

Transforming online teaching and learning: towards learning design informed by information science and learning sciences

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and learning

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Abstract

Purpose – The purpose of this paper is to provide an overview of the practical work of learning designers with the aim of helping members of the information science (IS) and learning sciences (LS) communities understand how evidence-informed learning design of online teaching and online learning in higher education is relevant to their research agendas and how they can contribute to this growing field.

Design/methodology/approach – Illustrating how current online education instructional designs largely ignore evidence from research, this paper argues that evidence from IS and LS can encourage more effective and nuanced learning designs for e-learning and online education delivery and suggest how interdisciplinary collaboration can advance shared understanding.

Findings – Recent reviews of the learning design show that tools and techniques from the LS can support students in self-directed and self-regulated learning. IS studies complement these approaches by highlighting the role that information systems and computer-human interaction. In this paper, the expertise from IS and LS are considered as important evidence to improve learning design, particularly *vis-à-vis* digital divide concerns that students face during the COVID-19 pandemic.

Originality/value – This paper outlines important ties between the learning design, LS and IS communities. The combined expertise is key to advancing the nuanced design of online education, which considers issues of social justice and equity, and critical digital pedagogy.

Keywords Online learning, e-Learning, Higher education, Information science, Online teaching, Learning sciences, Learning design, Instructional design

Paper type Viewpoint

Introduction

Universities and colleges responded to the COVID-19 global outbreak by closing campuses and rapidly transitioning to unplanned-for remote teaching towards the end of the Winter 2020 term. The online pivot saw academics adapting their on-campus teaching practices to online learning in a hurry. Given just days to transition traditional residential courses to remote teaching delivery, the virus cast a spotlight on the socio-economic divide between those who have and those who do not have access, to not only affordable medical care but also to digital technologies that connect us during social distancing. On campuses, as institutional budgets tighten during

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the pandemic, contingent faculty face more job insecurity and loss of health benefits. Our increasingly diverse students including members from historically disadvantaged, marginalized groups, such as Black, Hispanic, Indigenous, LGBTQ, adult, international and first-generation students, experienced a deepening of inequality when online learning exposed many differences between students that had been less visible on campus (Casey, 2020). At my institution, adjuncts or sessional instructors were often excluded from meetings to prepare emergency plans as they held other employment, and international students in disciplines such as engineering and computer science suddenly lacked access to the specialized software, hardware and network connectivity that they needed to complete their final assignments and exams.

As higher education institutions plan for resumption of some on-campus activities, it is becoming increasingly clear that there are no easy answers to the question, “When *will* the coronavirus pandemic end?” These are unusual times with great uncertainty for how long online delivery of post-secondary courses and programs will continue. Currently, many are experiencing teaching and learning in challenging circumstances fraught with technological, infrastructural and instructional barriers. Evidence from high-quality research can inform effective, efficient and even enjoyable learning experiences, but presently, many learning design practitioners work with “eyes closed”, ignoring or skipping over research evidence (Neelen and Kirschner, 2020).

Learning designers (LD) – also called learning experience designers, educational developers and instructional designers – work in a service role behind the scenes in academia. LD often facilitate faculty development workshops and courses, and support faculty in designing online courses, programs and technology-enabled contexts. Ideally, LD build capacity in faculty to harness the affordances of digital technologies and help students achieve desired learning outcomes. Unfortunately, faculty may refrain from exploring teaching innovation because of institutional culture, myths and practices (Beetham and Sharpe, 2020). Yet, the coronavirus crisis presents an unprecedented opportunity to change the status quo by examining the research – practice nexus in online learning design *vis-à-vis* digital divide concerns. This paper aims to help members of the information science (IS) and learning sciences (LS) communities understand how:

- LD can apply evidence from the information and LS research to their practice in improving e-learning and online education; and
- IS and LS researchers can help LD develop evidence-informed learning designs and contribute to legitimizing the growing field of learning design for effective and efficient online teaching.

