Empirical Article

Progress and Challenges in Digital Teaching and Learning in the Canadian HE System

Tony Bates

Toronto Metropolitan University, Ontario, Canada

Email: tony.bates@ubc.ca

Address: Chang School of Continuing Education, Toronto Metropolitan University, Toronto, Ontario, Canada

Abstract

Canada has a long history of digital and online learning. The article gives a brief overview of the development of digitalization of teaching and learning in Canadian HE, and the current status in terms of online and blended enrolments across the country, including the impact of Covid-19. The main reasons for this shift in teaching and learning are discussed, as well as the main challenges and opportunities Canadian HE institutions face as a result of the digitalization of teaching and learning. The article ends with conclusions about the extent and type of digitalization, its objectives, and the attitudes and policies of the main stakeholders towards digitalization of teaching and learning in Canadian HE institutions.

Keywords: Canada, digitalization, higher education, online/blended learning, teaching/learning

Introduction

Canada is the second largest country in the world by total area, yet its population is only 39 million. Even though nearly 80 per cent of the Canadian population live near the southern border with the USA, and in its larger cities, Canada is still in general a sparsely populated country, with long distances between major cities, and between urban centres and their vast hinterland. This has historically influenced the organization and delivery of higher education and in particular has provided a foundation and rationale for online learning and distance education.

At the same time, Canada's closeness to and strong connections with the USA, its economically advanced cities, and a well-educated work force, have resulted in ideal conditions for the development of advanced digital applications such as online learning.

The Canadian Higher Education System

Education is constitutionally the responsibility of the ten provinces and the three territories. Thus, there is no national higher education system in Canada. There is no Federal Ministry or Department with responsibility for post-secondary education, although the federal government does provide student aid and tax breaks for students and their parents, and funding for research and innovation. The federal government is largely responsible for funding higher education opportunities for indigenous learners, although those who go on to post-secondary education usually attend a provincially funded institution. There are four types of public post-secondary institution in Canada:

- universities,
- polytechnics/institutes of technology,
- one- and two-year professional and vocational colleges,
- CEGEPs (general and vocational colleges) in Québec.

Almost all universities are provincially funded and there are few private, for-profit online universities in Canada, and their programs are small. There are numerous private, for-profit vocational colleges, but still a majority of two-year college students attend provincially funded institutions.

Most Canadian students receive financial support of some kind, ranging from endowment-funded scholarships to low interest student loans to tax breaks. In most provinces, grants and tax-breaks combined usually cover at least the tuition costs. As a result, Canada has the second highest rate of access to higher education in economically advanced countries, according to the OECD (2022). Almost two-thirds of those aged between 25-35 in Canada have some form of tertiary education qualification (Schuetze, 2019). For more details on the Canadian higher education system, see Usher, 2022.

Online Students

Pre-Covid

Because there is no federal agency responsible for higher education, there are no official national statistics on the number of students taking online or distance courses. However, since 2017, the Canadian Digital Learning Research Association has been conducting annual surveys of all publicly funded universities and colleges in Canada regarding their digital learning activities.

There are still difficulties in collecting accurate and reliable data, because there is not consistency between institutions on how to count online or distance enrolments. Nevertheless, the CDLRA recorded that in 2017, roughly 17 per cent of all students taking courses for credit were taking at least one online course, and that eight per cent of all credit course enrolments were in fully online courses (see Table 1 for a breakdown by type of tertiary institution. Credit courses are those leading to an official degree or diploma, so these data do NOT include continuing education enrolments).

Bates (2019) reported that in 2018:
- the average online course load for students was three to four courses a year (the overall course loads ranged from 7-8 course a year in universities to around 10 courses a year in colleges.)
- the 1.36 million online course registrations in 2016-2017 were the equivalent of 4 universities of 27,000 students each, 4 colleges of 12,000 students each, and 1 CEGEP of 3,500 students.

Table 1

Number and percentage of online course registrations for all Canadian postsecondary institutions by type of institution, 2017:

Type of institution	Online course registrations	All credit course registrations	% online
Universities	839,673	10,261,104	8%
Colleges outside Québec	476,232	5,661,687	8%
CEGEPS (Québec)	34,364	1,798,790	2%
Private, provincially supported Québec colleges	6,956	232,018	3%
Total	*1,357,225*	*17,953,599*	*8%*

Source: Donovan et al., 2018

Perhaps more important than the actual numbers though is the trend. CDLRA also collects from the institutions estimates of future online course enrolments. Most institutions expect their fully online courses enrolments to increase in the future. The surveyed institutions reported that their online enrolments had been slowly but steadily increasing for the

last 15 to 20 years up to 2019. The rate of increase was reported at around 10% per annum, while on-campus enrolment numbers had been mainly static.

