"I hate to be cynical about technology, but I've seen too much of it not driven by pedagogy": A 60-year history of McMaster University's educational technologies

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ABSTRACT

This chapter recovers and reflects on nearly 65 years of instructional uses of technology at McMaster University, from the launch of McMaster's remote television learning experiment in the 1960s, to the rapid mass-migration to virtual environments during the COVID-19 pandemic. We draw on archival material, literature on educational technologies (edtech) published by McMaster educators, oral history interviews, and some of our own experiences with edtech to review four eras of evolution: initial experimentation (1958–1969), early adoption (1970–1989), centralized infrastructure (1990–2009), and ubiquity of online learning technologies (2010–2020). Rather than offering a comprehensive listing of changing tech, we focus on themes that have repeated over time in the human and social context surrounding educational technology development and use. We end by discussing how we might carry lessons from the pandemic into the university's strategy for digital learning.

KEYWORDS

accessibility, educational technologies, history, online learning, post-secondary education

Educational technology (edtech) researchers have primarily typified their field as one that is rapidly evolving, dynamic, and cutting-edge. However, such a futurist focus on the seemingly unrelenting nature of innovation has also, in the words of Martin Weller (2020), produced a field that is "remarkably poor at recording its own history and reflecting on its development"; it's as though there is no opportunity for pause "in a field that is always

interested in the future" (Introduction section, para 2). Edtech researchers may only acknowledge history when seeking to contextualize contemporary interventions with the systems and resources they are designed to replace or focus on histories of specific technology rather than the human agents and stories involved (Watters, 2021). There are thus many opportunities for historians to examine the social contexts encouraging or inhibiting new educational technologies and how they mitigate or perpetuate problems in education (Terzian, 2019).

In this chapter, we recover and reflect on what we can learn from the most recent 65 years of instructional uses of technology at McMaster University (Mac), from the launch of McMaster's remote television learning experiment in the 1960s to the rapid mass-migration to virtual environments during the COVID-19 pandemic. In this writing, we focus not on a comprehensive listing of changing tech but themes that have repeated over time in the human and social context surrounding educational technology development and use. As we illustrate throughout this piece, our history of edtech at McMaster University has been fraught with conflict, challenge, triumph, and reward and offers much for us to learn from as we contemplate the current and future role of edtech in cultivating our learning and communal ecosystems. Specifically, in the words of one of our interview participants, this history can help us "not to make the same mistakes twice" (Student 1) and realize when "many claims made for a newly emerging technology are likely to be neither true nor new" (Bates, 2019, A Paradigm Shift section, para. 1). Following a review of our scholarly approach, the chapter digs into four rough periods of evolution between 1958–2020. We close by weaving together observations and reflections of pandemic learning experiences with the longer-form lessons that we might derive from this history.

METHODOLOGY

We sought to answer the following questions: (a) What significant milestones mark the development and use of educational technologies at McMaster University?; (b) What factors, dynamics, and conditions have informed this development?; and (c) What might we learn from McMaster's history of educational technologies?

To approach these questions, we began by reviewing textual records, including materials that de Bie, Ing et al. (2022, this volume) identified as relating to technology when they processed the archives of McMaster University's teaching and learning centre and that de Bie, Dhanoa, and Ing (2022, this volume) identified during review of McMaster newspapers. We additionally searched for mentions of educational technology in the finding aids for materials collected about McMaster by the McMaster University Library William Ready Division of Archives and Research Collections, and we conducted a Scopus database search for a sample of articles published by McMaster staff and faculty between 1965–2022 pertaining to teaching and technology.

After review and clearance by the McMaster Research Ethics Board (protocol 5263), we also conducted oral history interviews. A shortlist of potential participants was developed based on our personal knowledge of staff and student contributions to McMaster edtech from

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a range of positions, time periods, and perspectives. Thirty-two individuals were invited, and 10 consented and participated in online interviews (see Appendix A for sample interview questions) ranging from 30 minutes to 2 hours on Zoom. This included three McMaster students (Student Participants 1 and 2 and Renee Gibbons) and seven current and former staff and faculty members: Dale Roy, former consultant and later director of McMaster's teaching and learning centre, John Bell, current director of Information Technology (Humanities), Tim Nolan, inaugural coordinator for the disabled and later director of Student Accessibility Services, Laila Bastedo, who has been involved in managing McMaster's learning management systems, faculty member Karen Balcom, and Staff Participants 1 and 2. These participants have been involved in edtech at McMaster for between 4 and 30 years, the earliest starting in 1979. Transcripts were auto-generated on the Zoom platform and edited for accuracy. When quoting participants throughout the chapter, we refer to them by name or with an anonymous identifier following their preferences.

Notably, two authors of this chapter, Joanne Kehoe and Jon Kruithof, have been significantly involved in educational technology support at McMaster, and their knowledge informs the most recent decades of edtech developments we discuss. Joanne has worked for over 24 years at McMaster in various roles in Continuing Education, the Faculty of Health Sciences, and the university teaching and learning centre.[1] Her edtech involvement was cultivated through instructional design, multimedia production, technology integration, and facilitation in support of online courses, training programs, and digital pedagogies. Jon has worked in edtech-related roles since 2000 and at McMaster for 10 years, starting by running a learning technologies help desk to his present role as a lead learning technologist, both at the university's teaching and learning centre. His work has spanned several technologies, but his primary focus has been supporting and managing McMaster's learning management system (LMS).

Following oral history methods (Mulvihill & Swaminathan, 2022; Yow, 2015), we drew on these combined sources of information to weave together the following account.[2] Working as an interdisciplinary team, rather than "standardize" our different writing styles, we have chosen to preserve them. While this was a pragmatic decision, it also offers a bit of an illustration of one anchoring theme throughout the chapter: the strengths and limitations of multiplicity. As a final methodological note, we recognize that the account we share is, by necessity, an illustrative survey that does not capture all of the nuances of McMaster's edtech history. Most significantly, student perspectives of many of the developments we describe were not available to us in most of the archival records we reviewed, and we did not have the chance to interview alumni from different eras, only several current students. We have sought to enhance the quality of our analysis through the integration of multiple sources and the provision of a supplementary timeline of published literature on McMaster's edtech (Appendix B) and hope this chapter serves as a beginning point for a deeper communal reflection on how technology shapes educational relationships at our institution.

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FINDINGS

In this work we align with the definition that "edtech is any mechanism or technology process that helps people learn better" (Dale Roy, study participant). While tools and technologies have certainly been used in teaching at McMaster prior to 1958—such as the printing press, chalkboard, radio (see The Silhouette, 1937), and so on, we start our history in 1958 in the early days of televisions and computers, as these developments comprise the earliest, extended explorations of educational uses of modern technology we identified during our search.

A number of themes repeat across McMaster's edtech history that have much to teach us today. These include the importance of (a) clarifying the purpose of technology and ensuring its use is paired with sound and relational theories and methods of teaching and learning (pedagogy) to achieve quality learning experiences; (b) developing strategy and evidence-informed practices to guide the university's use of technology in a proactive rather than reactive way; (c) recognizing the limitations of pursuing novel and cutting-edge tech for reputational, efficiency-focused, or revenue-generating purposes rather than pedagogical ones; (d) attending to financial, technological, and human support requirements for effective adoption of edtech; (e) active consultation and communication to ease doubts about edtech and disruption when technology inevitably breaks; (f) balancing centralized edtech support infrastructure while maintaining individual autonomy to innovate; and (g) pursuing opportunities to advance accessible education through technology.

We elaborate these themes through our categorization of four eras of educational technology evolution at McMaster: initial experimentation (1958–1969), early adoption (1970–1989), centralized infrastructure (1990–2009), and ubiquity of online learning technologies (2010–2020).

Initial experimentation (1958–1969): Adapting technology for education and research

It was in a 1960 statement to the press that university president, G. P. Gilmour, officially heralded McMaster's entry into a new era of teaching with the introduction of a television "extension" course, the term of the time for adult and continuing education (see Carter, 2022):

By adapting television for educational purposes, we hope to . . . open new avenues of adult education for those who desire to further their general knowledge. The new credit course [in biology] will bring the classroom right into the living room for thousands of viewers and will stimulate an intellectual appetite in those who seek education, as well as entertainment, from television. (McMaster University, 1960a, p. 4 of addenda)

This turn to TV teaching was only one facet of a much larger administrative push to place McMaster at the forefront of technological progress in the academy during the 1960s and 70s. The drive began in 1958, when Mac became the second university in Ontario to secure a digital computer, a G15D manufactured by the Bendix automotive company's newly founded computing division (McMaster Computing Facilities, 1962). Though that machine had been

purchased with the express purpose of supporting scientific and engineering research, it was not long before enterprising university staff and instructors also began to envision its potential as an aid to student instruction and learning.

The bold claims of press statements crafted for public consumption, however, belie a more turbulent early history of technological adaptation at the university. The Bendix was obsolete almost as soon as it was unboxed, and the university witnessed its computational prowess quickly eclipsed by that of later or wealthier adopters, like the University of Toronto (UofT). By 1962, a Computation Committee report to new president Harry Thode assessed the condition of McMaster's computer facilities as "the least adequate of any of the universities with active scientific research programs" in Ontario (McMaster Computing Facilities, 1962, p. 1). The Bendix proved unable to keep up with the volume of data processing requests, creating a backlog in the demands for bookings on computer usage, with far-reaching consequences: "If a graduate student has to reserve the machine from 3:00 A.M. to 9:00 A.M. (as now often happens)," the Computation Committee explained, "he is not at his most efficient for classes and other duties the following day" (McMaster Computing Facilities, 1962, p. 4). Instead, much to the administration's chagrin, students and faculty began turning towards the more efficient IBM 7090 computer housed at the University of Toronto, queuing processing requests and sometimes travelling to Toronto to compile research data. UofT agreed to this practice with the stipulation that McMaster begin "pulling [its] own weight by acquiring a computer of 'intermediate' size" (p. 4). The Computation Committee's search for a new machine ended in 1963 with the selection of IBM's brand new 7040 computer, the younger brother to the UofT's 7090, though major discussion and decisions about McMaster's strategy for computer investment continued.

Meanwhile, the television course "experiment" was facing its own adoption woes. Having been explored by a Television Sub-Committee of the Senate during November and December of 1959, the proposal had passed quickly through the Senate in January 1960. A first-year biology course, to be taught on television by H. Kleerekoper, was in development by May with aims to have it ready for the fall or winter semester (McMaster University, 1960a). But the cavalier pacing of university approval left many staff and instructors feeling left out. A discussion of "faculty relations" during the May 31, 1960 meeting of the Television Sub-Committee of the Senate noted that "some resentment or misgiving had already been expressed by faculty members that they had not been taken into the confidence of the administration" in deciding on the adoption of television learning (Patrick, 1960, p. 2). To make amends, informal conversations among faculty and staff with President Gilmour led to invitations for faculties and departments to craft their own reviews of the potential for televised learning systems.