This paper will outline important ties between the learning design, LS and IS communities. The combined expertise is key to advancing nuanced evidence-informed learning designs enhanced by consideration of issues of social justice, equity and critical digital pedagogy.

Towards learning design informed by information science and learning sciences

In the following sections, I first present a brief overview of the way online courses are currently designed by LD in higher education through presenting a case at a small public university. Second, I propose an alternative approach that is informed by evidence from research from IS and LS. Finally, I identify some important links between learning design, IS and LS to transform online teaching and learning practices towards improved, nuanced designs.

Case: learning design at a small public university

As an LD in the Office of Open Learning (OOL) at the University of Windsor, I support faculty, staff and graduate student instructors in designing and facilitating high-quality

online teaching and learning. Our university is a small, public four-year university in Ontario, Canada. In Canada, “college” refers to smaller, often two-year institutions that grant certificates and diplomas rather than degrees. The average cost of tuition in Canada at CA \$6,463 is far less than the average cost of US\$10,116 for the public, in-state public universities in the USA, which is considerably less than the average tuition for public, out-of-state and private universities in the USA (Duffin, 2019; Powell and Kerr, 2019).

My university is considered a mid-sized Canadian research institution with 16,000+ students, including international students from nearly 100 countries comprising 23% of the student body. Many of our domestic students are first-generation students from surrounding rural communities. These students were able to return home to their families, and continue their studies in online courses, albeit with slower network access. Similarly, students from the metropolitan Greater Toronto Area simply returned to their homes and continued with high-speed internet access. Others, especially international graduate students, fared rather poorly. Far from home, some of these students were displaced from student residence halls, experienced job loss and began relying on food banks with the cessation of meal plans. They also experienced distress with the health of their family and friends back home in countries such as China, India and the Middle East, exacerbating stress in the final weeks of winter term.

In response to the challenges they were facing because of COVID-19, the university gave all students new grading choices for Winter 2020. Once final grades were uploaded to the system, each student chose from the following three options:

- (1) to accept the final course grade assigned by their professor;
- (2) to request a pass/non-pass grade based on the minimum required passing grade in their program; and
- (3) to voluntarily withdraw from the course without academic penalty.

In addition to the challenges faced by our students, many faculty and staff were forced to upgrade their computers and network connections. They coped with learning to teach online while working from home with children out of school and with family responsibilities. In spite of these and many other challenges, we successfully transitioned 700+ courses to online delivery in Winter 2020 and are cautiously optimistic in developing about triple the number of online courses for Fall 2020.

My research training and interests encompass both IS and LS. However, my day-to-day LD practices are necessarily more pragmatic. For the pivot from residential to online courses, the OOL collaborated with the Office of the Provost, Centre for Teaching and Learning (CTL) and Information Technology Services (ITS) as part of the academic continuity team alongside Deans, Department Heads and Chairs.

The CTL and OOL are co-located, central units reporting to the Associate Vice-President Academic. Both units offer individual and group pedagogical consultations, workshops and courses. Additionally, they offer practically and theoretically grounded certificate programs in university teaching, and online and open teaching, respectively. These programs are designed to help academics at all levels and disciplines develop their teaching practice with the goal of enhancing student learning.

The CTL’s *University Teaching Certificate* (www.uwindsor.ca/ctl/463/university-teaching-certificate) is an internationally recognized certificate program in university teaching. The OOL’s Certificate in Online and Open Learning (www1.uwindsor.ca/openlearning/67/certificate-of-online-and-open-learning) is a flexible program to prepare instructors for designing, developing and teaching high-quality online, blended, technology-enhanced and open courses that have enrolments from external, both national and

international, colleges and universities. Our curricula overlap in teaching traditional instructional design approaches of constructive alignment (Biggs and Tang, 2011); backward design (Fink, 2013); and universal design for learning (Rose *et al.*, 2014). One course, *Exploring the Edges of Online Teaching*, is informed by evidence from the IS and LS, but we have postponed this year's offering of the course to deal with the crisis at hand.