Some provincial governments, such as British Columbia, Alberta and Ontario, had in the past encouraged the growth of online learning by special funding for the development of new online courses in addition to the annual government operating grants for universities and colleges. However, in recent years this growth is now driven without specially earmarked funding. Johnson (2019) reported:

The vast majority of Canadian post-secondary institutions offer online courses for credit, with almost all universities and colleges across Canada delivering courses online. Online offerings have remained consistent and, in 2019, there were no institutions that moved away from delivering courses online.

This is a major difference between Canada and the USA. Online learning in Canada is spread widely across all institutions, whereas, although still quite pervasive in the USA, and the overall numbers are much higher, online learning is concentrated in a relatively small number of universities and colleges with very large numbers of online enrolments, such as the University of Maryland University College, University of Southern New Hampshire, Arizona State University, Western Governors' University, the University of Phoenix, and Ivy Tech Community College (Seaman, Allen, & Seaman, 2018).

The Impact of Covid-19

As a result of Covid-19, all universities and colleges in Canada, as elsewhere, almost immediately switched to emergency remote learning, a form of online learning based mainly on delivering lectures synchronously online via video-conferencing.

However, prior to Covid-19, the majority of online courses in Canadian HE institutions had been largely asynchronous, using learning management systems such as D2L's Brightspace, Moodle, Canvas or Blackboard Learn. Nevertheless, even before Covid, almost two-thirds of all HE institutions were also using video-conferencing for online learning in conjunction with an LMS (Johnson, 2019).

At the time of writing, it is still too early to predict the consequences of Covid-19 for online learning. The necessary haste in moving to emergency remote learning meant that many of the lessons about what was required for good quality online learning were ignored. As a result, responses from students and instructors were mixed, with many students and instructors strongly disliking emergency remote learning, while others found it worked quite well.

What is clear is that even before Covid-19, fully online learning in Canada was increasing at a steady rate. So, also, according to data from the CDLRA, was blended or hybrid learning, the mix of on-campus and online learning. Blended learning can take many forms and is very difficult to track, but in 2021 Johnson (2021) reported: While more than half of institutions (53%) agreed that faculty were more interested in teaching fullyonline courses, there was a stronger interest among faculty in teaching hybrid (partially online) courses. Three-quarters (75%) of institutions agreed that faculty were more interested in teaching courses where instruction is partially in-person and partially online.

Johnson concluded: The findings from the 2021 National Survey of Online and Digital Learning show that, even with a return to on-campus learning, hybrid and online learning options are desired. Further, the data indicates a shift in preferences among faculty and students toward using more digital learning resources and educational technologies in their classes. Most institutions do not expect to return to a pre-pandemic state of teaching and learning, and online learning and digital resources will likely play a much greater role at Canadian post-secondary institutions going forward.

Similar results have been found in the USA. For instance, Seaman and Seaman (2023), conducted a series of seven surveys of community colleges (two-year institutions that grant associates degrees) between April 2020 and September 2022. They found (pp.10-11) that:

> Most community college students reported being more optimistic about online learning (56%) and blended learning (50%) than before the pandemic. In addition, fifty-two percent of faculty reported being more optimistic about online learning than pre-pandemic; only 17% said they were now more pessimistic…. The substantial changes in attitudes and future teaching desires indicate that a return to the pre-pandemic "normal" is not likely. Faculty report that, for the most part, their teaching practices have changed, and that these changes will continue without a wholesale return to the pre-pandemic approaches.

One of the challenges of this expansion of digital learning is the definition of terms. This is important, because students need to know the requirements of a course. Do they have to attend campus on a regular basis? How much of the

course is online? If it's online, do they have to log in a particular time (synchronously)? The CDLRA has been working with organisations in the USA such as WCET and the Online Learning Consortium to agree a common terminology. Based on a survey of nearly 1,000 faculty and just over 1,000 administrators, the researchers found a very high degree of agreement on most of the terms used to signify digital learning, as follows:

Table 2

Definitions of Digital Learning

TERM	DEFINITION
Online learning	All instruction and interaction is fully online (synchronous or asynchronous).
Hybrid learning	A blend of online and in-person instruction (online instruction is synchronous or asynchronous).
Hyflex learning	Students can move between online and in-person instruction as they see fit (also referred to as multi-access or co-modal learning).
In-person learning	All instruction takes place in an in-person setting.
Synchronous learning	Instruction takes place in real-time and requires student presence (in-person or virtual) at a set time.
Asynchronous learning	Instruction is available for students to access at a time that works best for them.

Source: Johnson, Seaman and Poulin, 2022

Provincial Government Strategies

Higher education policy is the responsibility of the provinces in Canada. Provincial governments began to support the use of online courses in the mid-1990s. Their approach to digital learning is an extension and development of their policies towards online learning.

