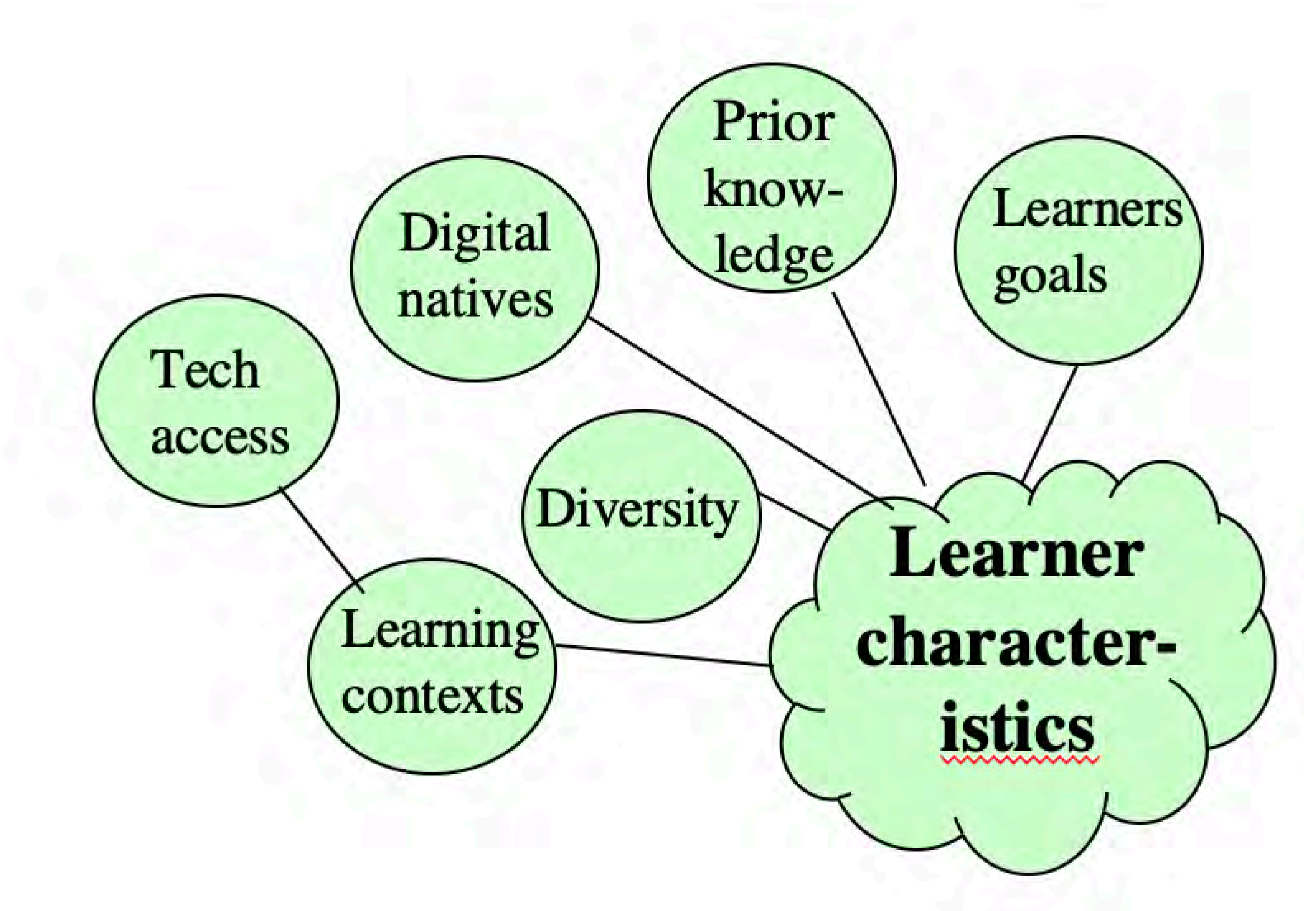

Figure 6.3.1 Learner characteristics

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 teachers and 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: in post-secondary or higher education, 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 2021/2022, at the University of British Columbia Vancouver, the average age of undergraduates was 22, and the mean age for graduate students was 30 – UBC, 2022)

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.

In the k-12 sector, the Covid-19 pandemic brought to light a number of issues regarding the home environment for many students. There was considerable inequity in the conditions for studying at home. Many children did not have an adequate, quiet place where they could study. A significant number of students (between 20-25% in the USA and Canada – see for instance Salman, 2022) did not have adequate home access to technology, such as computers or the Internet. This becomes more important the more students are expected to study at home as well as at school. This may mean providing alternative arrangements for some students, such as equipment loans, local wi-fi hotspots, or extra time on school premises where there is access to the technology that students need for studying in a digital age (Salman, 2022).

Overall, teachers and instructors need to pay more attention to the students' learning environments outside the school or campus, such as at home, work or when travelling, and should take steps to mitigate or improve the learning conditions beyond school or campus premises.

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 2.2)

6.3.6 Technology access

The Covid-19 pandemic clearly illustrated that even in the most economically advanced countries, there is still a significant proportion of students who lack technology access. Technology access will be discussed more fully in Chapter 9.2.

6.3.7 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.

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Activity 6.3 Who are your students?