During the online pivot, we focused on delivering just-in-time activities to cover fundamentals of online teaching: clear communication, content delivery and assessment using the institutional LMS, Blackboard and available video conferencing tools (Zoom, Microsoft Teams and Blackboard Collaborate Ultra "Virtual Classroom"). We drew on the oft-used Community of Inquiry model (Garrison *et al.*, 2000) to highlight the overlapping elements of online education key to high-quality educational experiences: cognitive presence, social presence and teacher presence.

Understandably, many instructors felt overwhelmed with remote teaching. The OOL has been providing support and faculty professional development in online, open and hybrid learning and teaching since 2013. We have secured almost \$4m in funding since 2012 to develop online and open projects. Approximately 60 not 45% of faculty (238 of 562 not 624), including new hires, have participated in our faculty development workshops, institutes, courses and informal community of practice sessions since the pandemic began. Moreover, we have continued to offer individual consultations, departmental retreats and course and program design sprints for these individuals, but the rest had not signed up for this context for teaching and may need encouragement to participate before the Fall term.

However, in the years leading up to the pandemic, the demand for online learning in the larger academic context had grown at a pace outstripping overall enrolments in both the USA and Canada. For example, in the USA, online enrolments increased 5% between 2012 and 2016, whereas overall enrolments declined by almost 4% (Seaman *et al.*, 2018). In Canada, online enrolments increased even more, by 40% in universities and 60% in colleges, whereas overall enrolments grew by 2% (Donovan *et al.*, 2018). Nonetheless, a survey of online learning in Canada found significant barriers to quality online teaching, with the greatest challenge being the lack of faculty development not only for online teaching but also for teaching in general (Beetham and Sharpe, 2020; Donovan *et al.*, 2018).

Starting on March 13, 2020, in response to the World Health Organization's declaration of a global pandemic because of COVID-19, the CTL and OOL offered voluntary, drop-in and scheduled departmental support for instructors transitioning to remote teaching. Initially, we were available for consultation both on campus and online, but all classes were cancelled for March 16th, 17th and 18th to resume in their new form of delivery on March 19th. We began working from home on March 18th after the University moved to an "essential services only" model where most of the faculty and staff are working remotely. The CTL and OOL started offered extended times for drop-in consultations in the Virtual Classroom named the "Blackboard Café" (BB-Café), coordinated sprints (30-45 min), facilitated workshops (2-3h) and taught courses (five days intensive) to provide flexibility and choice of faculty development opportunities. Aside from situated workshops in a few departments, faculties and schools, attendance at the faculty development offerings were voluntary. CTL, OOL and student hires resolved 550 ITS ticket requests for teaching and learning support from March 1 to June 11, 2020.

A recurrent request that emerged in these faculty development opportunities were instructions on how to record video lectures. One explanation for this request may be based on the instructors' beliefs that this is online learning pedagogy, as in many massive open online courses, use a series of videos to transmit knowledge to students. Therefore, in addition to the demonstrations during the sprints and workshops, we provided short

instructional videos to show faculty how to record and share video content with students, primarily presentation slide screen recordings.

In addition to course delivery, our faculty required assistance with needed changes in assessment practices. As our regular online proctoring service was not available because of increased demand for these services, we advised faculty to create alternative assignments to high-stake, timed and invigilated final exams. For instructors who retained multiple-choice question exams for large-enrolment classes, using an open-source Blackboard Quiz Generator tool (<https://github.com/college-of-southern-idaho/blackboard-quiz-generator>) to convert questions into an appropriate file format for Blackboard was helpful because the manual entry of test items was laborious and time-consuming. Academic integrity is a central concern for many academics in online delivery, as they believe that it is easier for students to cheat online.