Meta-Organisations

Several provinces established meta-level organizations to help co-ordinate or encourage online learning, although these organizations do not offer online courses or programs themselves.

BCcampus has in the past managed a fund from the British Columbia provincial government to support the development of new online courses and open educational resources, and more recently has managed funds for developing open textbooks. It has also established an open educational resources repository available worldwide.

Contact North | Contact Nord in Ontario, established in 1986, offers five core services in English and French. The five services include:

- 112 local online learning centres serving 600 small, remote, rural, aboriginal, and francophone communities;
- a portal of online courses and programs from Ontario institutions for students and prospective students;
- a portal for faculty and instructors, focusing on online learning;
- a portal for students needing literacy and basic skills training;
- a Student Information Hotline providing support to students and prospective students.

eCampus Manitoba also provides an online portal for students where all the courses offered by most of the universities and colleges within the province are listed.

These organizations often support faculty development initiatives for online learning, through webinars and local conferences and workshops. They also facilitate professional communities of practice. In British Columbia, for instance, the Educational Technology Users Group (ETUG) is supported by BCcampus.

Provincial Government Digital Learning Strategies

More recently the governments of both Ontario and British Columbia have developed specific strategies for digital learning in higher education.

In 2020, Ontario created a virtual learning strategy for higher education, consisting of four elements:

- positioning Ontario as a global leader and testbed for digital innovation in educational technology.
- establishing Ontario as a global leader in virtual learning by creating opportunities for international students who want to study from their home, while accessing Ontario's world-class, digital content.
- encouraging lifelong learning by supporting virtual micro-credential programs to help people learn new skills at their own pace, when and where they need their education most.
- investing over $50 million between 2020-2022 for the development of digital courses and resources, to be allocated to Ontario colleges and universities; the allocation of funding is managed by eCampus Ontario.

In 2022, British Columbia published a draft Digital Learning Strategy based on extensive consultations with various stakeholders. The strategy has three priorities:

- Policies and processes: institutions will be required to update existing policies or develop new policies to address the impact of digital technology on all facets of post-secondary operations and to foster innovation and excellence
- System collaboration: system-level coordination and collaboration is required across BC's post-secondary system to reduce the escalating costs related to digital technologies, and to improve the sustainability of BC's post-secondary institutions in response to increasing demands for digital infrastructure including hardware, software, and human resources.
- Enhancing digital equity: mitigating or eliminating digital inequities by developing BC's digital capabilities within the post-secondary institutions, across the post-secondary system, inclusive of adult higher education entities, and within BC more broadly.

The strategy document also included a set of guidelines to assist post-secondary institutions in navigating the expanding use of digital technologies supporting teaching and learning.

There are significant differences in the approach of the two provinces. Ontario's is more focused on funding to support digital learning; British Columbia's approach is more on ensuring equity and system collaboration. Both require institutions to develop specific strategies for digital learning.

Institutional Strategies

Open Universities

There are two public universities in Canada that offer programs only at a distance:

- Athabasca University, established in 1970, and funded by the Alberta government, is an open, fully distance university that draws up to 40 per cent of its 40,000 students from outside the province of Alberta. It offers both undergraduate and graduate degrees fully at a distance.
- TÉLUQ in Québec, established in 1972, is a francophone, fully distance university offering full degree programs to just under 20,000 students a year. It is a fully autonomous university within the Québec higher education system and awards the degrees and diplomas.

However, both these institutions are facing existential challenges as more and more conventional universities offer fully online courses and programs.

Thompson Rivers University, a campus-based, provincially funded institution in British Columbia, also offers distance courses and programs through its Open Learning Division (TRU-OL). TRU-OL partners with three other BC universities to ladder their distance education courses towards a TRU degree.

Royal Roads University (RRU), on Vancouver Island in British Columbia, offers a mix of online and on-campus programs, focusing on graduate level career development. RRU offers three formats:

- on-site with 100 per cent face to face learning;
- blended, with part of the program taught in a face to face residency and the balance on line; and
- fully on-line.

RRU's residency-based programs are usually short, ranging from one to three weeks, usually in the summer. The majority of its programs are fully online.

Dual-mode Institutions

As already noted, most campus-based universities and two-year colleges in Canada also offer fully online courses. Some of the universities have a long history of distance education provision. Queen's University (Ontario) offered its first correspondence courses in 1889 and overcame geographical challenges in regions without access to the postal service by employing the North West Mounted Police (now the Royal Canadian Mounted Police) to deliver material for these courses (CADE, 1999).