1. How would you characterise the students you are teaching: students attending school full-time; students taking some courses online and some in-person at school; full-time students straight from high school; 'full time' students who are nevertheless working part-time; or students working full-time? How would a typical class of yours break down between these 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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=201#audio-201-1

6.4 Managing content

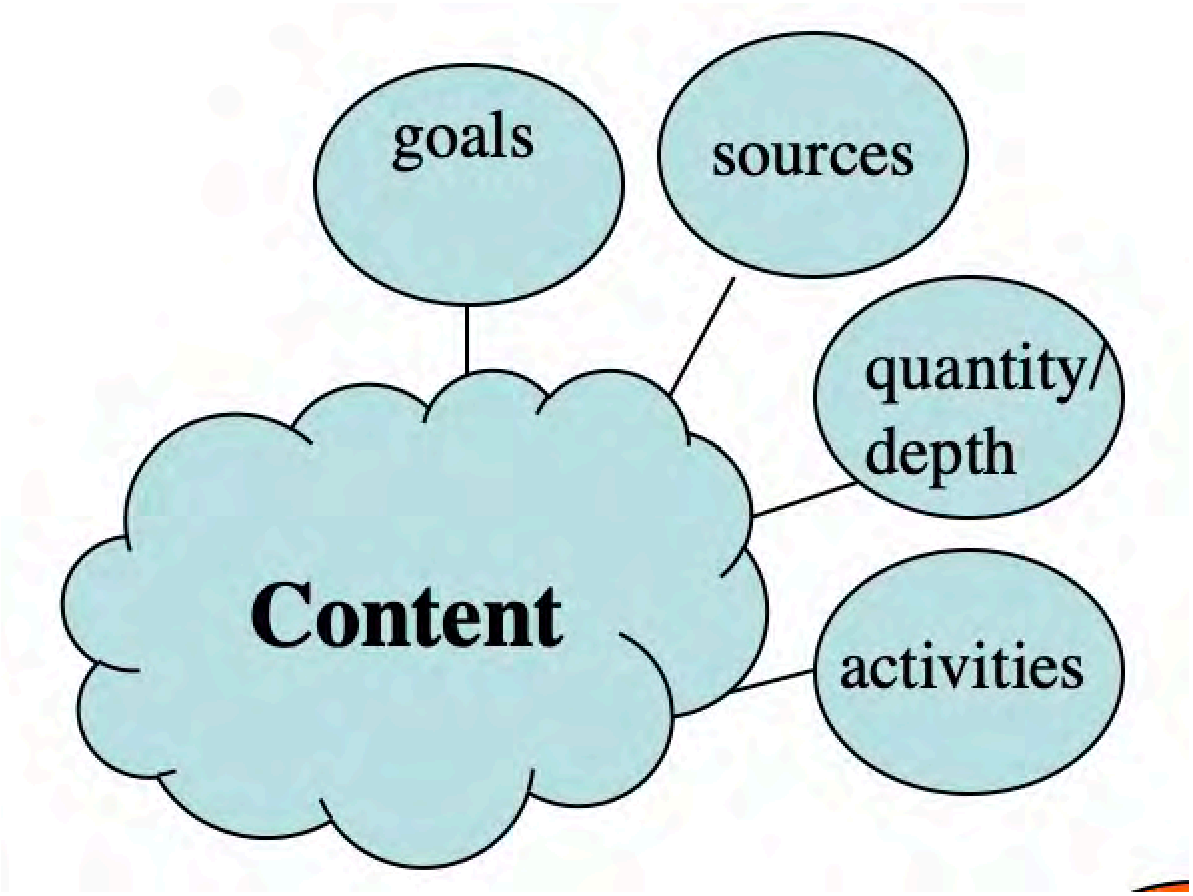

Figure 6.4.1 Content

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

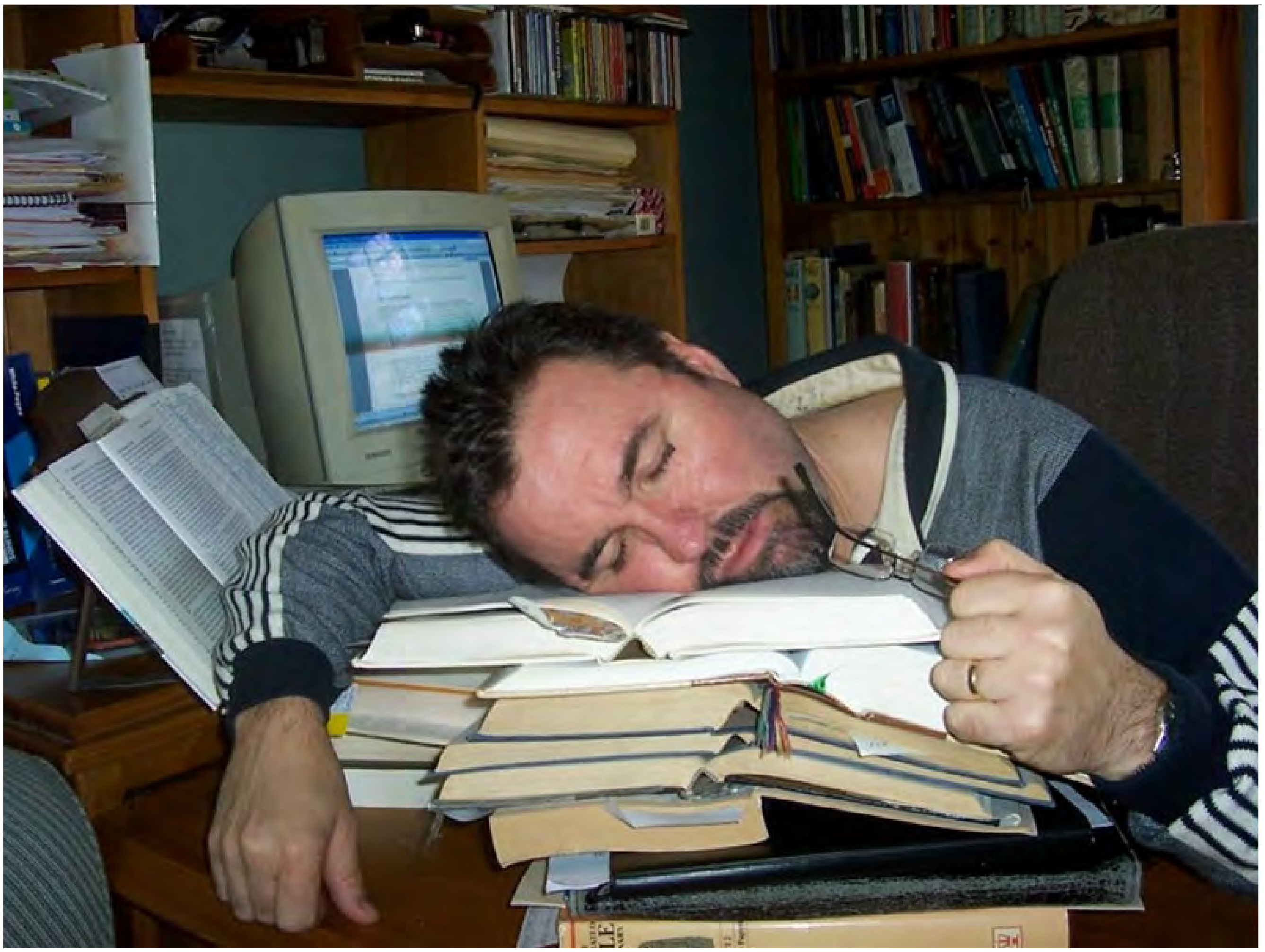

Figure 6.4.2 Is there too much content in your course? Image: © handyguyspodcast.com

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, because:

- some things need to be learned in 'the right order',
- without structure content becomes a jumble of unrelated topics,
- 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

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.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=208#audio-208-1

6.6 Learner support

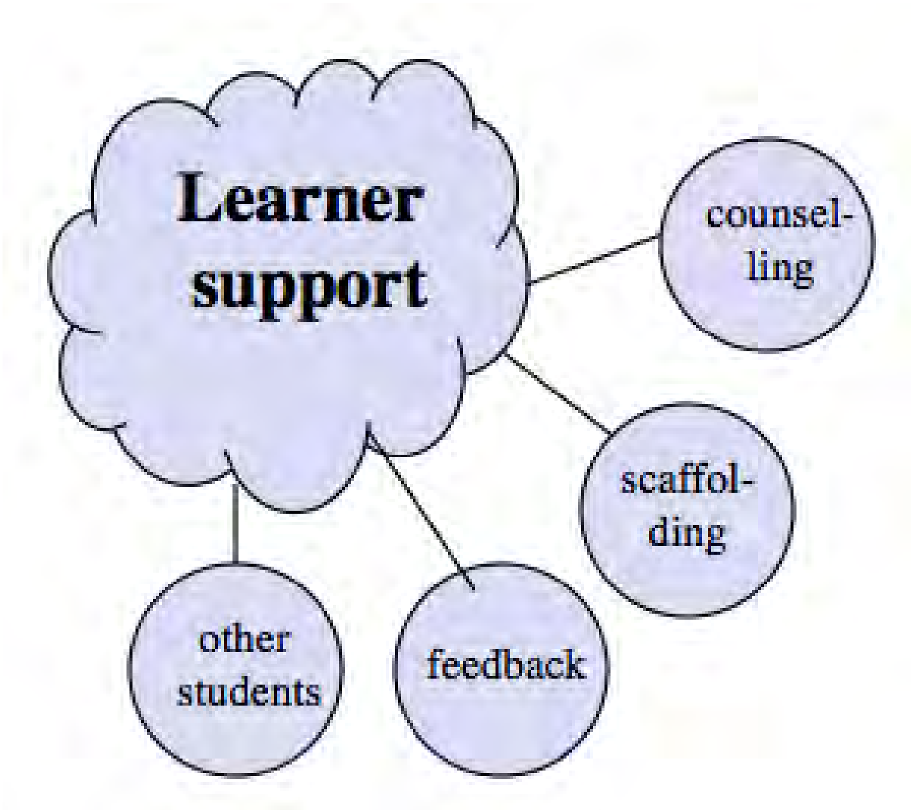