It was under this atmosphere of ongoing faculty and administrative tension that the biology course forged ahead in January 1961. At a cost of $75.00 for credited enrollment and accepting up to 200 students, the 60 lectures—recorded at network studios and McMaster's own science labs—began broadcasting on CHCH television every Monday, Wednesday, and Friday morning from 7:30–8:30am (McMaster University, 1960b; The Silhouette, 1960). For

assessments, students were expected to attend "Saturday morning seminars at the university every three weeks" and write an examination in June (McMaster University, 1960b). The enthusiasm from students and the administration for Kleerekoper's pilot course led to its renewal for the winter of 1962 and the addition of a new Introduction to Music television course, taught by Frank Thorolfson (Patrick, 1962). However, those intervening months of testing in biology had also provided faculties and departments the opportunity to craft their formal responses to the experiment.

Figure 1. McMaster's TV teaching experiment

Photo 1 (Left): 1960 filming of Prof. Kleerekoper teaching basic cell biology. McMaster University Photograph Collection (Box 5, File 21-3). Photo 2 (Right): Arts 104 TV lecture by philosophy Prof. John Mayer de Berncastle; undated ca. 1966. McMaster University Photograph Collection (Box 5, File 21-9). Photographer: Tom Bochsler. Access and permission to use from The William Ready Division of Archives and Research Collections, McMaster University Library.

The reception was mixed. The history department was particularly scathing in their appraisal. In his report to the faculty dean, department chair Goldwin French concluded that "there would appear to be no significant advantage to be derived by the University or by the extension student from the general introduction of television courses" (French, 1961, p. 1). It was a matter of equity: the learning experience of television courses must be able to "produce extension graduates of a calibre equivalent to that of full-time graduates" (p. 2), which French and his colleagues did not believe was possible. The historians were especially skeptical of the recorded lectures' ability to develop "students' critical faculties" (p. 3), even with mandated visits to campus for intermittent tutorials or labs. They worried that without immersion in the university's community and "social and intellectual facilities" (p. 3), the learning experience would not produce anything more than superficial knowledge. Ultimately, French plainly inferred that the administration was diverting valuable funds and resources toward the pursuit of a public relations goal that prized technological novelty over learner experience. In this

correspondence we see an early example of how perceptions of technology's utility in learning, empirically proven or not, functioned as an early barrier to adoption.

Faculty reports arrived by the winter of 1963. In more measured words, the Faculty of Arts and Science (1963) agreed with French's assessment that the advantages of televised learning remained largely unproven after two trial semesters. Out of a concern that remote learning might begin to supplant an on-campus educational experience, they further urged the university to consider caps on the "number of T.V. classes which may be counted by any one student in fulfilling the requirements for a McMaster degree" (p. 2). While the lackluster responses from faculty were not enough to kill Mac's TV teaching experiment, they were sufficient to confine it to an "experimental" status. Though not quite proven to be a revolution in teaching and learning, the administration, along with the more enthusiastic faculty and staff, still eagerly attended inter-university conferences to discuss the platform's educational adoption after 1970. Moreover, in answering calls for educational decision-making based on evidence of learning and working to disseminate knowledge from its experimentation with technology in teaching, McMaster began to engage with what would later become the scholarship of teaching and learning.

Figure 2. Student commentary on TV teaching

Student cartoon entitled "TV viewing can be dangerous". Published in 1975 in *The Radish*, McMaster's short-lived alternative newspaper (Unknown Artist, 1975). Accessed at The William Ready Division of Archives and Research Collections, McMaster University Library.

Television was not the only area where recording technologies were subject to liminal experimentation. Beginning from the mid-1960s onwards, audiocassettes and slide decks were integrated into undergraduate courses. For instance, in addition to its TV correspondence course, the chemistry department's Learning Resource Centre (LRC) developed a

groundbreaking systematized audio-visual (A/V) individualized tutorial model in 1967–68 (Humphreys, 1971). This program, pioneered by David Humphreys, allowed students to "borrow a small portable kit consisting of a play-back cassette machine, battery slide viewer, and work sheet" for an overnight loan (p. 277). While the loans were designed to be take-home projects, students could also use the material in the LRC workspace. The chemistry department's experiment was rapidly integrated, managing to avoid many of the adoption pitfalls and faculty backlash likely because it was developed at a more grassroots, faculty, and departmental level. The undertaking proved so successful that the LRC was expanded between 1969 and 1973 to accommodate even more experimentation with individualized and group A/V learning experiences. Other departments soon followed their example.[3]

With the sun setting on McMaster's first decade of work translating modern technology for educational use, we already begin to see some recurrent themes. Most notable is that the desire for institutional recognition by being at the forefront of technological development is tough to hold on to given the unrelenting forward momentum of innovation and high price tags. As Dale Roy mused during our interview for this study, "You can spend an awful lot of money, and not have any impact on learning." Success and failure in these newly mechanized arenas also seemed dependent on an inclusion of stakeholders and the management of their concerns. While these developments offered a start for modern technological adoption in teaching at McMaster, there was still a need to clarify a purpose for this machinery beyond its novelty before arriving at the true beginning for our modern age of educational technology.

Early adoption (1970–1989): Clarifying a purposeful role for technology in education
In 1969, Gerald Keech, director of the Computing Centre,[4] wrote to the McMaster President's Council: "The need for a well-defined pattern for the development of computer services on campus is long overdue" (Keech, 1969, p. 1). He argued persuasively that the university could not simply react to every new technological trend. They had to craft a more meaningful plan. For Keech, the next decade must be about designing, upgrading, and testing technology against defined purposes to scientifically assess its utility in serving a diverse range of organizational applications (Keech, 1969). It was the start of a shift in mindset: rather than subjecting the faculty and staff to technological change, it would now be the technology that was sublimated to meet McMaster's needs. This bears striking resemblance to advice offered to us in our interview with the current director of Information Technology (Humanities), John Bell:

> Now, personally, unless we can accelerate the adoption curve and unless we can try to get closer to the edge, not the cutting edge, mind you, just the edge, we're always going to be playing catch up. We're always going to be reactive instead of proactive.

The 1970s and 80s did also mark the beginning of a breakage of technology from the silos of educational "experiments" into the administrative and teaching and learning realms proper. We describe below four thematic areas of institutional interest.

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Alleviating workloads through mechanized administration and grading (1970–1979)

By the mid-1960s, a generation of baby boomers graduating high school had led to a booming university student population, leaving traditional paper registration and record keeping struggling to keep pace and administrative staff finding "it extremely difficult to handle the work load" (James, 1964, p. 1). It was recommended that McMaster allot some of the processing time on the new IBM 7040 for administrative purposes (James, 1964). Further efforts to mechanize administration resulted in several noteworthy developments. In 1971, McMaster purchased the Higher Education Long-Range Planning/Planning Translator software (called HELP/PLANTRAN) from the Midwest Research Institute in Kansas City. HELP/PLANTRAN was a modelling software that could assist administrators and faculty with organization and course planning, called computer-managed instruction (CMI),[5] without the need for any specialized computer knowledge (Hedden & Higbee, 1971). Some faculty were even inspired to offer these administrative modelling tools for student use, including weekly predictions of their overall grade (President's Committee for Instructional Development, 1976). Other instructors used the CMI tools for exam creation, compiling and drawing templates from a randomized list of "unique questions [that] can be prepared at a moment's notice" (p. 8). The introduction of optical mark readers in 1978, the early version of scantrons, further eased the burden of administering learning by automating the grading process as well, enabling up-to-date, detailed records of student performance (New Educational Technology Sub-Committee, 1980). It seemed by 1979 that computer services at the university were increasingly catering to administrative desires.

Edtech is born: Tensions between old pedagogies and new technologies and ensuring tech serves an educational purpose (1979–1988)

The early years of television course experimentation and computer-assisted learning programs had fallen short exactly because they had attempted solely to reproduce traditional classroom interactions rather than enrich them through these new mediums. "I hate to be cynical about technology," Dale Roy told us, "but I've seen too much of it not driven by pedagogy," the theories and methods of teaching and learning. His voice comes in clearly: "If you understand how people learn, then you use that technology in useful ways, or you don't use it, because it's not serving any learning purpose." While use of technology was novel for course management, when Dale joined McMaster's teaching and learning centre in 1979, the university was still working to make this connection between pedagogical theory and technological utility.

The widespread turn towards considering how technology might enrich learning began percolating in earnest in the spring of 1970, when the universities of Ontario collectively commissioned an inventory and study of educational technologies (Trotter, 1970). Echoing Dale, the report concluded that the application of technology at the university must, at its core, be guided by good pedagogy. "The benefits of technology are enormous" the commissioned researcher Bernard Trotter wrote, but "every technical process reaches into and changes our environment and changes us in ways which cannot be predicted and which are not always for

the better" (Trotter, 1970, p. 1). Trotter (1970) observed that higher education was at a critical juncture to reject or adopt emerging technologies and to manage the struggle among old and new ways of defining "good pedagogy." Those adherents of the "old ways" were suspicious of new opportunities to instruct beyond the traditional lecture experience, though showed little concern for growing student dissatisfaction with these methods.[6] Those of the "new way" viewed traditional methods as obsolete and saw the teacher and technology as resources accessible in the evolved learning experience, one that met student interests and real-world needs (Trotter, 1970, pp. 2–4).

Back at McMaster, Trotter's provincial review had prompted a more concerted move towards an instructional development approach to technology use. This began with an effort to inventory what educational technologies were being used in classrooms. A resultant 1976 survey turned confidential report to President Arthur Bournes revealed ongoing disinterest among faculty in engaging with learning technologies and suggested the most innovative work continued to be developed among the Faculties of Health Sciences, Science, and Engineering, where both graduate learning and the job market demanded technical proficiency (President's Committee for Instructional Development, 1976).[7]

Guiding this initiative was the freshly established New Education Technology Sub-committee (NETS) of the interdisciplinary McMaster President's Committee on Teaching and Learning, an advisory and working group to discuss and address educational issues across campus. The NETS surveyed faculty and crafted recommendations that would anticipate future technological needs of both instructors and students. To little shock, the subcommittee's 1980 report found that "instructional development [around technology] at McMaster has tended to be more 'random' than 'planned'" largely because of instructor skepticism regarding these teaching "gadgets" (New Educational Technology Sub-Committee, 1980, pp. 2, 4). The NETS committee defended new devices by referring to good pedagogical theory and practice: "The technology by itself does not make for good or poor teaching or learning," a statement they believed to be "as true for the computer or television as it is for the chalk board" (p. 4). Instead, it was the role of the teacher "to combine, in a provocative and stimulating way, the knowledge he wishes to impart, the course materials he has prepared ('software'), and the equipment ('hardware') he requires to present that material" effectively (pp. 4–5). Thus, technology was not a novelty, a "needless complication," or a "toy" but an instructional tool (p. 4).