There are basically four types of fully online courses commonly offered:
1. individual fully online courses, serving several purposes:
   - enabling students who have dropped courses, or need only one or two more courses, to complete their undergraduate degrees without having to come back full-time for another year;
   - providing more flexibility in scheduling for students throughout their academic studies;
   - offering increased access for working adults/students with young families;
2. courses towards a full undergraduate degree available entirely online;
3. post-graduate masters' programs, mainly aimed at working professionals;
4. non-credit courses or programs leading to certificates or diplomas.

Many of these dual mode universities offer parallel on-campus and distance courses and do not indicate the mode of delivery on degree transcripts. Indeed, in most cases on-campus and fully online students take the same examination, usually under supervision at a proctored exam site or more recently through online proctoring.

Although the majority of students in Canada are taking just one or two online courses as part of their on-campus program, more recently some conventional universities have also started offering complete undergraduate degree programs fully online. For instance, students can start a B.Tech program in computing at Mohawk College then transfer to McMaster University to complete the last two years fully online. Similarly, Queen's University is offering a fully online B.Tech in mining engineering aimed at working miners across Ontario. Entirely fully online undergraduate programs though are still quite rare in Canada, the main providers still being Athabasca University, TRU-OL and TÉLUQ.

Université Laval is a francophone institution in Québec which has been rapidly expanding its online enrolments and is probably in 2022 the largest provider of tertiary online learning in Canada, as Athabasca University's enrolments have been static since 2019.

The Commonwealth of Learning, charged with promoting open distance education throughout the 53 countries of the Commonwealth, is located in Vancouver, British Columbia.

Thus, in Canada there is a wide variety of higher education institutions engaged in online and digital learning, from fully online distance teaching universities to small campus-based institutions nevertheless offering at least some online courses.

Digital Technologies

Canada has been a leader in the development and use of digital technology for teaching and learning.

Early Developments

The first fully online course for university credit was offered in 1986 at the Ontario Institute of Studies in Education, a graduate school of the University of Toronto.

The first web-based learning management system, WebCT, was developed at the University of British Columbia in 1996 by Murray Goldberg, and later acquired in 2006 by Blackboard, Inc. WebCT was being used by 10 million students in 80 countries at that time. In 2000, the University of Guelph partnered with Desire2Learn, a Canadian company based in Kitchener, Ontario, to develop another major learning management system, now called Brightspace.

The University of British Columbia began offering fully online courses for credit in 1995, and also offered its first fully online programs in 2003.

Dave Cormier, an instructor at the University of Prince Edward Island, was the first to coin the term MOOC (Massive Open Online Course). The first MOOC, Connectivism and Connective Knowledge (CK08), was offered in 1998 by the Extension Division of the University of Manitoba, by George Siemens, Stephen Downes and Dave Cormier. However, a majority of MOOCs follow a different design, using mainly video-recorded lectures, based on a model developed in 2011 at Stanford University and MIT in the USA.

Current Technologies

In 2022, though, there are basically two kinds of technology being used for digital learning in Canadian tertiary education:

Institution-wide technologies

These technologies have become more or less standard, and are available across the whole institution, both for on-campus and off-campus digital learning:

- learning management systems
- video conferencing systems
- lecture capture and streaming

Many universities now have Learning Centres, with publicly accessible online educational resources, wi-fi and Internet access, and open spaces for research and innovation, where students can go to work individually or in self-managed groups. These types of facility will become increasingly important as blended and hybrid learning expand.

Nearly all universities and colleges in Canada use these resources extensively. The role of Centres for Teaching, Learning and Technology is critical in helping instructors exploit such technologies.

Specific applications

These are applications, such as simulation and games, virtual and augmented reality, and artificial intelligence applications, that are used for specific purposes within a particular program, but are not universally used throughout the institution.

Another important development is the design of interactive classrooms that integrate technology into digital learning on-campus. Queen's University has developed a range of interactive classrooms of different sizes and designs. The instructor has a central 'pod', students are grouped around tables with access to power and the Internet, and each group of students has their own screen on the classroom walls. Students can bring in work done outside the classroom and demonstrate it, and there are quiet cubicles where they can go and do individual work.

Some institutions, such as the University of British Columbia and Emily Carr University of Art and Design, have created emerging media laboratories where instructors and educational technology specialists can experiment with and explore the application of new technologies. Thus, there are many 'pockets of innovation' in digital learning in Canada, many of which have been reported by Contact North.

Why the Move to Digital Learning?

There are several reasons for the move to digital learning in Canadian tertiary education.

Flexible Delivery

This is probably the main driver currently. Many Canadian students are working part-time (even if classified as full-time students) to help keep down student debt and to pay their way through college, or have a long commute to the institution from where they live. Most fully online students are not really 'distant' students. They usually live within an hour or so travel time to the institution, but their time is valuable and digital learning gives them more flexibility in managing their time. Covid-19 reinforced the flexibility of digital learning. Instructors also liked the idea of working mainly from home. Digital learning is really just another aspect of the digital age, where employers, workers, students and instructors all want more flexibility and control over their lives.