Figure 6.6.1 Learner support

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 a teacher/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 role of the teacher or instructor 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, teachers or 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 teacher or 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 or teacher 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 teachers and 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.

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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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=212#audio-212-1

6.7 Resources

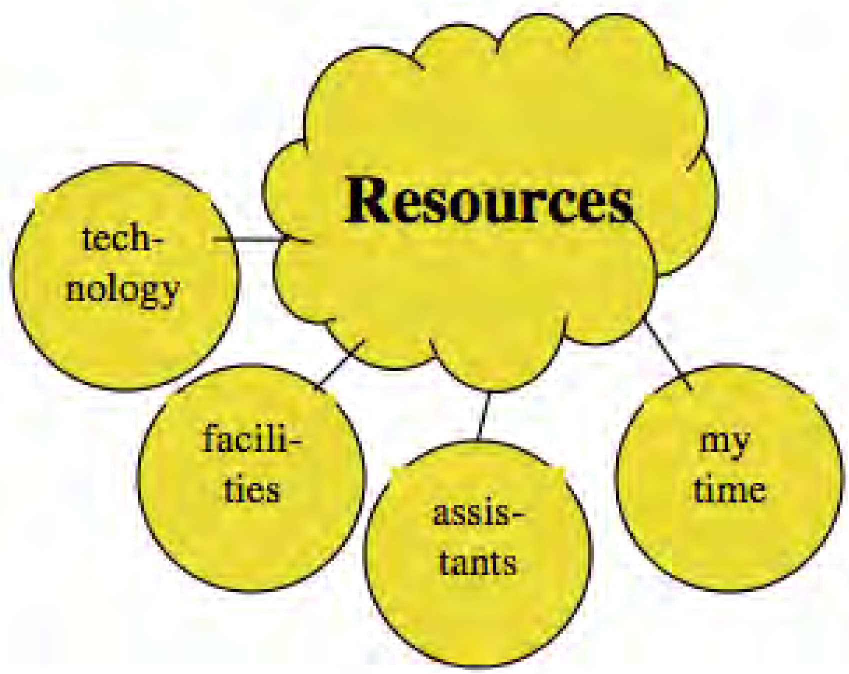

Figure 6.7.1 Resources

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 10, Section 7
- Chapter 11, Section 4.2
- Chapter 13, Section 6
- Chapter 14, Section 3

- Chapter 14, 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. In the school system, there may be a teaching assistant available to help with children with special needs, or IT support staff from a central unit to help with computers or networks.