Interestingly, the work of the NETS committee ran concurrently with another initiative focused on "technical impediments to teaching." In 1979, sociology professor Frank E. Jones wrote a letter to the President's Committee on Teaching and Learning expressing concern about classroom facilities, noting poor sound quality, access to projection equipment, and provision of acetate sheets. Although Jones reiterated that "the quality of the lectures depends on an Instructor's knowledge and skills," he maintained that the university still had an obligation to ensure optimal conditions for instruction (Jones, 1979). The resulting Teaching Classroom Facilities Committee (1980, 1981) surveyed the state of more commonly accepted classroom tools at McMaster, gathering lengthy departmental reports of scratched blackboards, chalk-less classes, projectors with broken bulbs, shoddy audio systems, as well as

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dirty and vandalized rooms (Teaching Classroom Facilities Committee, 1980). The largest volume of complaints, by far, related to procurement of acetate sheets, leading committee members to jokingly refer to the survey as "The Acetate Rolls Saga" in internal memoranda (Teaching Classroom Facilities Committee, 1981, p. 3). The Committee's *Technical Impediments to Teaching* report corroborated audio-video problems in classrooms, while focusing equally, if not more so, on the cosmetic needs of classrooms that appeared "a little dowdy because of the oddments of furniture that they contain and also some could do with a fresh coat of paint" (Emberley, 1980, p. 1).

The dual productions of the NETS and *Impediments to Teaching* reports represented something of a juncture for McMaster as it entered the 1980s. Once more, conditions seemed poised to pit older pedagogical approaches against new technologies in a battle for budgetary priority. Yet McMaster's resolution found more nuance, with new funding driven into microcomputers, A/V services, and computing support centres, which included a $22,000 investment from the President's Committee on Teaching and Learning for improvements to classrooms (Teaching Classroom Facilities Committee, 1981). As funding increased, Dale Roy also began to see the familiar problem of fanfare for untested gadgetry and technological monetization schemes disconnected from pedagogy. The NETS committee's recommendation for instructional development in technology, for instance, also came with advice to immediately explore patents for McMaster-created computing programmes (New Educational Technology Sub-Committee, 1980). Now more than ever, with greater resources and interest, a goal of creating satisfying learning experiences had to vie with the competing demands of capital and novelty.

Spreading use of microcomputers in teaching and learning (1979–1986)
Interest in developing computer-assisted learning grew rapidly at Mac by the early 80s. To investigate what the introduction of microcomputers ("micros") might mean for McMaster, the President's Committee on Teaching and Learning created a new ad hoc Study Group on the Use of Microcomputers for Instructional Computing. By 1984, the study group had concluded there was now a generation of graduating high school students who felt as though access to computing had become a kind of "educational birthright" (Study Group on the Use of Microcomputers for Instructional Computing, 1984, p. 3); employers were demanding computer expertise, not just literacy; and faculty themselves appeared to be "less intimidated by microcomputers" as a growing number now owned one in their home and were more eager to use them in the workplace (p. 34). A new computer science course was offered in the 1984/85 academic year to meet growing demands for expertise, quickly becoming a mainstay of academic programming. Even the Faculty of Humanities was reported to have founded a rudimentary computing centre out of the offices of the Department of Slavic Studies in order to pilot potential courseware—though no courses in the faculty were making use of instructional computing (Study Group, 1984). The teaching and learning centre's procurement of ten Apple II computers, along with some Texas Instruments 99/4s (Instructional Development Centre,

1979), also allowed the centre to start to "bring in sample software, especially educational software," Dale explained.

By 1984, a joint initiative overseen by Kim Nossal, chair of the renamed University (rather than President's) Committee on Teaching and Learning (UCTL) and Alan Blizzard, director of the teaching and learning centre, was established to loan microcomputers to interested faculty. The aim of this experiment was to "give faculty members access to a microcomputer for from one term to a year to either investigate the utility of microcomputers in courses not presently using them, or to develop or refine educational software for use in courses" (University Committee on Teaching and Learning, 1986, p. 1).[8] The UCTL and teaching and learning centre canvassed teaching faculty to drum up interest in integrating computer-supported learning into courses. The pitch was low stakes: "Are You Interested in Teaching with Computers?" the flyer asked rhetorically, and it gave instructors a pathway forward: "We Can Help" (Instructional Development Centre, 1986, p. 1). Although not all the microcomputer projects saw implementation, with some experiments ultimately failing and busy faculty abandoning others, enthusiasm and growing faculty interest were sufficient to deem the experiment a success (King, 1985). Ultimately, this program represented a shift in the university's culture, a recognition that educational computing could no longer be avoided. Fifteen years later, McMaster's teaching and learning centre would repeat this loan program with laptop computers (Down, 2000).

Using technology to enhance accessibility of learning (1980–1990)

Developing uses of technology—such as calls to improve classroom lighting and microphones or the quality and storage practices of audio and video materials so that students could access them for individual study and content review (New Educational Technology Sub-Committee, 1980; Teaching Classroom Facilities Committee, 1981)—were not necessarily proposed or adopted with accessibility or disabled students in mind in the ways we might think of this today. But there was growing recognition that technology could be used to enhance student learning experiences.[9]

Accessibility enhancements continued in the form of course content conversion. Throughout the 1980s, Anne Pottier, the present-day chair of the McMaster Accessibility Council responsible for accessibility policy development and implementation in the university, began work through Mills Library on creating audio-cassette copies of textbooks for blind and visually impaired students (see Anne Pottier's section in de Bie, Woolf, et al., 2022, this volume). The library also obtained assistive technologies to magnify material to a more readable size (The Courier, 1982). However, encouraging wider adoption for accessibility purposes reflected the usual problems—namely small and decentralized development scattered across campus, faculty resistance, unclear policies for storage and use, and a lack of capital.

Tim Nolan, who we interviewed for this chapter, explained to us that when he arrived at McMaster in 1988 as the inaugural coordinator for the disabled (a role that would later turn to director of what would become McMaster's Student Accessibility Services office), "there was no

such support service or formalized accommodation process for students with disabilities, there was no department, there was nothing" aside from the registrar's arrangement of accommodations for final exams and convocation. From 1988 to 1990, Tim worked to improve McMaster's program for creating and acquiring accessible textbooks through interlibrary lending arrangements with the W. Ross MacDonald School for the Blind in Brantford to acquire copies of textbooks on cassette tape and in Braille.

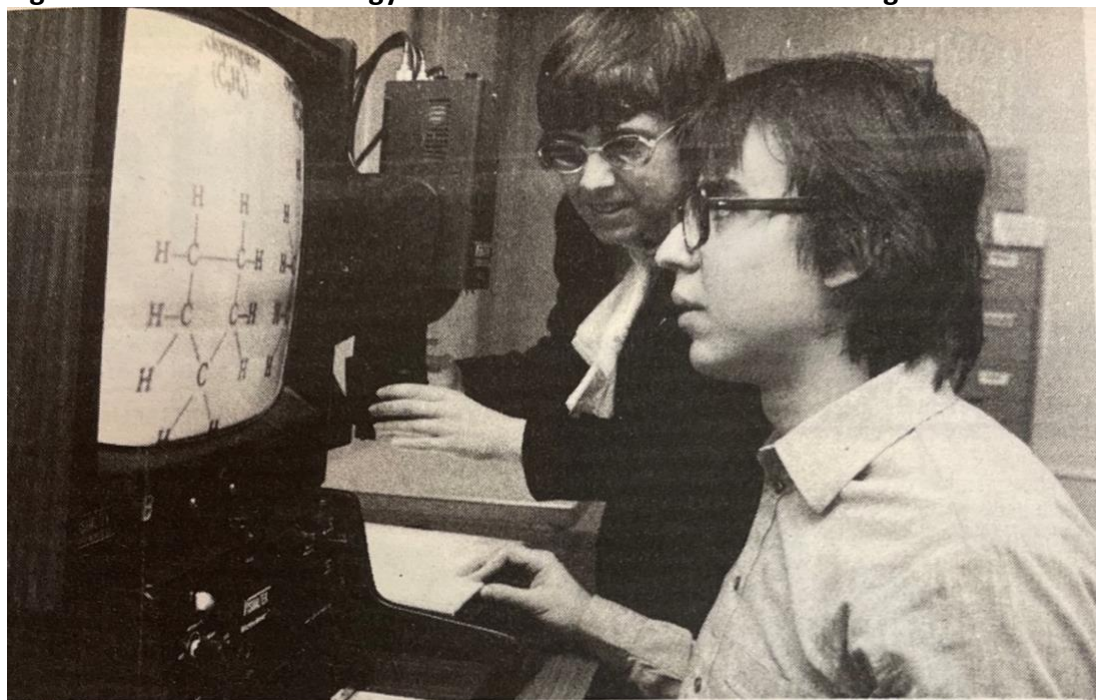**Figure 3. Assistive technology to enhance disabled student learning**

Photograph of Chris Teodoridis, a partially-sighted student, trying out the Visual-tek machine in Mills Library to enlarge print to a more readable size. Dr. Maryann Lisk, also visually-impaired, helps Chris to learn how to use the machine. Source: The McMaster Courier (1982). Permission to use from McMaster Communications, Marketing and Public Affairs. Accessed at The William Ready Division of Archives and Research Collections, McMaster University Library.

For Tim, educational technology means "simply access to information" and "giving somebody with a disability the same opportunity to access the same information in virtually the same way as anybody else would enjoy." In practice this philosophy meant hounding faculty members and publishers to create additional recorded textbooks, coursepacks, and lecture content and confronting barriers posed by copyright restrictions:

I took the position I'm not paying any copyright fees for doing the conversion of print to electronic format. . . . What publisher in their right mind is going to sue McMaster

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University for making print material available electronically to a student with a disability,
. . . who wants to take on that public relations nightmare?" (Tim Nolan)

It was this ingenuity and resilience in advocating for the needs of students with disabilities that
allowed McMaster to continue to centralize, create, and deliver accessible course materials in a
timely manner. Tim noted, "things have progressed [a lot] since then".

By the 1990s and 2000s, textbook and coursepack production processes were
harmonized with computational innovations, especially scanning practices with the advent of
new optical character recognition (OCR) and PDF reader softwares. "McMaster was the first
university in the province to actually convert a textbook to a Word document and provide that
to a student" who was deaf-blind, Tim told us. This formatting proved so popular that demand
for OCR documents increased rapidly. In no time, "we had quite a production line, like we'd
have 40 or 50 student volunteers coming into the office working off three computers every day
all day long" to scan course material. It was a moment of quiet triumph for Tim and his office,
though not without continued obstacles, and a testament to the need for community
investment and collaboration in new technological adoption.