Accessible and Convenient Technology

Although there are still significant gaps in Internet access, especially in remote rural areas, most Canadian tertiary students have convenient and easy access to the Internet. Most have computers, tablets and mobile phones, and are comfortable using them for study purposes. Similarly, instructors have access to relatively easy-to-use technology for delivery, such as learning management systems and video-conferencing.

Support from Centres for Teaching and Learning

The move to digital learning is not a huge step technically for instructors, although some training on how to use the technology is beneficial. This is now though easily available through the Centres for Teaching and Learning that most Canadian universities and colleges have established. The value of these support centres was given a tremendous boost by

Covid-19. Previously, fewer than 10 per cent of faculty had made use of the expertise of the staff of these centres. During Covid-19, more than half of all instructors received at least some help from such centres (Naffi, 2020). Perhaps the greatest value of these centres though is not technical support, but getting instructors to reconsider the design of their courses to increase active learning and to better manage student workload.

The Lifelong Learning Market

This is a more strategic development driven by demographics and a changing economy. The number of students coming out of Canadian high schools each year is either declining or static due to demographic reasons. Canada's fertility rate was 1.4 per woman in 2020.

The main growth in recent years in student enrolments has come from international students. There were over 800,000 international study permit holders in Canada in 2022, a 30% increase over the previous year. In some of the smaller Canadian higher education institutions, international students make up more than 60% of the institution's student population. Canada has set a target of roughly 500,000 new immigrants a year. Acceptance as an international student can ease the path to immigration.

International students have been a financial lifeline to Canadian colleges particularly. Government direct funding to post-secondary institutions varies from province to province but over the last 10 years it has been static or declining per student. This reduction in funding has been more than compensated for by the higher fees charged to international students. However, it is a fickle market and is easily interrupted by global politics. There are also signs that this market is reaching capacity in Canada.

There are severe labour shortages in many sectors of the Canadian economy due to the 'baby boomers' reaching retirement age, particularly in areas such as health and other sectors requiring a post-secondary education. The Federal government strategy is to meet this challenge through increased immigration. However, there are still barriers from professional associations and provincial governments to accepting foreign qualifications (or even qualifications from another province). This is leading to a demand for courses or programs that enable students to up-date or transfer their existing qualifications.

Lastly, the economy is changing. While manufacturing, agriculture and mining, three major Canadian industries, are still in high deman, the skills required are changing. In particular there is increasing growth from new employment sectors. For instance, more people are employed in the movie and video games sector in British Columbia than in mining, forestry and agriculture combined.

Consequently, many adults in Canada are looking either to update their existing qualifications or skills, or need to move into new areas of study because their jobs are changing. This is leading to a rapid growth in micro-credentials but also growing demand for professional masters' programs. These adults have families and may still be working, and need the flexibility that digital learning can provide.

The Needs of a Digital Economy

Although probably the least influential of the reasons driving institutions towards more digital learning, it is probably the most important in the long run for the Canadian economy. Recent reports (e.g. the Royal Bank of Canada's 'Human's Wanted', 2018) make it clear that automation, artificial intelligence, remote working, remote shopping, and other factors associated with the digital age require knowledge and skills that are different from the ones needed in an industrial age. Digital learning enables learners better to develop such knowledge and skills. It helps increase general digital literacy, but it is also more appropriate for teaching the high level soft or intellectual skills that people will need not only to work but to live in a digital age (see Bates, 2022).

Digital learning can be used to enable students to find, evaluate, and apply knowledge: to become knowledge 'managers.' This though requires not only the use of digital technologies, but also the re-design of teaching to encourage such learning. Fortunately, we shall see that the resources are now there to enable this to happen.

<div align="center">

Open Educational Resources

</div>

Open educational resources (OER) are a critical aspect of digital learning. OER are teaching, learning, and research resources that, through permissions granted by their creator, allow others to use, distribute, keep, or make changes to them.

British Columbia became the first jurisdiction in North America to implement open textbooks in 2012. By 2022, the collection has grown to include close to 400 open textbooks, open educational resource publishing guides, and other open resources. The books, adapted or created by BC faculty, cover all 'core' subjects at university and college level. All these books are available for free downloading under a Creative Commons license, and are offered in various e-book formats free of charge, or as print on demand books available at the cost of printing. In 2022, the project passed a milestone of $30 million in student savings on textbook costs over the ten years (Lalonde, 2022). The movement has now spread to most provinces and territories across Canada.