Our units also extended pedagogical/technological help desk via BB-Café drop-in hours, but also maintained availability for individual and group consultations tailored to the needs of particular faculties, departments and schools. For our commitment to service to the university during the transition to fully online teaching, we received personal thanks from the President, the Provost and many other members of the campus community. However, our small teams are still overextended, and we are in the process of hiring extra staff, largely contract LD and co-op students, to support increasing faculty development needs for online teaching in both the summer and upcoming fall terms.

One unique contribution to LD practice from the OOL is the *Online Learning in a Hurry* (<http://oliah.ca/>) project. The website features informal video podcast conversations (vodcasts) between our Special Projects Coordinator, Dave Cormier and many international scholars who champion open educational practices (Cronin, 2019) and critical digital pedagogy (Farrow, 2015). Many of these scholars are members of the LD community. None are currently members of the IS and LS communities, although some belong to the digital humanities community represented in IS. I sincerely respect these colleagues for their unwavering commitment to humanizing digital teaching. They aim to empower learners by providing access to free or low-cost Open Educational Resources (OER), including open textbooks (Jhangiani *et al.*, 2018), and for innovative open pedagogy that recognizes student partner contributions to knowledge construction of OER (DeRosa and Robison, 2015).

Learning sciences

The LS an interdisciplinary field of scholarship focused on the study of how people learn and the development of new ideas, methods and ways of thinking about learning via a collaboration of researchers in educational psychology, cognitive science, computer science, anthropology and other disciplines (Sawyer, 2014).

I argue that LS research focused on tools, techniques and ingredients for nuanced designs of learning (Neelen and Kirschner, 2020) are directly relevant to online teaching and learning. As described above, many of our faculty wanted to create video lecture recordings for their online course delivery. Clark and Feldon (2014) suggest that multimedia such as videos provide a vehicle for instructors to deliver interactive and authentic learning activities, but caution that they are not a panacea. Using videos wrongly, for example, to record PowerPoint videos with spoken text alongside the same written text will increase students' cognitive load (Mayer, 2003). To apply LS research, LD can suggest instructors heed Mayer's multimedia principle of temporal contiguity to use images and spoken text at the same time. In addition, LD may suggest parsing long direct instruction videos into smaller segments, for example, worked examples to explain key concepts and show students how the instructor, a subject matter expert, extracts relevant information from a

complex problem (van Merriënboer and Kirschner, 2018). Shorter videos are not only more accessible to students with low-bandwidth connections but also encourage all students to practice spaced learning, where they benefit from short study sessions than trying to learn the same material in one long session (Neelen and Kirschner, 2020). LD can also explain that quizzes accompanying the videos force students to engage in retrieval practice, or retrieve information from memory, which helps them learn more effectively than having them reading over their notes (Adesope *et al.*, 2017).

Moreover, LS colleagues have also conducted self-directed and self-regulated learning research directly relevant to online teaching and learning. For example, in the USA, Canada and abroad, LS researchers have investigated students creating knowledge that is new to them in knowledge building communities, from kindergarten to higher education and workplace contexts. Knowledge building researchers have examined both individual reflective spaces (Brett *et al.*, 2009; Scardamalia and Bereiter, 2014) as well as in computer-supported collaborative learning environments (Cacciamani *et al.*, 2012; Cesareni *et al.*, 2015; Chiu and Fujita, 2014; Loperfido *et al.*, 2014). These studies emphasize the importance of creating a community online, in which students exercise epistemic agency or take on cognitive responsibility for their knowledge work. Surprisingly, LD who have recently embraced open pedagogy that empowers students as co-creators of knowledge (DeRosa and Robison, 2015) and students as partners (Cook-Sather *et al.*, 2014) seem unfamiliar with Knowledge Building theory, pedagogy and technology (Scardamalia and Bereiter, 2014), which has a long history that can be traced back to the 1980s and includes democratizing knowledge as one of its 12 principles.

Information science

IS is a scholarly field or discipline that deals with “effective communication of information and information objects, particular knowledge records, among humans in the context of social, organizational and individual need for and use of information” (Saracevic, 2009, p. 2570).