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 a teacher or 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 a teacher or 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 time of the teacher or instructor

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 teacher or 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 13, Section 9 in particular).

6.7.5 Resources, class size and control

Nothing drives a teacher or instructor to distraction more than trying to manage with inadequate resources. Certainly, if an instructor is allocated a class of 200 students, in a large lecture hall, with no additional teaching support, then they are going to have difficulty creating a rich and effective learning environment, because the lack of resources limits the options. On the other hand, a teacher with 30 students, access to a wide range of technology, freedom to organise and structure the curriculum, and with online 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 14, 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

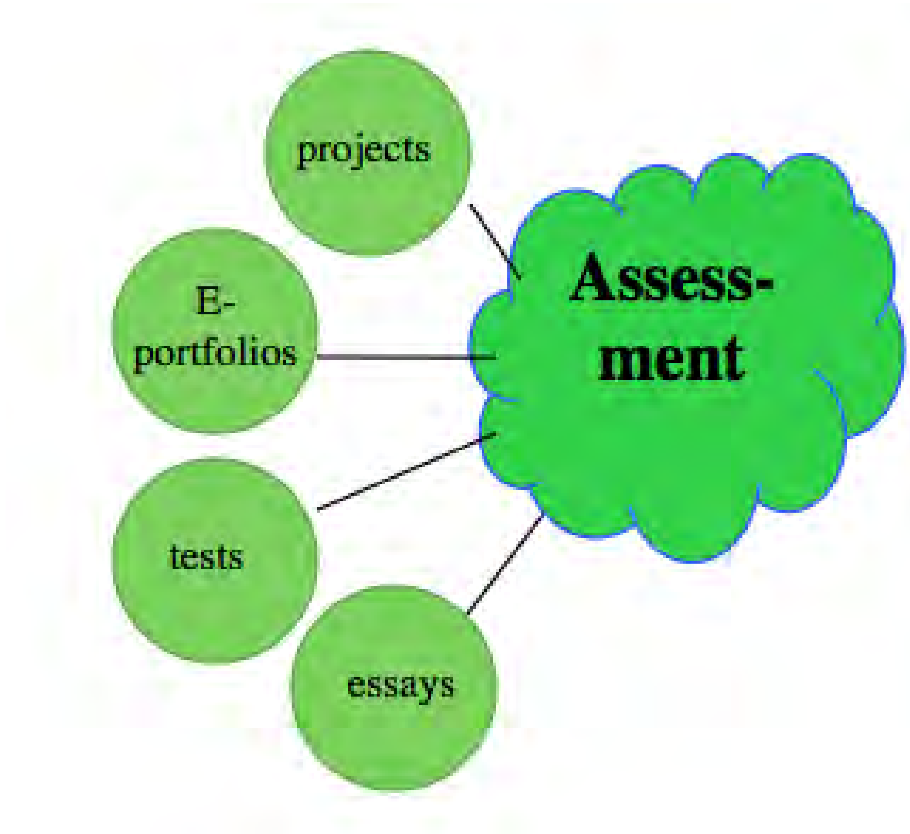

Figure 6.8.1 Assessment

'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 9.4
- Chapter 13, 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 9.4.

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 9.2) 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.

6.8.3.8 Use of online proctoring

Online proctoring uses cameras and software to monitor the online performance of students when taking examinations away from a school or campus. These tools are offered by commercial companies such as ProctorU or Proctorio. Their use became particularly popular during the Covid-19 pandemic when students had to study from home. For an overview, see Kimmons and Veletsianos, 2021.

Figure 6.8.3 ProctorU web cam

There are various ways these tools work, but most involve software that tracks students' online activity – such as using a search platform during the exam – and are often combined with a camera or cameras that record a student's activity during the online exam.

Online proctoring has received a lot of criticism for being intrusive and violating student privacy (see, for instance, Balash et al, 2021). The need though for online proctoring can be avoided by using a different assessment strategy from tests or even essay writing. Students' online work through a learning management system is automatically recorded and can be reviewed over time by an instructor, making continuous assessment a possibility. Students can be asked to create electronic portfolios of their work to demonstrate the application of their learning in real world contexts through video and other forms of recording. However, online proctoring is another possible tool for monitoring more traditional exams.

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.

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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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=219#audio-219-1

6.9 Culture and learning environments

Figure 6.9.1 Old Sun Anglican Aboriginal School, Southern Alberta (date unknown): 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 and high school principals have found.

However, as new technologies allow us to develop new learning environments, instructors and teachers 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.