More importantly, increasing amounts of academic knowledge, including research and data, are now open access, available at a click of button. All knowledge will soon be open, easily available, and free. There is now less and less need for instructors to deliver information; it is increasingly freely available. However, it would be wrong to give the impression that this is now happening on a wide scale in Canada. In 2019, only 54% of institutions reported using open textbooks, and 67% reported that they use other OER. Few institutions (9%) reported having a formal policy or strategy for OER and/or open pedagogy (Johnson, 2019). Several Canadian institutions (Athabasca, TRU-OL, Kwantlen Polytechnic, Portage College, BCcampus, eCampus Alberta and Contact North) are members of OERuniversitas (OERu), which offers free online courses so that learners can gain formal credentials from the partner institutions. OERu is a consortium of 36 organizations across five continents, and is dedicated to widening access and reducing the cost of post-secondary education by providing open pathways to formal, quality credentials.

Main Challenges and Future Opportunities

In general, digital learning is increasingly accepted and continues to expand in most Canadian post-secondary institutions, but nevertheless there are a number of challenges that need to be addressed.

Institutional Strategies for Digital Learning

There are three major challenges with the increasing move to digital learning. The first is pedagogical: the pandemic clearly indicated that just moving lectures online is unsatisfactory and leads to student disenchantment and poorer learning. Prior to the pandemic, online courses were mainly asynchronous, built around the use of a learning management system, and incorporated best practices developed over almost 20 years of online learning. These lessons need to be incorporated and developed by instructors moving into digital learning. The second challenge is infrastructure, in particular on-campus wireless and technology capacity, and appropriate learning spaces when students are studying both in-person and online. The third challenge is to make sure that all students have full access to digital learning, in terms of equipment and Internet access.

As more and more on-campus faculty start to use online components in their classroom teaching, so the demand grows for more technical support, such as instructional and web designers. When online learning was about 10 per cent of all enrolments, and growing at a rate around 10 per cent per annum, this was manageable. However, Covid-19 indicated clearly what is needed when everyone goes online. An increase in blended/hybrid learning in particular will require a re-think of how best to prepare and support instructors for digital learning. It is not possible to scale up support on a one faculty member: one instructional designer basis.

Decisions on the type and extent of digital learning are probably best made at the departmental and program level, and will depend as much on the nature of the target group as on the demands of the subject area. However, we have already seen that there are implications for campus planning, car parking (more online, less commuting), and on-campus IT infrastructure as well as for academic support.

Thus, a certain amount of central planning and management of digital learning is required. How fast and to what extent should an institution move into digital learning? The CDLRA found in 2019 that 57 per cent of colleges and 41 per cent of universities reported that they had a strategic plan for e-learning, hybrid learning, and/or online learning that was being implemented to some extent, and a further 29 per cent were in the process of developing such a plan.

Increased Faculty Development

Rapid developments in learning technologies, the need for teaching methods that help students develop the knowledge and skills needed in a digital society, the increased diversity of the student body, and the increasing integration of online and face-to-face teaching require instructors to have a much higher level of teaching skills, and in particular an understanding of pedagogy and alternative course design models. Most faculty and instructors in Canada are totally

unprepared for such developments. Their training is primarily in research and as subject experts. To date, faculty and instructors have been dependent on substantial help from instructional designers in particular, but adding more support staff as the use of online learning grows takes funding away from academic departments and impacts therefore on instructor: student ratios. The current system of faculty development in Canada is primarily voluntary. More systematic pre-service as well as in-service programs for faculty development are essential, if the quality of digital learning is to be maintained as it expands into the mainstream. Lastly, Covid-19 demonstrated the critical importance of the Centres for Teaching, Learning and Technology that most Canadian tertiary institutions have established to support faculty/instructors in moving to digital learning (Naffi, 2020). These Centres have a mix of instructional designers, web designers, and video specialists who help instructors with the transition to digital learning.

New Larner-centred Pedagogical Models

Perhaps the most interesting development though in Canadian digital learning is in the design of courses that require students to develop the skills of knowledge management (Bates, 2022). Instead of an instructor choosing, organizing and delivering academic content, courses are designed so that students collaboratively use the Internet to find, analyse, evaluate and apply knowledge to solve real world problems. E-portfolios are used to demonstrate the knowledge they have acquired. Thus, instructors become facilitators and guides rather than deliverers of information. This approach better prepares students for the volatile, uncertain, complex, ambiguous and constantly changing world that they will face on graduating. Digital learning is already leading instructors in Canada to experiment with new teaching methods; this is likely to increase over time (for a collection of over 200 examples, see Contact North's Pockets of Innovation.).

Student Assessment

Digital learning is both a challenge and an opportunity for student assessment. Many instructors ran into major problems with online assessment during Covid-19. Many institutions resorted to intrusive proctoring technology to ensure students did not cheat during exams. Students rightly felt this invaded their privacy when studying at home, and many instructors believed that students were still cheating. The main cause of the problem was a failure to adapt in-person assessment to online learning. Not only does the teaching method need to change; so does the assessment method. How much do students need to memorise when they can just look it up? We need to encourage students to go online for information to find out something, not discourage them.