IS studies complement LS approaches by highlighting the role of information systems and computer–human interaction. The information retrieval and user/user cases research in IS can inform online teaching and learning in very pragmatic ways. For instance, most modern LMS and apps have a built-in tool to collect user data to analyse and graphically represent the data via dashboards. Such tools can allow instructors to analyse learner behaviour, epistemic beliefs and interactions with their instructor and peers in timely, meaningful and actionable ways to give learners formative assessment and assist with pedagogical decision-making (Johnson *et al.*, 2011; Vatrapsu *et al.*, 2011).

Information retrieval, educational data mining and data science techniques from IS can shed light on LMS data and allow researchers to identify productive online collaborations (Fujita and Teplovs, 2009; Teplovs and Fujita, 2013) and provide micro-analysis of learner behaviours that facilitate productive online discussions (Chiu and Fujita, 2014). Learning analytics is of great interest to my provincial (state) government that privileges performance metrics to determine funding to postsecondary institutions. Data use concerns our open education and critical digital pedagogy colleagues a great deal. They highlight concerns for the ethics of collecting personal data, the threat to privacy and big brother surveillance to further nefarious ideological agendas. An open, transparent and respectful conversation on the guiding principles, policies and procedures for learning analytics may appease their concerns about algorithms and AI and how it may or not affect a human agency in negative ways.

For LD to apply such IS research to practice, however, scholars will need to communicate the evidence-informed online teaching and learning techniques in simpler, more accessible and pragmatic ways than traditional, research articles in journals. IS researchers would benefit

from following in Neelen and Kirschner's (2020) steps to clarify the contribution of IS research to LD. Neelen and Kirschner counter common fallacies and myths that LD professionals espouse with evidence from LS research, but with practical examples and tools that are readily available, such as computer programs for word processing, spreadsheets, search engines, as well as ways of using tools such as a stylus for digital note-taking.

Both IS and LS researchers would be well served by following the example of open and critical digital pedagogy scholars to mobilize their knowledge using open-licensed and free educational resources shared via Twitter, blog posts, infographics, YouTube videos, open textbooks, courses and digital pedagogy labs or practitioner workshops to help LD and higher education teachers become aware of evidence-informed practices using social media. For example, Tweeting out links to OERs that feature short instructional videos, shared Google Docs and open textbooks with engaging interactive elements created with tools such as H5P will enable LD to put IS and LS research into practice.

Conclusion

In this viewpoint paper, I aimed to provide an overview of the pragmatic work of LD to help members of the IS and LS communities understand how evidence-informed learning design of online teaching and online learning in higher education is relevant to their research agendas and the ways in which they can contribute to this growing field.

I illustrated the pragmatic work of LD by describing the online pivot at one small, public Canadian university during the global coronavirus pandemic. LD rose to the challenge of supporting faculty to transition to online teaching. Beyond providing basic instructional design principles such as constructive alignment, backward design and UDL, LD offered faculty instruction in multimedia production, specifically video production and how to share these resources with students and colleagues. LD also introduced ways to build engagement in online courses through creating learning communities in online courses in which students shared responsibility for self-directed and self-regulated learning with the instructor.

The brief overviews of the LS and IS research indicate that LS and IS researchers have much to contribute to LD. However, mobilizing knowledge from these scholarly fields will require effort, particularly since LD professionals are currently not members of the IS and LS communities. Starting a collegial conversation that includes voices from open educational practices and critical digital pedagogy scholars may be a powerful vehicle to transform online teaching and learning design. We have much to learn from our colleagues in terms of disseminating our research in pragmatic ways via social media, OER repositories and open educational platforms. The coronavirus crisis places higher education as we know it at peril, but it also presents an unprecedented opportunity for us to examine the research-praxis nexus in online learning design *vis-à-vis* digital divide issues faced by precarious contingent faculty and diverse students and promote pedagogies of care and empathy for other humans.

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