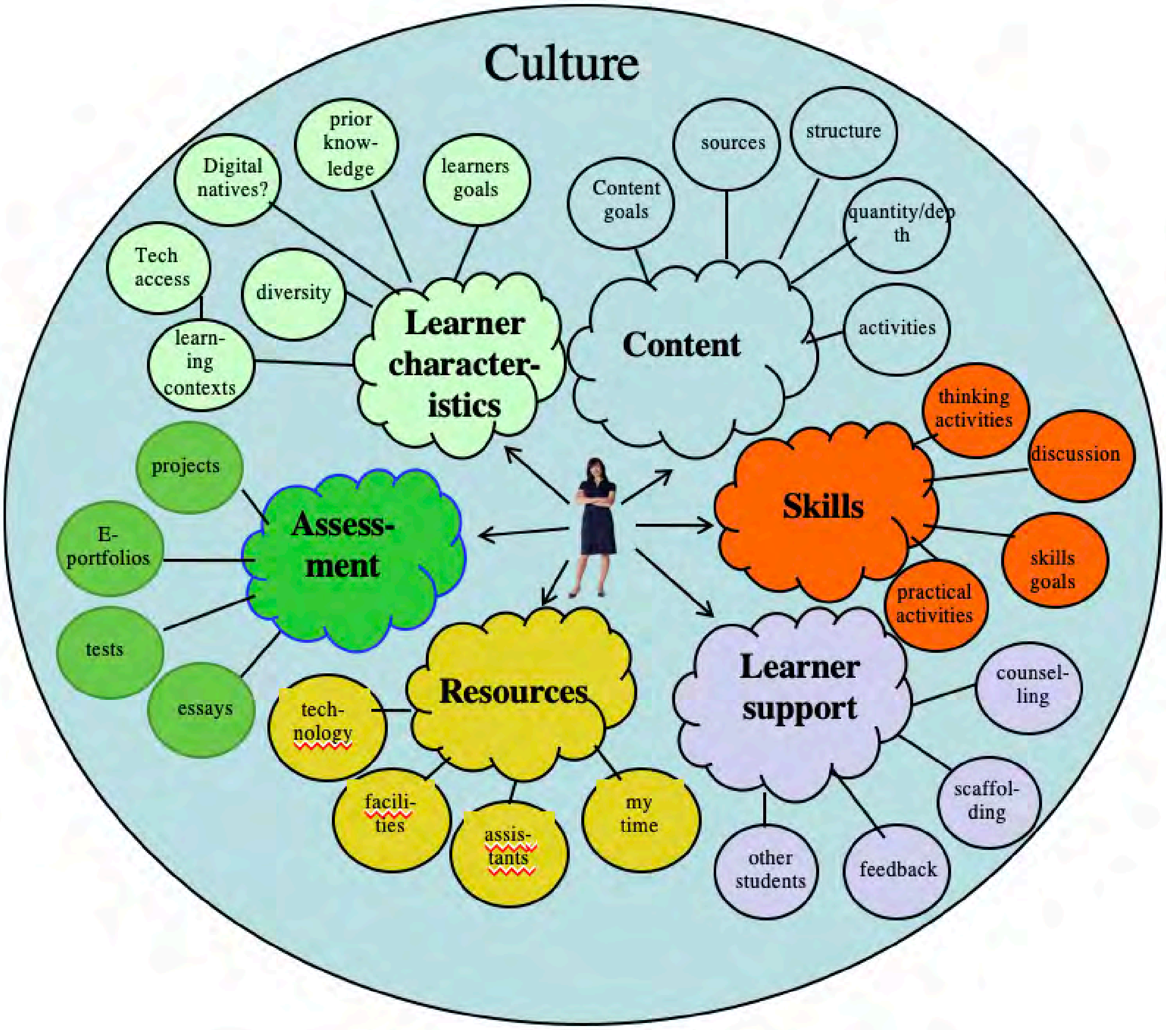

Figure 6.9.2: All the components of an effective learning environment

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.

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.

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.

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.

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=226#audio-226-1

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

- 7.1 Choosing technologies for teaching and learning: the challenge
- 7.2 A short history of educational technology
- 7.3 Media or technology?
- 7.4 The time and space dimensions of media
- 7.5 Broadcast vs interactive media
- 7.6 Media richness
- 7.7 Understanding the foundations of educational media

Also in this chapter you will find the following activities:

- Activity 7.1 How do you currently make decisions about what technology to use for teaching?
- Activity 7.2 What does history tell us?
- Activity 7.3 Media or technology?
- Activity 7.4 Time and space dimensions of media
- Activity 7.5 Broadcast or interactive?
- Activity 7.6 How rich is your medium?
- Activity 7.7 Analysing your current use of technology

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 social media, animation, simulations, virtual reality and artificial intelligence).
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:
    - synchronous (live) vs asynchronous (recorded)
    - broadcast vs interactive
    - 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 interactive, 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 (Figure 7.1) 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 technology's 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 7.1 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. Stephen Downes (2012) picks up from there with a short history of e-learning from around 1989 up to 2012. Martin Weller (2020) follows the trajectory of education by focusing each chapter on a technology, theory, or concept that has influenced each year from 1994 up to 2019. What I'm giving you here is the postage stamp version of ed tech history going back 2,500 years. I have deliberately selected the history to demonstrate how each new medium in particular has influenced educational practice.

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.

The earliest generally accepted examples of Chinese writing date back to the reign of the Shang Dynasty king Wu Ding (1250–1192 BC). 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. Further improvements in technology such as Zoom enabled video-conferencing to be streamed from desktop computers. 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 online learning, although lecture capture and video streaming is now changing that.

7.2.3 Broadcasting and video

Figure 7.2.2 BBC television studio and radio transmitter, Alexandra Palace, London
Image: © Copyright Oxyman and licensed for reuse under a Creative Commons Licence

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 was mainly about fleas. 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 issues (sets kept getting stolen), 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 online learning in a sense reverted back to primarily oral communication supported by Powerpoint or even writing on a chalkboard. This became the main method for delivering education during the Covid-19 pandemic. 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 in the early 1950s aimed 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 of this Chapter.

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 distinction between the use of computers for automated or programmed learning, and the use of computer networks to enable students and instructors to communicate and interact 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.

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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.

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 whiteboards, pencils, chalk, computers, software programs such as a learning management system, or a transmission or communications network, are all technologies. Printing 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. One could consider a physical classroom as a technology system, with blackboard, desks, and other equipment.