**1990–2009: From scattered and unsupported experiments to the Internet and
centralized infrastructure**

Globally, the networking of computers (Internet) was first used in 1982, and the more
user-friendly application, the World Wide Web (WWW), launched in 1991 (Bates, 2009). At
McMaster, students, staff, and faculty quickly gained access to these technologies with the
availability of McMail/the Unix PINE email system in 1992 (Public Relations, 2002). By the early
1990s microcomputers (called just "computers" by the mid-90s) and other electronic media
became less expensive and more readily available in the home. Even so, much of the work with
personal computers for education purposes at McMaster was limited to isolated groups
scattered throughout campus who could leverage funding to purchase and set up computer
labs and who initially needed to provide their own technology support (Laila Bastedo and Dale
Roy, study participants).

Introduction of Internet-based platforms to support teaching and learning

In 1995, the first learning management system (LMS) was introduced at McMaster, a
new technology that would come to have significant impacts on the ways instructors teach and
students learn. Called FirstClass, it was known locally as LearnLink and LearnLink: The Little Red
Schoolhouse to draw on the familiar metaphor of the one-room schoolhouse from Anne of
Green Gables, Little House on the Prairie, the Little Rascals, and the collaborative learning that
occurs in these spaces where students learn ideas and subjects beyond their current grade and
older students reinforce their learning through mentoring younger children (The McMaster
Courier, 1996b; Trim et al., 2000).[10] McMaster's choice and use of LMS would undergo many
changes in the next 15 years before the adoption of our current-day equivalent, Avenue to
Learn, in 2010.

Figure 4. Professor Carl Cuneo in McMaster's electronic classroom

The electronic classroom of the 1990s was used to simultaneously teach students at McMaster and Guelph Universities and the University of Waterloo. While the professor was audio and video recorded and projected on a large TV screen, pairs of students could use their own monitor as a whiteboard, to access overhead slides, to pose questions to the professor, and to participate in inter-class discussions. Source: The McMaster Courier (1996a; also see McMaster Courier, 1992). Permission to use from McMaster Communications, Marketing and Public Affairs. Accessed at The William Ready Division of Archives and Research Collections, McMaster University Library.

LearnLink was introduced at McMaster "not by the university administration, nor by computing support staff, nor by any academic program or unit of the institution" (Cuneo & Harnish, 2000, p. 1) but by Delsworth Harnish, a biology and pathology professor. Initially used in Harnish's biology courses, FirstClass quickly expanded for use in sociology with professor Carl Cuneo and other science and social science courses and became a McMaster-wide platform by 1998 (Cuneo & Harnish, 2000; Trim et al., 2000). Cuneo and Harnish (2000) were motivated by "an interest in promoting student learning," particularly deep learning and critical thinking, enriching classroom discussion through written exchanges, and tempering uncontrolled diffusion of technology through a focus on learning and pedagogy.

Another LMS platform, WebCT (Web Course Tools), developed alongside FirstClass. Its use in a business course was promoted in McMaster's *Daily News* as "go[ing] paperless," with course material available at reduced cost to students and higher student participation, as educators "become a facilitator rather than an instructor" (Professor Nick Bontis in Miecznikowski, 2001, para. 10). In short, "lectures changed" because the LMS offered professors a way to facilitate formative evaluation and solicit feedback so that "course concerns could be addressed before students moved on" (Trim et al., 2000, p. 5). For example, educators could now use online tests that provided students immediate feedback, monitor student log-ins and views of material, and engage with students on the discussion board (Miecznikowski, 2001). Learning management systems also enhanced efficiency and served a managerial

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function of controlling and regulating teaching "by offering templates that assure order and neatness, and facilitate the control of quality" (Coates et al., 2005, p. 25). In their educational research on the use and impact of LearnLink, early McMaster champions also recognized a growing digital divide between students with enhanced access to LearnLink from a privately owned personal computer and those using campus computer labs, with the former group gaining an academic performance advantage compared to the latter (Cuneo et al., 1999).

Figure 5. Introduction of LearnLink to teaching and learning at McMaster
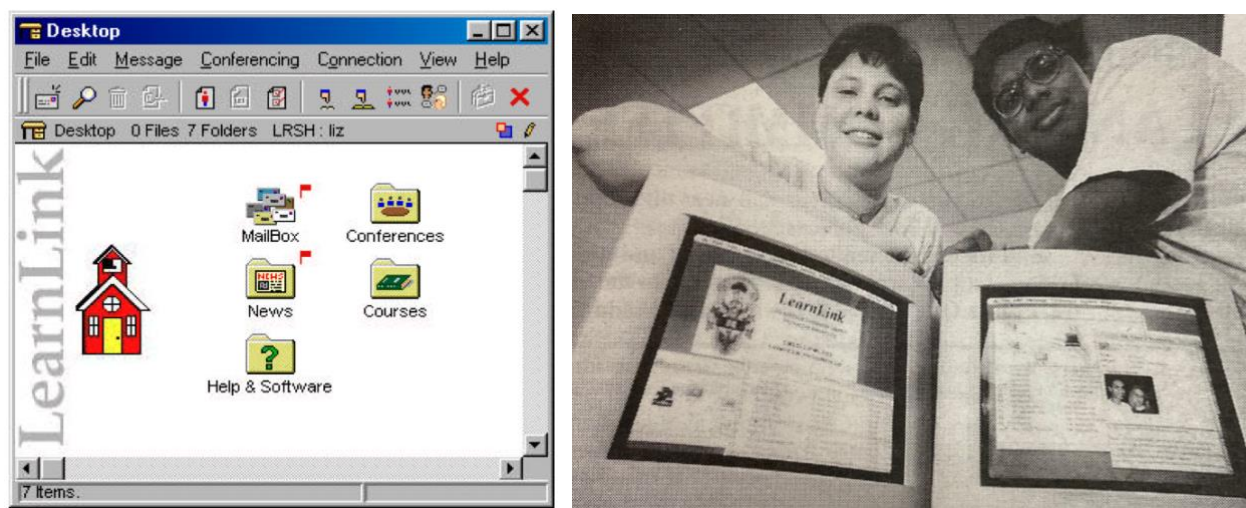

Photo 1 (Left): LearnLink home screen. Source: Trim et al. (2000). Photo 2 (Right): Third-year honors biology student Stacey Ritz and second-year honors biochemistry student Sivaruban Kanagaratnam show off their use of LearnLink to participate in online discussions with fellow students and instructors as part of their studies. Source: The McMaster Courier (1996b). Permission to use from McMaster Communications, Marketing and Public Affairs. Accessed at The William Ready Division of Archives and Research Collections, McMaster University Library.

FirstClass and WebCT were designed with different visions of what an online classroom could be. FirstClass was more flexible, customized at McMaster to encourage inquiry- and problem-based learning, critical thinking, and curiosity (Cuneo et al., 2000; Cuneo & Harnish, 2002).[11] WebCT's online space, on the other hand, was less interactive and emphasized the posting of documents, potentially "reinforc[ing] conceptions of teaching as the transmission of decontextualized and discrete pieces of information" (Coates et al., 2005, p. 27; Lai & Savage, 2013). While this possibility of replicating familiar teaching practices through WebCT supported adoption of the new technology, concerns were also raised at McMaster about how the "default options for a LMS," such as the layout, headings, and features, "may discourage instructor[s] from creative pedagogy" by "dictating how instructors teach" rather than "helping instructors translate their own teaching styles into online environments" (Lai & Savage, 2013, p. 5). Indeed, Trim et al. (2000) noted that "we continually frustrate ourselves by forcing old forms into new structures" (p. 8) rather than recognizing the new affordances that technology

provides.[12] In contrast, the free-form nature of FirstClass demanded an adopter think about new possibilities provided by the technology with no clear correlation with existing practices.

Another downside to these learning management systems is that they were unwieldy to manage at a large scale and increasing adoption meant higher support needs. By 1997, the Learning Technology Committee and Computing & Information Services unit "ban[ned] all e-mail from public access labs in order to cope with heavy student demand" (Cuneo & Harnish, 2000, p. 4), directing students to use the email functionality of LearnLink which was provided on a local McMaster network rather than the World Wide Web. There were 505 logins daily to LearnLink in mid-November of 1997, which rose to 5,850 during this same period a year later and to 19,626 in 1999, with 7,000 unique users by 2000 (Cuneo & Harnish, 2000). By 2004–2005, over 80% of undergraduates had a WebCT account and took at least one course using WebCT and almost 50% of undergrads used LearnLink for courses (Centre for Leadership in Learning, 2004a; Harnish, 2004). Manually adding students and courses and administrating account privileges was time-consuming and complex until a local solution could be developed (Laila Bastedo, study participant).

Initially technological support fell to individual faculties and departments (e.g., a half-time LearnLink support position in the Department of Biology) (Cuneo & Harnish, 2000), and identifying the best location for central cross-campus support proved complex. In 1999, for example, Professors Harnish and Cuneo refused to hand over LearnLink settings to the management of Computer and Information Services (CIS) "on the grounds that C.I.S. [had] no experience with FirstClass, nor with pedagogy, a requirement to run a successful LearnLink" (Cuneo & Harnish, 2000, p. 6). Generic technical assistance was no longer sufficient, and Cuneo and colleagues scanned universities across Canada for several models of specialized support in integrating technology with teaching and learning practices (Cuneo & Campbell, 2003).

The need for "a more satisfactory co-ordination of learning technology services" (Cuneo & Harnish, 2000, p. 6) was in part financially motivated. Rather than numerous departments doing their own thing in their own way, centralized support in one place accessible to all would cut costs while achieving some consistency and standardization. Student activism also played a role: when a lack of institutional financial support for LearnLink risked the platform shutting down in 2000, several hundred students and faculty members personally wrote the provost and signed a petition expressing their support (Cuneo & Harnish, 2000). There was additional concern that McMaster's investment in technology was lagging behind other institutions, that "faculty [were] not aware of the technological tools available to them" (Curwin, 2001, para. 3), and that a "one-stop shopping centre" (para. 5) was the best approach to providing technological support to faculty.

Centralizing support for educational technologies
Campus support for WebCT and LearnLink became the responsibility of a new Learning Technologies Resource Centre (LTRC), funded by a $1 million donation from the Royal Bank of Canada (RBC) (Centre for Leadership in Learning, 2000). As Dale Roy recalled, "McMaster made a serious pitch for big bucks to support teaching and learning [technologies]" because "up until

then it had been done largely on a shoestring," which meant the existing technology support staff struggled to meet demands for assistance.