Online learning facilitates continuous assessment, as it can leave a record of student learning on the learning management system. Students can record their activities and compile an e-portfolio of their work. In other words, digital learning can allow for more authentic assessment, tied to the 21st century skills needed in a digital age. This is not a particularly Canadian challenge but it is one that needs to be met in the transition to digital learning.

Privacy and Security

It is not only in assessment that privacy and security are issues in digital learning. In Canada, student privacy is mainly protected through password-protected learning management systems, but increasingly instructors are going outside these institutionally supported tools to use mobile learning apps and other technologies that do not have the same level of protection. British Columbia was, until recently, almost unique in North American in preventing public organizations from storing personal data anywhere outside Canada. Nevertheless, even students in BC have expressed concerns that their learning management system collects too much personal data (Vescera, 2019). Indeed, during Covid-19, it was discovered that some educational software companies were selling school children's data to advertising companies (Human Rights Watch, 2022). As in other countries, Canada is struggling at a national level to control the use of digital data by the large Internet companies. However, education is also big business for private ed tech companies. Canada certainly needs a more modern set of national laws that provide better protection for student data, without it unduly restricting the development of new ways to teach with technology.

Artificial Intelligence and the big Tech Companies

Canada is considered a leader in the general development of artificial intelligence. Canada was the first country in the world to implement a national AI strategy. However, there is little evidence at the moment (see for instance Zawacki-Richter et al., 2019; Bates et al., 2020) of a major breakthrough in the application of 'modern' AI specifically to teaching and learning in higher education, either in Canada or elsewhere, with the exception of perhaps large language models such

as ChatGPT and learning analytics. However, it must be recognised that, although AI has not to date been largely adopted in teaching and learning in tertiary education, AI still has the potential to disrupt the system. In particular, the big tech companies are more likely in the future to focus on using AI to replace or by-pass existing HE institutions in order to commercialise tertiary learning and teaching. AI is a sleeping giant and educators ignore it at their peril. Nevertheless, there is still a long way to go before it becomes embedded in teaching and learning in Canadian tertiary education.

Conclusions

Digital learning has reached a level of acceptance in Canada to the point that it is now being mainstreamed into campus teaching as well as distance education. Digital learning developments are breaking down the previously sharp distinction between face-to-face teaching and distance education. Above all, digital learning offers students in Canada an increasingly wide variety of ways to access post-secondary education. Digital learning though is going beyond increased access and flexibility for learners. It is beginning to impact on teaching methods, with a shift away from formal presentation to a focus more on knowledge management and intellectual and motor skills development.

However, there is still a long way to go before the whole of Canadian tertiary teaching and learning is fully digitalized. Although valid data collection methods are not yet in place to measure fully the extent of the digitalization in teaching and learning, probably less than a third of instructors in 2022 have moved away from the traditional, classroom-based teaching methods based mainly on lectures and labs supported by student reading, to a more learner-focused and digitally-based learning environment. However, the trend is moving in this direction and has been accelerated by Covid-19 emergency teaching.

Most Canadian tertiary education institutions have an extensive infrastructure to support digital education. Increasingly student services too are being digitalized and made available online and on-demand, particularly as a result of Covid-19. Most Canadian tertiary students have good Internet access, computers and mobile phones. Nevertheless, there are pockets or gaps in access, particularly in rural or more remote areas of Canada, and for students from low-income families, where the cost of data or lack of equipment can be a problem.

Most university and college administrations are supportive of the move to digital learning. Instructor resistance to online learning in particular is still significant, but decreasing year by year. Again, emergency remote learning further reduced resistance to online learning. Students generally are welcoming digitalization as it gives them more flexibility. There is still some resistance among some professional accreditation bodies to fully distance qualifications, but even that is slowly changing as these professions themselves become increasingly digitalized.

Government support for digitalization varies from province to province, but most provincial governments have earmarked funds or established agencies to support the move to digital learning. The main focus of these supporting agencies is professional development, collaboration between institutions (for example in developing and sharing OER), and special initiatives, such as BCcampus' Open Textbook program and Contact North's remote learning centres.

However, universities in particular are still highly autonomous. There are few mandatory requirements from government. Although governments in Canada and senior administrators in tertiary education have nudged and encouraged the move to digital learning, most of the adoption has come through the initiatives of individual instructors or academic departments to meet what they perceive to be the needs of their students. Canada is moving in the right direction. Whether it is quick or effective enough still remains to be seen.