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, or until a teacher and students fill the room. 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, virtual worlds, artificial intelligence
- **Social media:** Twitter, Facebook, TikTok, LinkedIn.

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

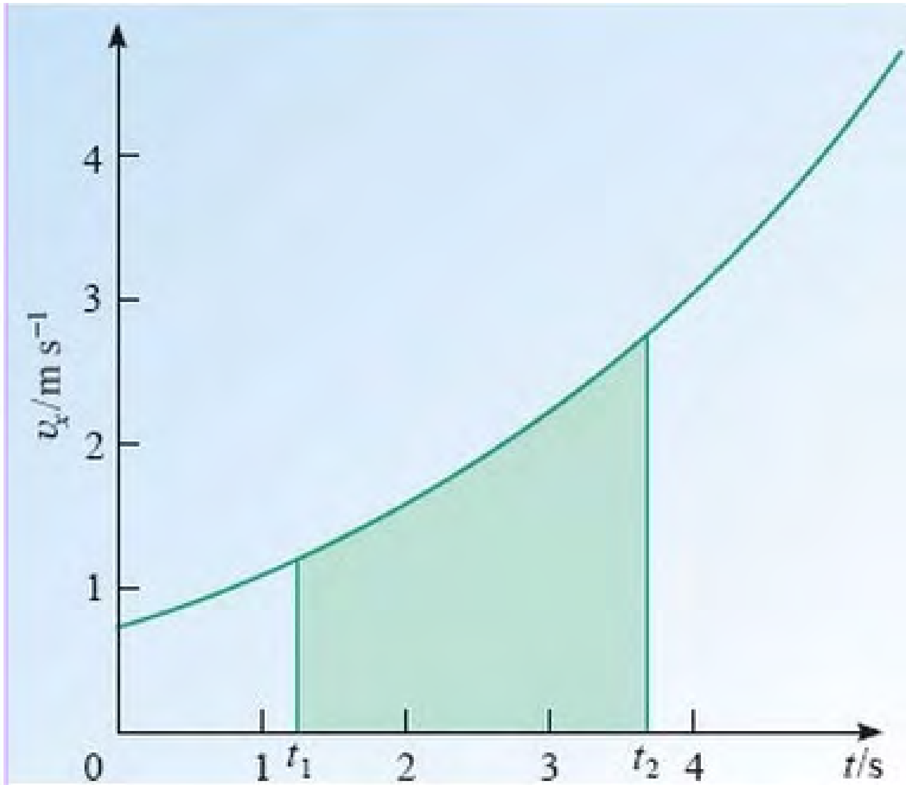

Figure 7.3.3 Graphs can represent, in a different way, the same concepts as written descriptions or formulae. Understanding the same thing in different ways generally leads to deeper understanding. Image: © Open University 2013

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 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 to students. 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 as the programs developed through the course, 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) had 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 (a lecture) to teach understanding, then a documentary approach to apply that understanding.

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 and a wider range of skills. On the other hand, using multiple media may increase 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 The affordances of media

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 or more relevantly classroom teaching 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 lectures on Zoom, 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.

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Schramm, W. (1972) *Quality in Instructional Television* Honolulu HA: University Press of Hawaii

More reading

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, T. (2012) Pedagogical roles for video in online learning, Online Learning and Distance Education Resources

Bates, T. (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)

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Salomon, G. (1979) *Interaction of Media, Cognition and Learning* San Francisco: Jossey Bass

Activity 7.3 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:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=237#audio-237-1

7.4 The time and place dimensions of learning

Figure 7.4.1 Audio cassettes are a single, recorded, asynchronous technology

7.4.1 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 synchronous or asynchronous, including live (transient) or recorded (permanent);
- whether media are broadcast (one-way) or interactive (two or multiple ways);
- 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 continua will depend to some extent on the way different media are designed or used. In this section I will focus on the synchronous/asynchronous dimension. The other two characteristics will be discussed in subsequent sections.

7.4.2 Time and space dimensions

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

7.4.2.1 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 an in-person 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.)

Figure 7.4.2 Image: University of Manchester, UK

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, such as a podcast, video-cassette or an audio-cassette, or available to those with permanent access through a streaming service, such as Netflix, YouTube or a university server that records and streams lectures or open educational resources, on the other hand, are permanently available to those possessing the recording. Books and other print formats are also recorded media. The key educational significance of recorded media is that a student 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.

7.4.2.2 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.

Figure 7.4.3 A large synchronous ZOOM lecture

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 live 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 to or access these technologies at times and the place of their own choosing.

Figure 7.4.4 illustrates the main differences between media in terms of different combinations of time and place.

		Place		
		Same Place	Different Places	
Time	Same time	Live (face-to-face) media in-person lectures seminars or tutorials labs/workshops/studios concerts	broadcasting synchronous lectures 'live' webinars video-conferencing virtual worlds remote labs some video games	Synchronous
	Different times	self-managed labs/workshops/studios physical libraries drop-in learning centres	Recorded media books recorded lectures podcasts web sites blogs, wikis learning management systems online discussion forums streamed video some video games	Asynchronous

Figure 7.4.4 Synchronous and asynchronous educational media (examples)

7.4.3 Why does this matter?

Synchronous and asynchronous technologies have different advantages and weaknesses (affordances) for teaching and learning.

7.4.3 1 The affordances of asynchronous technologies

Asynchronous technologies have been used in online learning for at least 30 years (and in the case of older media such as books for much longer). Because asynchronous online learning has had to justify itself in comparison with in-person learning, we have more practice- and research-based evidence of the affordances of asynchronous online learning, as well as well-defined quality standards.

Overall there are major 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 in general did better on blended learning than in-person learning, because they spent more time on task, as the online materials were always available to the students.