Formed in 2001 and officially opened on January 17, 2002, the LTRC became a modest effort to combine support for widely used technologies into one location with a single point of contact (Centre for Leadership in Learning, 2004b; D'Alvise, 2002). LTRC's mission was to inspire the McMaster teaching community to enhance learning by collaborating in the effective use of technology to support a quality educational experience, building and maintaining course management systems, and working on course-specific projects that employ technology to assist learning (Centre for Leadership in Learning, 2004a, 2007). University technology supports were restructured, with some of the staff focused on educational technologies and dispersed in departments across the university initially "on loan" to the LTRC, who then became permanent members of the centre (Curwin, 2001).

Another effort to centralize discussion and support for learning technologies on campus was the 1996 organization of the New Technology in Education Symposium by McMaster's teaching and learning centre, which offered sessions like "The Internet" and "Pre-recorded Videos" (Instructional Development Centre, 1996). The symposium evolved to become the first of many annual events—the Learning Technologies Symposium (LTS)—dedicated to showcasing educators' use of technology in the classroom and hosted in partnership with other campus units like the Learning Technologies Division of the Faculty of Health Sciences' Program for Faculty Development. The goal of the LTS and its various iterations was constant—to connect with colleagues, exchange ideas, and learn how educational technology was being used in courses and how it impacted teaching and learning (Public Relations, 2013).

As the university sought to centralize services in the LTRC, the LTRC did not see itself as—and sought to avoid perceptions that it was—the sole centre of the edtech universe on campus. Such a perception was likely to cause more harm than good as the LTRC aimed to offer support without raising tensions that it was taking money away from the faculties or assuming a directive or prescriptive role. Moreover, some educational technology staff remaining in departments valued the autonomy to continue exploring new approaches. Several tools popped up to serve local needs: for example, an electronic version of problem-based learning (e-PBL) in 2004 (see Chen, 2016; Valaitis et al., 2005), departmental instances of the alternative LMS Moodle throughout the next decade (Lawrence & Dion, 2010), and instances of Second Life, an early virtual reality environment. There was "an amazing lack of policy to guide the selection, evaluation, development, implementation and use of educational technology" (Conrath et. al., 1999, Practice over Policy section, para. 1), which allowed experimentation to flourish. This was not necessarily a bad thing; while centralization allowed for efficiency and consolidation of costs, departmental autonomy enabled a level of freedom for innovation. There was an ebb and flow to edtech, with an expansion of tools through experimentation and then a narrowing through central procurement decisions on repeat like the tide.

In 2005, the university published its first University Technology Strategy, identifying three main drivers for change: (a) mitigating risks posed by inadequate technology infrastructure, (b) enabling achievement of the university's strategic plan, and (c) reducing

duplication and conserving financial resources (Barrett, 2005). The strategy included a comprehensive mapping of all of the technological duplication on campus. With anticipated completion of the grant that funded the LTRC, LTRC staff were folded into the teaching and learning centre by the end of 2009 (Centre for Leadership in Learning, 2006).

Complex procurement decisions and disrupted implementation

By 2006, just as WebCT was becoming the most commonly used and centralized system to support learning at McMaster, it was bought out by another company (Vista, who operated the LMS Blackboard) and was no longer available for use. An extensive needs analysis was conducted at McMaster to determine how to proceed.[13] The resulting decision to move forward with Blackboard involved a 2-year migration plan from WebCT to McMaster's instance of Blackboard, which was named ELM: E-Learning at McMaster (LTRC, 2007a, 2007b; Public Relations, 2008, 2009). Unfortunately, the implementation ran into problems. As reported in McMaster *Daily News*, "ELM did not meet expectations... It sustained serious performance problems…and was not reliable for students and faculty" (Public Relations, 2010, para. 8). Due to a legal agreement with Blackboard, the source of the technical problems cannot be disclosed; however, it is fair to say that the outage was very disruptive. Students posted in Facebook groups and threads on MacInsiders (a chatboard) about how the implementation was impacting their studies, and news of the problem reached the wider higher education community (Mosteller, 2010; Schaffhauser, 2010). McMaster's teaching and learning centre issued an apology "for the problems and inconveniences" (Public Relations, 2010, para. 3).

In an untenable position of uncertainty that ELM would be a stable option, the university planned a migration to Desire2Learn's LMS named "Learning Environment," which was a monumental shift in how educational technologies were delivered on campus—from a self-hosted, on-premise product (Blackboard), to a vendor-hosted, and later cloud-hosted, solution (Desire2Learn, later rebranded as D2L). In 2010, campus transitioned to McMaster's Desire2Learn platform, Avenue to Learn (Public Relations, 2010).

While the campus characterized the instability of ELM as disastrous, learning from this situation has influenced the way subsequent technologies have been implemented at McMaster. For instance, the ELM outage reinforced how important communication is to successful technology change; moving forward, technology updates, upgrades, or brief planned or unexpected outages for maintenance purposes involved a much more thorough approach to pre-emptively informing the campus community about the change to their conventional use expectations. In the early days of Avenue to Learn, communication about upgrades and other outages became more frequent.

In the two decades between 1990–2009, we see just how important the Internet, and especially learning management systems, had become to teaching and learning at McMaster— and just how fragile education can be when the edtech we rely on breaks (del Campoa et al., 2012) or when adoption outpaces the human or financial resources required to effectively support expanding technology use. While the concern in earlier decades was the use of technology without a clear and effective pedagogical purpose, as edtech moved from novelty to

routine, there were more examples of the failure to realize the full pedagogical benefits of technology when it was used to replicate conventional teaching approaches rather than inspire extension of teaching through new tools. These decades also teach us about the value of balancing standardization with autonomy; although edtech had developed significantly since the early days of piloting TV teaching, ongoing experimentation with teaching tools and techniques continued to be valued at McMaster.

2010–2020: Ubiquity of online technologies to (mostly) enhance teaching and learning

By 2010, access to personal computers, laptops, and mobile devices was ubiquitous, particularly in post-secondary education. From an infrastructure perspective, the campus enjoyed increased Internet connectivity improvements, and while computer labs continued to be used for accessing pricey software such as multimedia applications and data analysis tools, more emphasis was placed on the reality that students were bringing their own devices to the classroom.

Extending from patterns noted in earlier edtech eras, we see in this decade the at times overwhelming number of technologies in use, the challenges involved in coordinating support for them all, McMaster's comparatively slow and cautious approach to online learning, the challenges of balancing external reputation-building uses of technology with internal needs, and the increasing enhancement of most, if not all, courses with some form of technology—whether with a communication platform for content delivery, an engagement tool, or an alternative approach to assessment.

The challenge of supporting educational technologies at scale

While there was a positive growth in collaboration to enhance support with edtech, an enduring and growing challenge was that central support for the high use of technologies across campus was increasingly provided by several different units. This was partially due to technology companies diversifying how their products could be used. For example, University Technology Services was responsible for procurement and use of Microsoft Office 365 applications, which, although initially categorized as a suite of productivity tools, were expanded and marketed for use in teaching (Wingfield & Singer, 2017). McMaster Libraries continues to support the use of the Echo360 platform, which evolved from a straightforward lecture capture system to a video hosting platform with tools for student engagement. Tools that were initially appropriately supported by central technology or library services have increased educational uses that overlap with teaching and learning supports.

In addition, faculties and departments across campus often went rogue and purchased their own educational technologies, perhaps due to frustration that a centralized process for widespread evaluation, adoption, and procurement of institutionally endorsed tools was difficult to navigate and time consuming. One example of this was the procurement of TopHat, a classroom response/engagement tool, in early 2020 by the DeGroote School of Business. Requests to then integrate these tools into McMaster's LMS led to unplanned workload increases for staff involved in supporting that system's use in teaching.

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Teaching, McMaster University.

These pockets of tool use and support contributed to a confusing landscape for both instructors and students regarding who to turn to for help, as one of our participants noted: "We've created a virtual obstacle course for students. If you want this, you go there, if you want this, you go there, if you want this, there's about four hoops and then you can go there" (John Bell, study participant). Decisions around what technologies best support good digital pedagogies were not always centralized, and availability of technologies didn't necessarily translate into thoughtful integration into teaching practice and improvement of learning experiences. As John Bell explained:

> We have an embarrassment of riches as far as tools go, and we're [a pauper's paradise] as far as tool use is concerned. . . . The fact of the matter is the uptake isn't what we would like it to be. And what we consider to be advanced [and pedagogically informed] usage of these things is something that's relatively hard to find.

The duplication of learning technologies on campus has also resulted in support staff, who consult on the pedagogical application of different tools, being unable to fully meet demand for assistance. This is especially so given the value of one-on-one support conversations with instructors to reinforce educational uses of technology:

> You answer [an Avenue to Learn request for support] ticket, and that opens a conversation. Or you conduct some training and people talk to you afterwards and that opens a conversation. And to me, the conversation is more important than the actual job that I do [maintaining the LMS]. . . . The problem isn't the technology, it's how to communicate the value of the technology to the person [using it]. And that's, I mean, my job is literally a translation job, [translating] . . . educational theory to practice. (Jon Kruithof, 2022)

Understandably, this confusing landscape of support has contributed to faculty developing a cautious approach to integrating educational technologies that may or may not have a short shelf life or a contract end date, as well as requiring building relationships with multiple units and staff members across campus who are involved in the tool's support.

The slow—and cautious—move to and within online learning development
Globally, over the past 2 decades, learning has moved significantly beyond physical walls. The "distance education" of the 20th century typically meant the instructor and the learners were physically separated, with teaching and learning taking place through one or more of a combination of paper correspondence, media cassettes, and CDs (Roffe, 2004).
The 2000s version of distance education quickly moved to online learning, which uses the Internet, computers, and software such as learning management systems to deliver synchronous and/or asynchronous learning content, activities, and assessments. Courtesy of the affordances of the Internet, dramatic increases to just-in-time "learn it yourself" training

such as that made readily accessible via Youtube and monetized by Lynda.com fundamentally changed how learning experiences are designed. Online learning enrolments have skyrocketed with an estimated 76% of Canadian postsecondary institutions offering some form of online learning in 2019, with 79% of these having entire programs that can be completed fully online (Johnson et al., 2019).

However, this online course growth was not equally taken up at McMaster. Reporting on the number of online course offerings of Ontario universities, Harrison (2016) ranked McMaster as the second lowest in the province (19th out of 20 schools), with a total of two online undergraduate courses in 2012.[14] For a variety of reasons and perhaps misconceptions (including a mid-2010s statement from university leadership that McMaster is an "in-person school" that several of this chapter's authors recall hearing but that we have been unable to locate in official documents), senior administration elected to place emphasis on McMaster's identity as an in-person university, with limited strategic and institution-wide planning on blended and online course development and delivery. The traditional in-person classroom format was viewed as the superior form of learning—a view that was at least in part financially motivated so as to not lose international student tuition—and the quality of online education was distrusted, with only small pockets of online course delivery found in the Centre for Continuing Education and scattered departments across campus (Carter, 2022).

