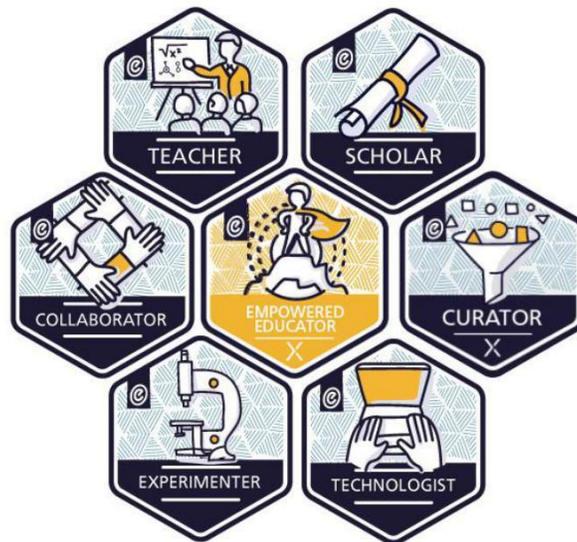


Shifting Perceptions, Changing Practice: Ontario Extend

extend



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Abstract

In 2017, eCampusOntario identified a need for a professional learning model to underpin a foundational approach to technology-enabled and online teaching. In response, we collaborated with six colleges and four universities in Northern Ontario to develop resource materials that could provide a common baseline of knowledge and complement specific training and development programs for online learning development.

The process included reviewing exemplary resources that were already available in Ontario, along with professional learning models from other jurisdictions. We also examined teaching and learning framework documents.

Our explorations of existing programs and reviews of current research revealed a foundational gap, which became the focus for design and development of the Ontario Extend professional learning program. This capacity-building initiative was grounded in the belief that the impact of learning should be the primary motivator for creating technology-enabled and online learning experiences. Its purpose was to help educators develop their digital skills and empower them to decide for themselves which technologies might best suit their students' needs. It included activity-based resources to provide a starting point to stimulate further thought and collaboration. (All of the resources are openly licensed [CC BY-NC-SA] and available for institutions to adapt, reuse, and remix.)

The program was initially offered in face-to-face, online, and hybrid versions, providing a hands-on opportunity for educators to experience the Ontario Extend professional learning program and to develop a strategy for integrating its open source resources within their own institutional professional learning programs.

After implementing the first iteration, we set out to evaluate the program to identify strengths and weaknesses that could be remediated by redesigning selected program elements. Our research focused on examining and analyzing the experiences of Ontario Extend through the lens of the developers, program facilitators, and participants. The purpose was to gain insights about ways to adapt the resources and activities so that they would be more relevant and linked to practice.

Our ambition to answer our questions about pedagogical value was not fully realized, due to lack of data. What the data did demonstrate, however, were the design principles that we might refine and test in Iteration 2 of Ontario Extend. As well, several participants told us that they had implemented and tested new ideas in their classrooms after completing the program. Iteration 2 of Ontario Extend is planned for January to March 2019.

The focus of Ontario Extend is on the personal and professional digital skills that are needed to make better decisions about teaching and learning with technology tools. Extend is grounded in the belief that digital fluency is a process, not a product, and that learning to teach effectively with technology requires an experiential learning approach.

As we adapt and revise professional learning programs designed to build digital skills for all educators, our goal should be to analyze the ways in which programs are designed in order to gain a deeper understanding of what works well and what doesn't, and not simply seek proof that the program works. The research should aim to articulate the design principles of a program and to gain evidence that can inform future development and implementation decisions. This type of information advances both the practical and theoretical understandings of ways to design educational initiatives to enable and enhance our praxis in a constantly evolving, technology-mediated world.

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Introduction

In 2017, eCampusOntario identified a need for a professional learning model to underpin a foundational approach to technology-enabled and online teaching. In response, we collaborated with six colleges and four universities in Northern Ontario to develop resource materials that could provide a common baseline of knowledge and complement specific training and development programs for online learning development.