Research at the UK 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). The Khan Academy is a more modern approach but using similar principles of using voice over graphics.

This research underlines the importance of changing design as one moves from in-person 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?

7.4.3.2 The affordances of synchronous technologies

Before the Covid-19 pandemic, there had been little research on the affordances of in-person lectures compared with online teaching. To some extent, in-person lectures or seminars were considered the gold standard. There was no need to identify its advantages over online learning. However, Covid-19 and emergency remote learning resulted in a number of lessons being learned, both about the affordances of lectures in general, and also of the limitations in moving lectures online.

Couey (2022) has set out some of the advantages or affordances of synchronous, in-person learning::

- a dedicated space and time where students and instructors can meet to discuss learning material develops a sense of companionship and can foster an environment conducive to learning
- students are able to discuss complex material together in order to gain a better understanding in real-time, and instructors have a greater finger on the pulse to know what they need to focus on
- students can interrupt the lecture to ask questions which can lead to a more narrow, targeted discussion.

- students can break out into smaller groups to collaborate with each other. Some of the best learning opportunities come from these spontaneous questions and discussions
- teachers can feel the pulse of the room and have a much greater idea about which parts of the lesson students understand and which they might need to spend more time reviewing.

Up until 2019, most online learning was asynchronous, (at least in North America), built around the use of learning management systems. In Canada in 2018, nearly all institutions (93%) were using an LMS for online learning (Johnson, 2019). This suited students who were fully distance learners in particular, who were often also often working full-time, or were at home with young children. Courses were deliberately designed to take advantage of the affordances of asynchronous learning.

However, even before the outbreak of Covid-19, the use of synchronous video-conferencing technologies such as Zoom, Microsoft Teams, BigBlueButton, and so on was increasing rapidly to the point where just over two-thirds of all institutions were also using such synchronous technologies, usually in parallel with an LMS (Johnson, 2019).

In the Spring of 2020, when nearly all post-secondary education was abruptly moved online because of the Covid-19 pandemic, most courses that had not been originally designed for online learning were also moved online. However, because this was an emergency (hence the term emergency remote learning), the main technology used was synchronous video-conferencing for several reasons:

- Instructors were able simply to transfer their familiar in-person lecture methods online.
- The technology was relatively easy to use without extensive training.
- Most institutions already had a license for such technology.
- Lastly, there was no time for instructors to consider re-designing courses.

So during the pandemic, the dominant online teaching method was synchronous lecturing. This did not go down well with students for a number of reasons. The main concerns with synchronous lectures used for emergency remote learning identified from a number of different research studies (Bates, 2021) were as follows:

- too much passive screen time

- too little student interaction either with the instructor or with other students
- work overload, because instructors were often giving students extra work on top of the lectures
- most students preferred to watch the recordings of the lectures but sometimes students were not given access to recordings of the lectures, because the instructor wanted students to be ‘present’ for questions and discussion
- lack of the social aspects that result from being on campus (although this was not really possible anyway during the pandemic).

This suggests the need for a number of adaptations of in-person lectures when moved online:

- probably the most important lesson from the pandemic was that moving classroom lectures online without considerable adaptation is not an effective way to teach.
- some instructors made good use of the break-out rooms in Zoom, for instance, allowing students to have synchronous discussion or do collaborative work, then returning to report to the main session.
- research suggests instructor presentation should be limited to 15 minutes or so followed by a break for questions and discussion.
- it is really important for students to have access to a recording of the lecture.
- lectures should be used in conjunction with asynchronous online activities, such as online discussion forums, online reading or research.
- instructors should carefully consider student workload, especially if combining synchronous and asynchronous learning activities.
- it should be remembered that many students opt for online learning because of its flexibility, which synchronous lecturing considerably retricts.
- online synchronous lectures are not suitable for very large classes because of the difficulty of getting good group interaction with such large numbers. It would be better to record the lecture and arrange for smaller group discussions, either synchronously through Zoom break-out rooms, or (more easily) asynchronously through the learning management system.

All this suggests that, wherever possible, instructors should consider redesigning the whole course if it is to go online, and the rest of the book looks at ways to do this.

7.4.4 Conclusion

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 or synchronous 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 so as to exploit their unique advantages or affordances, and should also be combined with asynchronous media. Indeed, for online learning, asynchronous should be the default model, but supported by synchronous teaching where necessary and appropriate.

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Activity 7.4 Time and space dimensions of learning

1. Does this categorization of technologies make sense to you?

2. Can you easily place other media or technologies into Figure 7.4.4? What media or technologies don't fit? Why not?

3. Write down the (a) advantages and (b) disadvantages of of having some students 'live' in the classroom for a lecture and other students participating from home or elsewhere through synchronous streaming of the lecture at the same time. (This is sometimes called 'bi-modal' teaching – see Bruff, 2020.)

For my comments on the last question, click on the podcast below:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/teachinginadigitalagev3m/?p=243#audio-243-1