Between 2010–2020, funding from the Ontario Ministry of Training, Colleges and Universities in the form of the Productivity and Innovation Fund (PIF) and the Ontario Online Initiative (OOI) (see Wright et al., 2014) provided opportunities to "try out" and expand blended and online course design efforts at McMaster. Rather than narrowly focused format conversion from in-person to online, courses gained more interactive elements. For example, PIF funding was used to redesign Commerce 2AA3: Introductory Financial Accounting—a large introductory, primarily didactic course into an interactive blended format, under the instruction of Emad Mohammad and Aadil Juma. Psychology professor Joseph Kim developed the IntroPsych Blended Learning Model (i-BLM), introduced in 2007 to move the large enrollment introductory psychology course to a blended format. This model combined live in-person lectures and small group tutorials with online modules, the first examples at McMaster of well-designed, media-rich, interactive learning objects that could be reused and iterated on an enduring basis (Sana et al., 2011). With funding from PIF, McMaster's teaching and learning centre also collaborated with other Ontario research-intensive universities to develop online learning modules (MyGradSkills) aimed at developing graduate students' professional skills (Public Relations, 2014; Samson, 2014).

As blended and online course development grew, so did the support available. By 2017, the educational technologies team at McMaster's teaching and learning centre included 16 instructional designers, digital media specialists, and technology analysts. Building this in-house online course expertise was critical to focus on how to effectively design and conjoin pedagogy, principles of multimedia learning, and educational technology to improve student learning within an online format. Supported by this production team, development of online courses through the Ontario Online Initiative funding—starting with the Bachelor of Technology and

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Bachelor of History programs in 2015—was highly-structured and often involved year-long timelines as well as faculty onboarding to digital pedagogies. Faculty member and study participant Karen Balcom reflected on "a lot of help" received from instructional designers in the preparation of an online history course:

> [They were] working so hard. I mean they work hard now, but then it was like a turnout online courses kind of factory. And the things that were turned out were beautiful but being able to take full advantage of working with the instructional designers meant being pretty far ahead like months [in terms of advanced planning].

The investment in the development of these modules was justified due to the reuse and repurposing of learning content across courses and students. As Karen Balcom explained, an online module developed to teach basic research skills for history "could be used in classes; it could be something that could sit alongside the research methods course that we were teaching to just solidify skills. We had it built into all of the first-year classes in the history department." When contrasted with the scathing denunciation of the television extension course experiment in 1961 by department chair Goldwin French, the Department of History's place at the forefront of online course adoption also marked a point of surprising transition for the Faculty of Humanities' long-held resistance to learning technologies and platforms.

McMaster's teaching and learning centre also responded to problems when platforms used to create content were phased out. The development of many online modules was initially completed using the Articulate e-learning software—an expensive, Flash-based program that few across campus were able to pay for and use appropriately, as it was a complex software with a steep learning curve. When Flash, a software used to produce animations, was phased out in 2020, all of these modules required remediation, needed to be recreated altogether, or were eventually unused, which was the case of the MyGradSkills modules that had consumed significant energy and required heavy investment of time and labour. This was a frustrating experience not only for those involved in e-learning module development but also for faculty: "After Flash was phased out, you had to be so specific about which web browsers you used which was super frustrating because I felt like we put in all this work, and then the tech changes" (Karen Balcom, study participant). These incidents highlighted the importance of thoughtful evaluation (e.g., considerations of maintenance, licensing, support needs, pedagogical uses) before adoption of a new technology and encouraged an ongoing caution that continues to influence how teaching technologies are procured, used, supported, and evaluated at an individual and institutional level as well as how blended and online teaching modalities are strategized, designed, and developed at McMaster.

Massive open online courses: Finding a balance of global vs. local impact
The first massive open online course (MOOC) was launched in 2008 (Bates, 2019).[15] While MOOCs were initially focused on socially constructed and flexible learning through participant discussions, they evolved to become more mass produced, linear, and automated,

with large enrolment and little social interaction (Bates, 2019). Post-secondary institutions increasingly developed MOOCs in partnership with a corporate platform provider (e.g., Coursera, EdX, Udacity, etc.) who administered and monetized the MOOC, with generated revenue shared between the developer and provider.

In 2014, McMaster signed a partnership with Coursera and launched McMaster's first MOOC. At that time, there were multiple motivations informing MOOC design: a desire to (a) build McMaster's profile globally to gain a new audience that was otherwise unlikely to enroll in McMaster's conventional academic programs, (b) enhance McMaster's ability to deliver on its new brand promise in the areas of health and wellness, (c) fuel enhancements in the measurable and reputational factors that influence world and national university rankings, and (d) support McMaster's existing reputation as a centre of innovation in pedagogy and an early developer and adopter of new teaching approaches. The latter was particularly relevant for McMaster's teaching and learning centre, as it proposed that revenue generated through MOOC development could increase financial resources for enhancing teaching and learning at McMaster.

Drawing on funding through the Ontario Online Initiative, the teaching and learning centre team worked with Kevin Dunn to transform his existing engineering course (CHEM ENG 4CO3/6CO3 Statistics for Engineers) into the 6-week Experimentation for Improvement MOOC (Dunn, 2015). In August 2015, Provost David Wilkinson encouraged further MOOC development, and in the fall of that year, the teaching and learning centre produced Finance for Everyone (F4E), a five-course specialization including a capstone project taught by Arshad Ahmad, the Director of McMaster's teaching and learning centre (Public Relations, 2016). Building on this experience, McMaster's teaching and learning centre received Strategic Alignment Funding (SAF) from the Office of the Provost to create a series of MOOCs featuring expert faculty to enhance our emerging "Brighter World" university brand.[16] McMaster also recruited the globally renowned MOOC developer, Barbara Oakley, as a distinguished scholar of global digital learning to mentor and shape McMaster MOOCs (e.g., see Ahmad & Oakley, 2017).

At this point, the teaching and learning centre, in conversation with the Office of the Provost, deans, and teaching support staff across the university, took stock of the time and resources needed to produce MOOCs and recognized that the focus on an external brand, impact, and potential new revenue source took time away from supporting our own McMaster teaching and learning community. MOOC production was subsequently abandoned in favour of building resources and support for internal stakeholders, while the teaching and learning centre continues to offer consultation and advice for educators looking to design and deliver similar openly licensed online curricula and resources that can be created, shared, and revised more flexibly. This shift in focus also gave greater attention to the role of the teaching and learning centre in building faculty capacity in digital pedagogies through professional development workshops so that these skills are dispersed across campus rather than restricted to expert online course production teams.

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Technology-enhanced learning: Informing content delivery, engagement, assessment, and digital accessibility

Over 2010–2020, the campus experienced a steady increase in technology-enhanced learning, with most courses having a digital component. While brief and partial, the sections below offer several examples that illustrate the rapidly increasing array of options for enhancing learning through technology.

Web conferencing: New technologies reducing old barriers and creating new ones.

Teleconferencing initially arrived in the 1980s, allowing educators to communicate across geographical distance through connected telephone lines—not only with audio, but also visual displays and the ability "to draw on an electronic blackboard and have your information picked up on TV screens at other sites" (The Courier, 1983, p. 8).

Figure 6. 1980s experimentation with teleconferencing

McMaster faculty members test the use of teleconferencing during a two-day seminar at McMaster, Melbourne, and Fredericton. Source: The McMaster Courier (1983). Permission to use from McMaster Communications, Marketing and Public Affairs. Accessed at The William Ready Division of Archives and Research Collections, McMaster University Library.

Thirty years later, web conferencing platforms, which enable real-time video, audio, and chat through a computer, tablet, or mobile device, were in popular use in pockets across McMaster, from the tool Elluminate to BlackBoard Collaborate in the early 2010s to WebEx in 2016, which was recently discontinued in favour of Microsoft Teams and Zoom at the onset of the COVID-19 pandemic in early 2020. In the Faculty of Health Sciences, for example, with support from the Research, Instruction & InnoVation in Educational Technologies (RIVET) unit in the Program for Faculty Development, use of the WebEx platform enabled students on clinical placements to join together remotely from various locations. Educators could use embedded

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tools like screen sharing and breakout rooms to deliver and discuss course content, host virtual office hours and tutorials, and enable online activities. Use of these tools circulated around campus as staff in different learning technology roles at McMaster met and talked with each other (Staff Participant 1).

During the COVID-19 pandemic, more contentious web-conferencing applications were tested by educators at McMaster, such as Respondus Monitor, which uses a student's computer webcam to record their completion of an online test. One staff member we interviewed critiqued this academic integrity "solution" as not pedagogically sound:

> Instead of using technology to punish students through things like Respondus to proctor exams and assuming that they're going to cheat, let's rethink it. Let's not do the technology approach and say that technology is going to solve this, but instead, let's be more thoughtful about the kinds of assessments that we do. Ask questions like why students are cheating, and approach it from a care lens. (Staff Participant 1)

Alongside exciting edtech developments that support more accessible learning across geographical locations, we see different uses of the same technology that risk negative impacts on student learning and trust.

MacVideo: Shifting from specialized expertise to low-barrier capacity building.
In 2014, McMaster's teaching and learning centre received Strategic Alignment Funding to address institutional video-streaming needs motivated by the development of blended and online courses through adoption of Kaltura, institutionally branded as MacVideo. The centre also developed the One Button Studio video production space in the Mills Library and facilitated an integration process to connect MacVideo with Avenue to Learn. These tools enable instructors to record their own videos in a professional-quality space; upload and conduct basic edits to videos and screencasts; publish, search, and share media directly within Avenue; and view analytics related to video consumption in their course.[17]

Instructors can also invite students to use university tools to create their own videos as part of an expanding interest in alternative options for assessing student learning. As illustrated in Figure 7, other examples of technology-enabled assignments used in the past 2 decades include creating a digital thesis on CD-Rom (The McMaster Courier, 1996c), blogs (Lawrence & Dion, 2010), and wikis (Moulder et al., 2011).[18]

MacVideo and the One Button Studio are contemporary expressions of the teaching and learning centre's long-standing role in making technologies accessible to educators and providing facilities for experimenting with new teaching tools and creating instructional media (Down, 2000; McNeil, 1999). The procurement of MacVideo represents a move from the resource-intensive edtech specialist-led development of online learning modules, as was the case during the creation of Massive Open Online Courses, to building capacity across the campus community for video creation. This shift became especially crucial during the COVID-19

pandemic when, by necessity, faculty members needed to quickly develop their own e-learning content.