The purpose of the program was to help educators develop their digital skills and empower them to decide for themselves which technologies might best suit their students' needs. It included activity-based resources that provide a starting point to stimulate further thought and collaboration for more deliberate course design and digital pedagogical practice.

The development and design of Ontario Extend was informed by both an analysis of exemplary resources that were already available in Ontario, along with professional learning models from other jurisdictions, such as [@ONE](#) from the [California Virtual Campus](#) and the [iTeachU](#) program at the University of Alaska Fairbanks. We also examined the flexible learning initiative from the University of British Columbia (2017). In addition, we reviewed the recommendations of several recent reports and articles (detailed in the Bibliography) including Towards a National Digital Skills Framework for Irish Higher Education (Allboardhe.org, 2015), Faculty Supports for Online Teaching (Schmidt & Carbol Consulting Group, 2014), and Pitfalls and Potential: Lessons from HEQCO-Funded Research on Technology-Enhanced Instruction (Lopes & Dion, 2015).

The 2017 summary report of the Canadian Online Learning Survey posits that over the past three years, online course enrolments have accelerated in Ontario, with 25% growth in the colleges and 20% growth in the universities. Outside Ontario, online course enrolments have increased by approximately 10% per year in universities, and 15% in colleges outside of Quebec (T. Bates, 2018). It is apparent from the survey that most colleges and universities are interested in increasing their hybrid, blended, and online course offerings. However, about two-thirds of the institutions in Ontario identified two main barriers or challenges to building capacity for technology-enabled and online teaching: a lack of suitable training and resistance from educators.

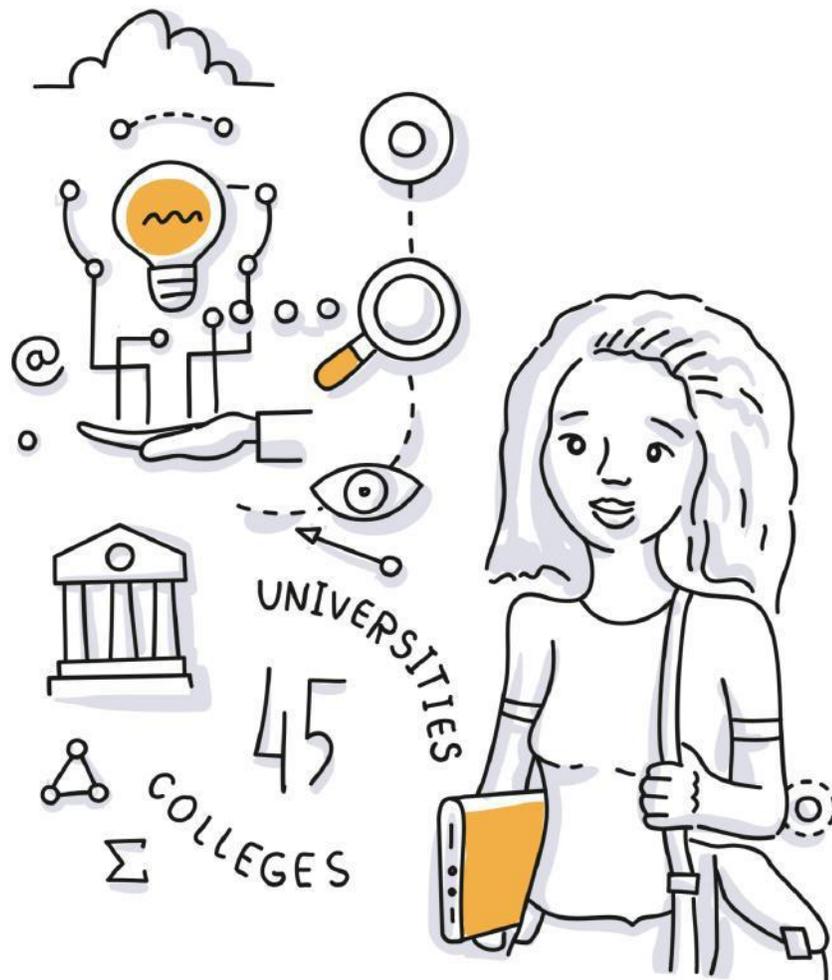
There is no question that institutions and their teaching and learning centres already have focused professional development programs and workshops, but our consultations clearly identified the need for additional training for online, hybrid, and technology-enabled learning. This led to the question, What was the gap between the training that was being offered by the centres and the perceived need for something additional or different?