7.5 Broadcast or interactive media?

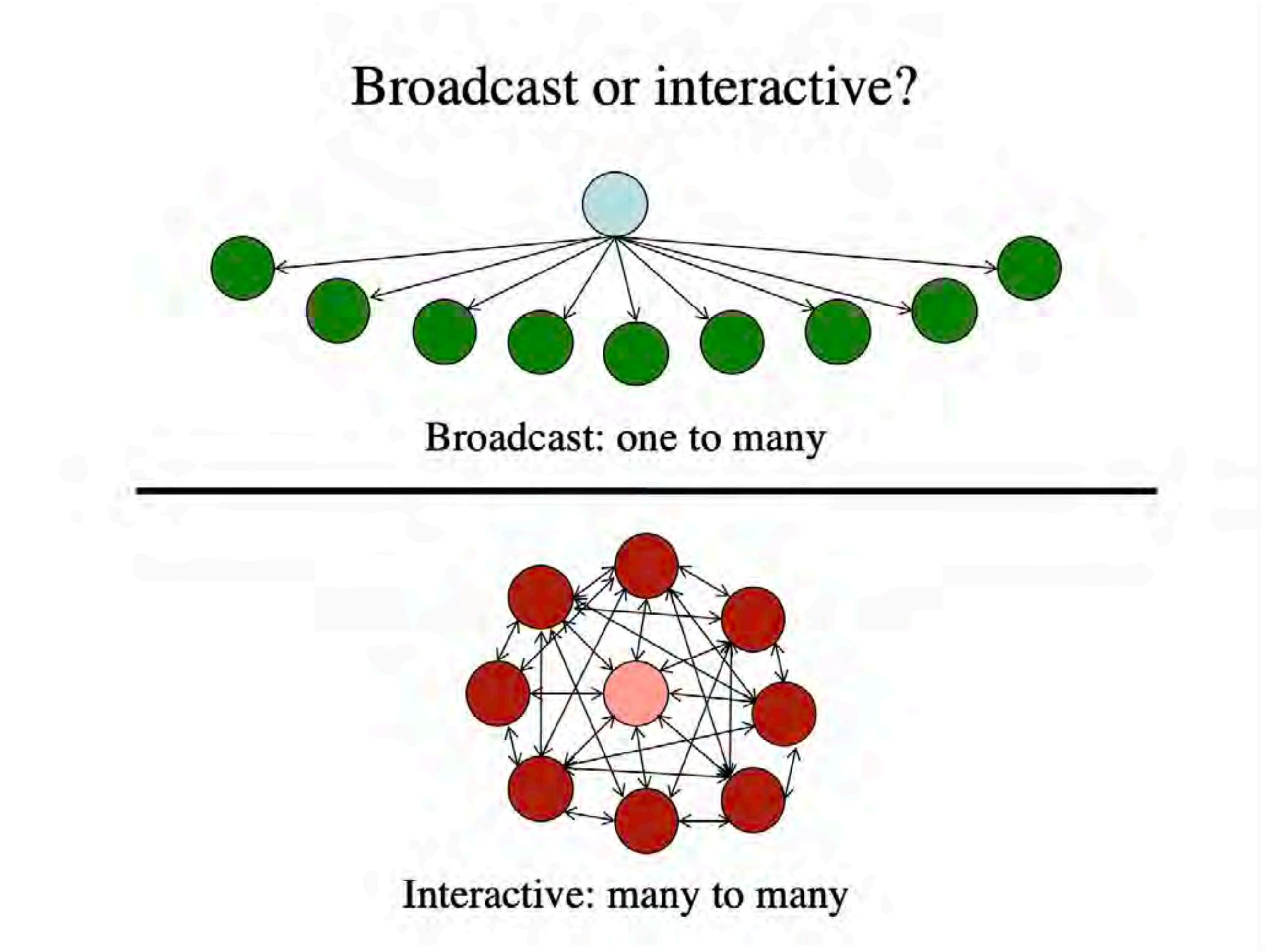

Figure 7.5.1: Broadcast or interactive communication?

7.5.1 Broadcast or interactive communications 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 'interactive'[1],

1. In earlier versions of this book, I used the term 'communicative' instead of 'interactive'. However,

allowing for two-way or multiple communication connections. Interactive communications media include those that give equal 'power' of communication between multiple end users. There is currently a lot of discussion in education about the difference between synchronous and asynchronous technologies, but the distinction between broadcast and interactive communications technologies is equally important.

7.5.1.1 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.

We can also apply this analysis to non-technological means of communication, or 'media', such as classroom teaching. Most 'transmissive' lectures are also a broadcast medium – one message to all participants, and little or no interaction – whereas a small seminar group has the characteristics of interactive communication.

Affordances

- 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.
- Broadcast 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.

broadcasting is also communicative. Interactive emphasises the relationship between all participants in the communication.

7.5.1.2 Interactive communications media

The telephone, video-conferencing, e-mail, online discussion forums, seminars and tutorials where students play a major role in the discussion, most social media and the Internet are examples of interactive 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.

Affordances

- The educational significance of interactive communications media is that they allow for interaction between learners and teachers, and perhaps even more significantly, between a learner and other learners.

7.5.2. A flexible dimension

Unlike synchronous and asynchronous, this dimension is not a rigid one, with clear or unambiguous classifications. For instance, an uninterrupted lecture is clearly a broadcast medium, but most lectures allow for at least some questioning or interaction. Furthermore, most technologies are somewhat flexible in that they can be used in different ways. Video-conferencing technologies such as Zoom are a good example. They can be used both in a broadcast mode (lectures) or an interactive mode (meetings, or student break-out rooms for discussion).

However, if we stretch a medium too far, for instance trying to make a broadcast medium such as an xMOOC also more interactive, stresses are likely to occur, such as students being overwhelmed by the amount of communications. So I find the dimension still useful, so long as we are not dogmatic about the characteristics of individual media or technologies. This means then looking at each case separately, and especially how it is used in specific contexts.

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 between students and between students and instructor. However, it could be argued that the communication functions in an LMS require additional technologies, such as a discussion forum and email, 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 website, 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 website that allows end user interaction is less of a broadcast medium. However it is not a 'pure' interactive medium either. The power is not equal between the airline and the customer, because the airline controls the site content.

It should be noted too that some social media (e.g. YouTube and blogs) are also more of a broadcast than an interactive medium, whereas other social media (such as Signal or Telegraph) use mainly interactive technologies with some broadcast features (for example, personal information on a Facebook page). A wiki is clearly more of an 'interactive' 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 interactive communications 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 interactive communications media, while the instructor's role may still be central, as in online collaborative learning or seminars, there are also 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