References

Bates, A. (2022). *Teaching in a Digital Age*: *Third Edition* Bccampus. https://pressbooks.bccampus.ca/teachinginadigitalagev3m/

Bates, T. (2019). Who dunnit? Identifying the main online providers in Canadian post-secondary education *Online Learning and Distance Education Resources,* 29 March https://www.tonybates.ca/2019/03/29/who-dunnit-identifying-the-major-online-providers-in-canadian-post-secondary-education/

Bates, T., Cobo, C., Mariño, O, & Wheeler, S. (2020). Can artificial intelligence transform higher education? *International Journal of Educational Technology in Higher Education* 42(17) Online. https://doi.org/10.1186/s41239-020-00218-x

CADE (Canadian Association of Distance Education). (1999). *Open Learning and Distance Education in Canada* Ottawa: Minister of Public Works and Government Services Canada.

Donovan, T. et al. (2018). Tracking Online and Distance Education in Canadian Universities and Colleges: 2018 Canadian National Survey of Online and Distance education: Halifax NS: CDLRA http://www.cdlra-acrfl.ca/wp-content/uploads/2020/07/2018_national_en.pdf

Human Rights Watch. (2022.) How Dare They Peep into My Private Life? New York: Human Rights Watch, May 25 https://www.hrw.org/report/2022/05/25/how-dare-they-peep-my-private-life/childrens-rights-violations-governments

Johnson, N. (2019). Tracking Online Education in Canadian Universities and Colleges: National Survey of Online and Digital Learning 2019 National Report Halifax NS: Canadian Digital Learning Research Association http://www.cdlra-acrfl.ca/wp-content/uploads/2020/07/2019_national_en.pdf

Johnson, N. (2021). 2021 National Report: Lessons from the COVID-19 pandemic Halifax NS: Canadian Digital Learning Research Association http://www.cdlra-acrfl.ca/wp-content/uploads/ 2022/ 05/2021 _national_report_en.pdf

Johnson, N., Seaman, J. and Poulin, R. (2022). Defining key terms related to Digital Learning WCET/Canadian Digital Learning Research Association/BayView Analytics https://wcet.wiche.edu/wp-content/uploads/sites /11/2022/08/Defining-Key-Terms-Summary-Report-Final.pdf

Lalonde, C. (2022). Celebrating 10Years of Open Textbooks in BC Victoria: BCcampus https://bccampus.ca/2022/03/07/celebrating-10-years-of-open-textbooks-in-b-c/

Naffi, N. (2020). *Disruption in and by Centres for Teaching and Learning During the COVID-19 Pandemic: Leading the Future of Higher Ed* Québec City: L'Observatoire Internationale sur les Impacts Sociétaux de l'IA et du Numerique and the Government of Québec, 24 August https://observatoire-ia.ulaval.ca/en/whitepaper-leading-the-future-of-higher-ed/

OECD. (2022.) Education at a Glance Paris: OECD https://www.oecd-ilibrary.org/education/education-at-a-glance-2022_3197152b-en

Royal Bank of Canada. (2018) .Humans Wanted: How Canadian youth can thrive in the age of disruption Toronto: Royal Bank of Canada https://www.rbc.com/dms/enterprise/futurelaunch/_assets-custom/pdf/RBC-Future-Skills-Report-FINAL-Singles.pdf

Schuetze, H.G. (2019). Access and participation in Higher Education in Canada. In: W. Archer & H.G. Schuetze (eds 2019), *Preparing Students for Life and Work - Policies and Reforms Affecting Higher Education's Principal Mission*. Brill-Sense. https://doi.org/10.1163/9789004393073_002

Seaman, J., Allen, I.E., & Seaman, J. (2018). Grade increase: tracking distance education in the United States. Babson Survey Research Group https://www.bayviewanalytics.com/reports/gradeincrease.pdf

Seaman, J., & Seaman, J. (2023). The Digital Transformation of the Community College Bay View Analytics https://www.bayviewanalytics.com/reports/pulse/digital-transformation-community-college.pdf

Usher, A., (2022). *The State of Postsecondary Education in Canada*, 2022. Toronto: Higher Education Strategy Associates https://higheredstrategy.com/publications/state-of-postsecondary-education-in-canada-2022/

Vescera, Z. (2019). Canvas is Tracking Your Data: What is UBC Doing With It? *The Ubyssey*, March 27 https://www.ubyssey.ca/features/double-edged-sword/

Zawacki-Richter, O., Marín, V.I., & Bond, M. *et al.* (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education* 16, (39.) https://doi.org/10.1186/s41239-019-0171-0

Tony Bates, Ph.D., is a Senior Advisor at the Chang School of Continuing Education, Toronto Metropolitan University, Toronto, a Research Associate at Contact North, Ontario and is a consultant assisting with the implementation of the British Columbia Institute of Technology's e-Learning Strategy. He directs a private consultancy company specializing in online and digital learning. Email: tony.bates@ubc.ca