From our explorations, we determined that an initial step in the continuum of professional learning opportunities was missing, that being a focus on foundational digital literacy skills. For there to be effective use of information about course design, templates, and quality indicators, it was essential to renew focus on the underpinning digital skills, knowledge, and attitudes that are critical to inform our teaching and learning practices. The intent was that the Ontario Extend program would complement the work of teaching and learning centres and the professional development programs for faculty that already exist.

The number-one request that emerged from our discussions with the six colleges and four universities was for information about designing courses, including a template, and a set of instructions and quality indicators. However, at the same time, we learned that some form of these scaffolds was already in place at the institutions. Further, in our review of recent literature, we found that the report Toward a National Digital Skills Framework for Irish Higher Education (Allboardhe.org, 2015) provides a review and synthesis of the kind of work on which we were focused, which were critical to informing the Ontario Extend prototype development.

The Irish report emphasizes that building capacity for digital learning requires more than providing templates for course design or quality indicators; it is about moving toward building confidence in online spaces and “nurturing opportunities for critical thinking, problem solving, creativity and innovation” (Allboardhe.org, 2015, p. 5). This perspective calls for a shift in our thinking.

Our study of Ontario Extend explores the experiences of educators who participated in the initial iterations of the program. It examines what, if any, pedagogical values and practice influenced the participants’ reviews after interacting with the program, and summarizes recommendations from participants for changes or improvements to the program design, materials, and facilitation strategy and approach.



Digital Literacy: The Foundation of the Ontario Extend Program

Faculty experience with technology varies, just as student experience does. Having access to and using technology tools in many areas of life does not necessarily equate to being comfortable with online learning and technology-enabled environments. This fundamental concept needs to be better understood; daily use of digital tools does not always translate into mastery or empowerment with those tools in the context of teaching and learning. Rather, users of educational technology exist on a continuum of knowledge, and gaps of knowledge vary among individuals. The Extend Program acknowledged this basic fact and aimed at providing a common baseline of knowledge through a “digital literacy approach” for today’s educators.

But what is, then, digital literacy? Coldwell-Neilson (2018) defines it as “the ability to identify and use technology confidently, creatively and critically to effectively meet the demands and challenges of living, learning and working in a digital society.” This definition evolved from one that is more basic: the ability “to understand and use information in multiple formats from a wide range of sources when it is presented via computers” (Gilster, 1997). As Martin and Grudziecki (2006) have also noted, to thrive (and not just survive) in a digital world, building knowledge, developing skills and shifting attitudes are required, as well as:

The awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process. (p. 255)

Critical to any definition of digital literacy—and what is apparent in the definitions above—is the awareness that the digital environment is continually evolving and that educators need a framework through which to continually update their own knowledge. As new technology tools emerge and learning environments evolve, the skills and knowledge associated with digital literacy also evolve. The search for key elements of such a digital literacy framework to empower educators was our quest during the development the Extend Program.

To be so empowered—with the skills to teach and learn in this ever-evolving digital milieu— educators have to continually engage in extending their abilities to use technology tools to perform tasks; solve problems; communicate, curate, and manage information; be cognizant of privacy concerns; behave ethically and responsibly; and collaborate, create, and share their work and knowledge. Gaining the skills and knowledge associated with digital literacy is, therefore, always an unfinished process.

All this is a tall order for educators, one that unquestionably requires an intentional strategy and a complementary support system. It also requires a range of different learning opportunities to acquire skills and knowledge, and to reflect on what it means to teach and learn both in ways that are new to us as educators or different from the ones we traditionally use.