Even so, although platforms like MacVideo make edtech more user-friendly, "this dynamic of people feeling this antagonistic relationship towards the technologies that they work with" continues when technologies are "not designed to be usable" (Staff Participant 1). Educators continue to face an ever-increasing need for more sophisticated technology that demands immense time and resources to develop and manage, and "even if someone wants to do something that's a bit more outside the box and less based on that capitalist, neoliberal model of learning, you can't [due to technology constraints] or you really have to work at it" (Staff Participant 1). Quite simply, many university staff and faculty "don't have the time or energy to do that" (Staff Participant 1).

Figure 7. Technology-enabled assessments of student learning
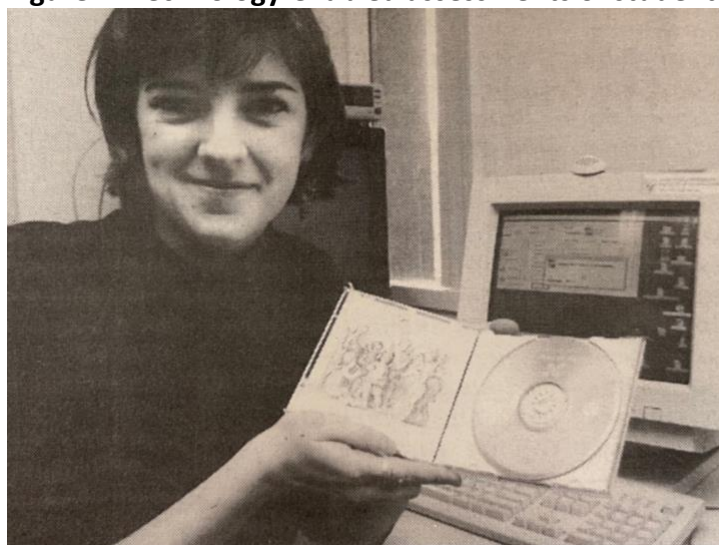
Original caption: "Avery MacLean's CD-Rom thesis has been an awakening of sorts for academics and graduate studies administrators who have yet to come to terms with new uses of technology for presenting such work" (The McMaster Courier, 1996c, p. 3). Permission to use from McMaster Communications, Marketing and Public Affairs. Accessed at The William Ready Division of Archives and Research Collections, McMaster University Library.

Learning portfolios: Alternative approaches to holistic assessment.

In 2011, President Patrick Deane's (2011) letter to the McMaster community, *Forward with Integrity*, motivated the creation of a Student Experience Task Force, which recommended that McMaster "recognize and facilitate student learning in both curricular and co-curricular environments" through "establish[ing] a McMaster Learning Portfolio or Passport" (Burgess et al., 2012, p. 6). Edtech staff and educators at McMaster began exploring how electronic portfolios (e-portfolios) might enhance the personalization of students' learning experiences—initially testing D2L's new ePortfolio tool, but choosing the enhanced functionality of PebblePad.[19] Through PebblePad, students could self-direct by setting and tracking learning

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too much of it not driven by pedagogy": A 60-year history of McMaster University's educational technologies. In A.
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goals, self-reflecting, and documenting their growth and accomplishments with a comprehensive portfolio (Balch, 2013, 2015c).

The use of learning portfolios did draw educator attention for a time, in large part supported by the creation of a learning portfolio program manager position within McMaster's teaching and learning centre to oversee this development. Use of the tool was well disseminated through boot camp sessions on designing portfolio-based activities, annual showcases of students' learning portfolios, and Learning Portfolio Fellowships that awarded $9,500 to support research, advocacy, and dissemination of learning portfolio initiatives by faculty members (Balch, 2013, 2015abc). By 2017, the McMaster Students Union was asking that the project be discontinued, citing its high cost, unclear results, and feedback from profs and students that learning portfolios were not being effectively implemented (Hastie, 2017).

While use of learning portfolios continues by some educators on campus, it has steadily declined from peak usage in 2018. Other alternative assessment platforms have similarly emerged to meet shifting teaching philosophies and student learning needs, and, like learning portfolios, many similarly go out of style when they are replaced by the next innovation or when senior leadership endorsement and institutional procurement or support are discontinued.

2021 and beyond: Pandemic reflections and some hopes for the future

Our participants agree that the COVID-19 pandemic has increased exposure for educational technologies. "Whether it is something that has been enjoyed or not," John Bell told us, "the fact is that a lot of our instructors have been forced to use educational technology tools that they wouldn't otherwise have experienced."

Yet these pandemic-prompted uses of technology offer another example of how, over the past 60 years, technology use in education has often been disconnected from broader pedagogical theory and best practice. Our interview participants consequently worried that the necessity of survival-focused adoption of edtech during the COVID-19 pivot online might have simultaneously regressed the focus on enriching learning. "The pandemic and the decisions that had to be made in relation to it really snuffed out a lot of experimenting," Staff Participant 1 explained. Many new edtech users are struggling to comprehend what teaching and learning should look and feel like in these virtual environments, as a comment from Staff Participant 1 demonstrates: "Right now, there are a lot of people who are like, 'oh look at all the neat things Teams can do' as opposed to saying, 'what do students need,' or 'what do instructors need.'" This has led many new pandemic adopters to prize the time-saving and regulatory capabilities (like those provided by Respondus, Turnitin, or Avenue progress tracking) over more difficult efforts to develop a pedagogy-driven understanding of tools that anticipates and proactively mitigates barriers experienced by a diverse student body (e.g., Brockbank et al., 2021; Do, 2020; Humphrey & Davis, 2021; Migueliz Valcarlos et al., 2020). For Dale Roy, we too easily went to technology to solve the loss of connectivity felt during the pandemic: "I was always a bit anxious about technology as an answer because, I think, until you got the pedagogy right, you just muddled it with technology."

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Alongside these worries, participants are "still pretty hopeful that change will happen" (Student Participant 1) as we reevaluate our relationships to edtech in the years following the pandemic. For Tim Nolan, there is hope that wider usage will produce greater access and representation: "I think COVID just simply hurried that obligation [to provide educational and learning support technologies] along," forcing "the hand of the institution to move in a direction it could have or should have been going."

Three disabled students we spoke to all gained access to technology-enhanced learning during COVID-19, like lecture recording and captioning, that was not previously available throughout their education. As Student Participant 2 reflected, remote instruction "was actually a very nice time for me because everything started going digital and there were captions everywhere." She additionally learned about valuable accessibility features of technologies she was previously unaware of that are both personally beneficial and useful to nondisabled students. These students suggested accessible technologies might be standardized and expanded during our return to in-person learning: "a lot of the benefits of online just [encourage us to] find a smarter way to do it in person" (Student Participant 1), without the need for special disability-related accommodation (see Syed, 2020).

There is a sense that many educators are listening. They have been attending professional development workshops on digital accessibility and engaging with related resources. Staff Participant 1 affirmed, "[With] accessibility and equity, I think a lot of instructors have recognized how much [technology] has benefited students with disabilities or who are encountering barriers for one reason or another." Karen Balcom, for example, has willfully taken it upon herself to improve in this area: "the big pedagogy and learning project that I set for myself in the context of online teaching was 'you have to up your game with respect to accessibility in your content.'"

CONCLUSION

If we can move forward by centring student learning and effective pedagogical uses of edtech, we are well positioned to realize these hopes—even more so if we continue to build on and extend our growing collaborative approach to edtech on campus. "What makes the edtech work for me," Karen Balcom explained, "is knowing that I [have] a community of folks [staff and students] who are willing to experiment with me." We might look to McMaster's Blended and Online Community of Practice (CoP) as one example of what this collaboration can look like; started as a cross-department group of staff and faculty with interest in these modalities, the CoP has grown on Microsoft Teams throughout the pandemic to a lively support network. In order "to innovate with educational technology, you need backup from the people" (Karen Balcom).

Through reflection on and understanding of the university's edtech successes and shortcomings, we might keep better focus on what matters most to us as an institution—our teaching and learning communities—and how technology might best support these ecosystems as we set off down both new and familiar trails. With McMaster's forthcoming launch of a digital learning strategy, we are embarking on a new era of intentional edtech planning with a

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recognition "that digital pedagogies and tools have the potential to help reduce or overcome certain barriers to learning, such as inaccessible course materials, family and personal responsibilities and obligations, transportation issues, physical classroom impediments and geographic location" (Carneiro, 2022, para. 7). We are excited to see how this work unfolds. "10 years from now, are we still stuck in a 2D screen?" John Bell wondered aloud, suggesting we need to consider "how can we extend the learning environment beyond the screen and beyond the stage? That's where the next steps are."

ACKNOWLEDGEMENTS

NOTES

1. McMaster's teaching and learning centre, presently named the Paul R. MacPherson Institute for Leadership, Innovation and Excellence in Teaching, has been previously known as the Shell Centre, Instructional Development Centre, Learning Technologies Resource Centre, Centre for Leadership in Learning, and the McMaster Institute for Innovation and Excellence in Teaching and Learning (MIIETL) (see de Bie, Ing, et al., 2022, this volume, for a history of this unit). For clarity and consistency, we refer to this unit as McMaster's teaching and learning centre throughout the chapter.
2. Yow's (2015) third edition offered structural guidance for using oral accounts as a means of conceptualizing and constructing a community history, which lies at the foundation of our own examination. This appeared in interview questions pushing participants to think about how evolving educational technologies mediated their social relationships with other stakeholders on campus. The work of Mulvihill and Swaminathan (2022), meanwhile, assisted our team in constructing a relevant, care-centered ethical lens for navigating and interpreting our interviews. Especially helpful here was Mulvihill and Swaminathan's second chapter (pp. 18–38) which helped to provide practical definition to matters of equity, diversity, and inclusion in our research practices, as well as how to weave the authors' own experiences and acknowledgements of positionality into such a project in a way that facilitates the sharing of authority among a diversity of storytellers.
3. Seeing too much instructional emphasis "being in accord with the interest of the faculty rather than with the needs of the students and community," Health Sciences began to expand A/V individualized instruction in their M.D. programming after 1969 (Kraemer, 1973, p. 343).

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This eventually developed into 10 to 30 minute take-home slide and audio-cassette kits, some of which were programmed around a core problem for students to solve on an accompanying worksheet, using edtech to converge their novel problem-based learning model (PBL) with asynchronous and individualized methods of learning.

4. A reorganization of the earlier Computing Facilities group, the Data Processing and Computing Centre was initially established in 1961 under director D. J. Kenworthy as a small unit tasked to provide technical support for the Bendix computer and advise the president and Senate on the procurement of new parts and software. It was the Computing Centre, reorganized but still under the earlier name, that prepared the initial 1962 report recommending McMaster procure the IBM 7040 (McMaster Computing Facilities, 1962). However, the Computing Centre also went through several restructurings during the 1960s and 70s that gradually expanded its user support and consultation services. Further technological evolutions during the 1980s and 1990s saw the centre's work eventually split apart among the university teaching and learning centre, Information Technology Services, and Library administration units.

5. Computer-assisted instruction (CAI) broadly covers three categories of computer use in post-secondary education. First is computer-managed instruction in which computing resources are leveraged to scaffold, organize, and administer an otherwise non-computerized learning experience. The second category is computer-assisted learning, which integrates computer use, typically in the form of pre-set games, quizzes, and simulations, as part of the learning experience. The final approach involves wielding computers as applied tools for learning. That is, allowing students to gain experience with coding, word and data processing programs, and/or developing their own software (Romaniuk, 2013). Luerhmann (1973) elaborated how university administrators had largely approached educational computing as "a way of reducing the cost or increasing the productivity of teaching staff" while "teachers look to CAI to relieve them of tedius [sic] jobs" (p. 2). The net result was untapped potential for both technology and learning. The focus on CAI had also created a self-limiting presumption that "the only educational role appropriate to the computer is that of the teacher, the deliverer of information" (Luehrmann, 1973, p. 2). Consequently, "the community of users that is least well served by computer centres" also happened to be the "largest community on any campus—the students" (p. 2).

6. Trotter (1970) viewed resistance and apathy to television in universities as at least partially arising from the apparent threat to "notions of the autonomy of the individual teacher and his right to privacy in a professional teaching relationship with students" (1970, p. 16). For example, professors felt that TV courses made "explicit separation between student and teacher which already exists in very large classes," wrenching from them the illusion of control by opening the courses to outside expertise (p. 16).

7. For instance, Health Sciences had produced eight hundred slide-tape programmes for instructional use while the chemistry department worked with the Ontario Educational Communications Authority (later TVOntario, then TVO) to develop and broadcast general interest courses as part of Trotter's vision. Meanwhile, the business and engineering schools

were experimenting with gamified learning, including a manual "business game developed by Proctor and Gamble" as well as a student-designed computer programme for "simulations of a water resource situation" that was ultimately sold internationally (President's Committee for Instructional Development, 1976, pp. 7–9).

8. The initial group of six participants, selected from across the faculties, were loaned three IBM and three Texas Instruments micros for a period from May to October 1985 (University Committee on Teaching and Learning, 1985, p. 1). In keeping with larger university trends, these early projects largely focused on sciences, engineering, and business initiatives. For instance, Ken Deal from the Faculty of Business investigated how existing statistical analysis software might be utilized for marketing research in undergraduate courses. Perhaps the most unique project was conducted by Maria Cerezo of the Department of Linguistics, who aimed to develop an early program for computer-assisted instruction in Spanish (University Committee on Teaching and Learning, 1985, p. 2).

9. NETS also recommended further exploring the potential for distanced or self-paced learning, teleconferencing, student skill development, and assessment (New Educational Technology Sub-Committee, 1980) with primary aims to promote the university, attract new or non-traditional students, and follow suit with other nearby universities.

10. The name was explained to students as follows: "Why a little red schoolhouse? Talk to your grandmother. The little red schoolhouses of days gone by were actually very productive environments for learning. Several grades were all in one room so the 20 or 30 students were all working at different levels on different material. While the grade ones were doing their math, the grade fours were listening to the teacher tell them that you couldn't work for the city of Toronto if you were a female employee who married. Some of the grade four students were helping the grade one students with their math and some of the grade one students were listening to the grade four discussion. So a wide perspective was present, all in one 20' by 20' room. Continuous flow education was also practiced as older students helped younger students with the same problems they had struggled with, and younger students provided their own perspective. The better teachers took full advantage of this rich environment. It is obvious that we can't all fit into a 20' by 20' room anymore, but we can still take advantage of some of the best features of the one room schoolhouse, electronically" (Life Sciences Computer Cluster, 1997, para. 8).

11. For example, based on the instructor's pre-planned and real-time design of a hierarchy of folders called "conferences," the LearnLink interface could be configured in different ways to share files, messages, and online chats (e.g., organized based on time/phases of the course or course topics/subtopics) (Persico & Manca, 2000; see Graham et al., 2019 and Trim et al., 2000 for further description and screenshots of FirstClass). A unique customization of McMaster's LearnLink is that students could join "conferences" for courses in which they were not registered at any time without special permission and send messages to fellow students across course boundaries (Cuneo & Harnish, 2000, 2002; Trim et al., 2000). In today's Avenue to Learn equivalent, students could search, drop in to, access course files of (e.g., PowerPoint slides, readings), and participate on the discussion boards of any Avenue to Learn course shell they

wished, not only those for courses in which they were formally registered. They could also use the platform to communicate with friends and students across campus about different topics, akin to today's uses of Facebook or What's App groups, Discord, and other communication platforms.

12. Coates et al. (2005) explain, "LMS are not pedagogically neutral technologies, but rather, through their very design, they influence and guide teaching. As the systems become more incorporated into everyday academic practices, they will work to shape and even define teachers' imaginations, expectations and behaviours. This may be particularly the case for academics with only a few years experience . . . [as] increasingly, LMS will play a major role in how academics learn to teach" (p. 27). At McMaster, Trim et al. (2000) reported that instructors who used LearnLink to implement problem-based learning and other student-centred discussions were excited by the technology and wanted to investigate its potential, while those less impressed and intending to discontinue use of LearnLink felt the software was better suited to information transmission such as posting lecture notes and answer keys for assignments.

13. Use of WebCT supplanted LearnLink except in the Faculty of Health Sciences (FHS) where LearnLink was well aligned with their inquiry methods of teaching. Consequently, support for LearnLink moved to the FHS, where it remained until institutional use of the tool ended in 2020. As part of their LMS needs analysis, McMaster received 12 vendor proposals and assessed the top five products: Learning Environment (Desire2Learn), eLearning Server (Intrafinity), Vista (Blackboard), Moodle (Open Knowledge Technologies), and FirstClass (Palantir Information Systems) (LTRC, 2007b).

14. Compared to over 200 online courses at the smaller schools of Wilfrid Laurier and Guelph Universities and up to 334 at the University of Waterloo, which had just under 5,000 more students than McMaster. That year, McMaster also had 25 non-undergraduate online courses, the fourth lowest in the province (Harrison, 2016).

15. The term MOOC was first applied in 2008 to a course developed by Canadian educators George Siemens, Stephen Downes, and Dave Cormier for University of Manitoba Continuing Education that involved paid tuition for in-person attendance and a free online version that enrolled 2,200 students (Bates, 2009).

16. From 2017–2019, staff at McMaster's teaching and learning centre supported the production and launch of: Mindshift, Barbara Oakley's second MOOC; DNA Decoded led by Felicia Vulcu and Caitlin Mullarkey of the Faculty of Health Sciences (Mullarkey & Vulcu, 2018); and Hacking Exercise with Stuart Phillip and Martin Gibala from kinesiology.

17. Notably, five of our interview participants highlighted McMaster's obligations towards safeguarding instructor, staff, and student privacy in the online learning environment. At the centre of these conversations are learner data analytics drawn from online courses and collected by the external companies whose technologies we use.

18. For example, in an effort to keep up with rapid changes in the ways students learn, departments at McMaster began to explore the integration of wikis with course content and evaluation (Moulder et al., 2011). In 2007, two courses in the School of Geography and Earth Sciences used wiki-based assignments to foster active and collaborative group learning. Wiki

sites—websites like Wikipedia where users can add, remove, or edit content—were especially appealing; Wetpaint, one hosting option, was free and easy to use with minimal commercial advertising and a simple interface that resembled other word processing applications. Faculty and students were generally enthusiastic about the integration of wikis as an exciting exercise for students that does not take more effort to grade than a regular assignment (Moulder et al., 2011).

19. D2L's new ePortfolio tool was initially tested but there were numerous complaints from the McMaster community about usability, design, and lack of functionality that D2L was unable to address in a timely fashion. In response, McMaster's teaching and learning centre oversaw a joint committee in 2013 that reviewed, selected, and launched the learning portfolio tool, PebblePad, which ran alongside D2L's ePortfolio tool until the latter was shelved in 2015 due to multiple complaints from students and faculty about its functional ability.

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APPENDIX A: INTERVIEW QUESTIONS

1. When /in what context were you involved in educational technologies at McMaster? What significant topics, projects, evolutions in technology did you see happen during your time at McMaster?

a. What technologies were in use/being developed at the time?
b. What was your role at the MacPherson Institute (MI), or its predecessors, and within these projects? (Or, how did this project/role interface with the MI?)
c. Do you recall how these "new" ideas for technologies came about?

2. Can you tell us some of the dynamics in place that contributed to educational technology projects "working" or "not working"?
    a. For example, who introduced/advocated for the project? Was it a consequence of direction from leadership, government encouragement, reception by stakeholders, legal, cost, technological functionality, jurisdiction/responsibility, etc.? Were there any patterns between which projects were successful vs. not?
    b. What were the key dynamics that informed decisions and implementation regarding educational technologies at McMaster?
    c. Areas of turbulence that informed educational technology evolution at McMaster?
    d. (If relevant) How has the pandemic changed educational technology projects? What went better, what went worse?

3. Can you comment on any philosophical shifts in how we understand technology and education?
    a. What big changes (like the pandemic) have shifted how we think about teaching/learning and technology? How did they shift our thinking?
        i.   For instance, seeing them as separate, symbiotic, or integrated?
        ii.   Technology as improving teaching and learning? Or interfering with teaching and learning?
        iii. Technology as supporting accessibility/equity?
        iv.   Philosophical shifts related to capitalism/neoliberalism (maximizing profit, minimizing cost), ethics (commodification of education, surveillance)?
        v.   Basing decisions on evidence/research related to integration of technology in education? Designing technology specifically with pedagogical principles?
        vi.   Philosophical ideas about where technology/learning technology services should be located in the university?
        vii. Are there any areas you believe need further research?

4. Can you recall any significant teaching and learning advancement/innovation that was made possible through the use of educational technologies during your time at McMaster?
    a. Could be a class/instructor example or more generally related to community teaching practices.

5. (If relevant) What do you see as the future of educational technologies at Mac?
    a. What do you imagine changing over the next 5–20 years?
    b. What new or evolving technologies are on your radar?
    c. What needs to become standardized?
    d. How can departments stay "current" with quickly developing technologies?

6. This chapter will belong to an anthology thinking about the past/present/future of teaching and learning at McMaster. From your perspective, what is the value of recording and sharing this history of educational technology at McMaster?
    a. What would you hope for readers to learn from this chapter?
    b. For those who have worked with students: how can this anthology chapter bring attention to any technology-related issues students have?

7. Is there anything you'd like us to include or exclude about yourself?

8. Is there something we haven't asked that we should know about?
    a. Any people we should talk to?

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