Digital literacy defined as a developmental process—from access and functional skills to higher level capabilities and identity—is described in Sharpe and Beetham’s framework (2010) and illustrated in Figure 1.

Defining digital literacy: a general model

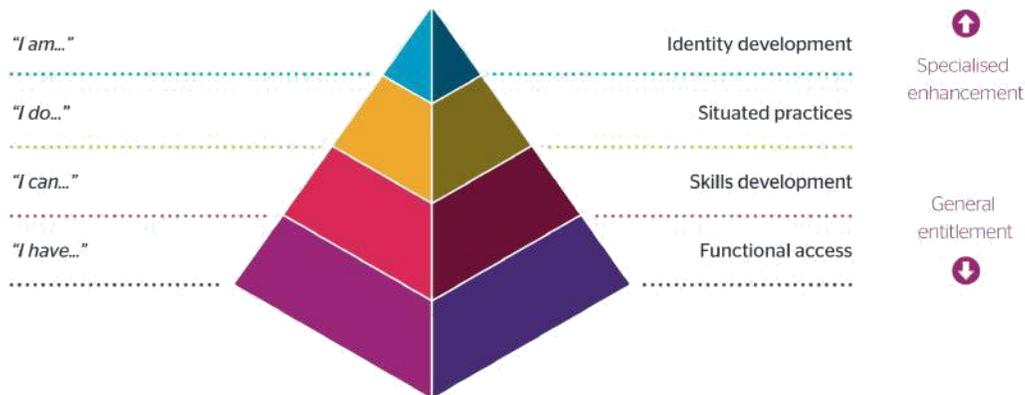


Figure 1. Pyramid model of digital literacy (Sharpe & Beetham, 2010, updated by JISC, 2014)

Designing an eCampusOntario Framework for Building Digital Skills

As an approach to rethinking what we should be doing as educators, we began by planning a design-based initiative that would become a framework for practice—one that could be implemented and evaluated systematically. The components we considered included:

- Informing the framework with research.
- Identifying a practice model that reflects the attributes of empowered educators, adapted from Simon Bates (2016).
- Building the Extend model: prototyping the design of six modules.
- Designing implementation models such as social networks and project-based activities.
- Designing an evaluation model that supported later refinements of the program.
- Identifying design principles that could be supported by research and further developed in practice.

We also asked ourselves these questions:

- What do educators need to know, think, and do in order to build digital knowledge, skills, and attitudes as the first steps to enhancing and extending how they design and deliver learning experiences in face-to-face, hybrid, or online environments?
- Acknowledging that identifying our specific learning needs is often a difficult task, as it requires stepping out of our frame of reference, how do we know what we don't know, or even know that we don't know?
- How do we identify and learn to teach using different ways and tools that we haven't previously learned?
- What levels of personal discomfort will the process of learning cause?

With a specific set of design elements in mind, and our own initial thoughts about answers to the reflective questions, we began to consider the affective nature of the learning design for Ontario Extend. Rather than seeing it as a traditional program of study, our interest was in developing a self-directed learning program, driven by the interests of participants and supported by a network of mentors and colleagues. We set out to build a process for engaging educators in a professional learning approach that could grow and evolve over time to match emergent needs or the advent of new technologies. We wanted to encourage risk taking and experimentation and provide networked opportunities for a personal professional presence associated with scholarly teaching.

Professional Learning versus Professional Development

Over time, the term “professional development” has taken on the connotation of something that is delivered to educators in order to influence their practice; it is something that is done to and for them. Such professional development activities often lead to certificates of participation.

In contrast, we believe that “professional learning” is grounded in the notion that learning results from what an individual does and thinks, and only from what they do and think. We can, therefore, advance learning only by engaging others in doing and thinking, and not by doing things to and for them (Ambrose & Bridges, 2010).

A key element of many professional learning programs is that they are outcomes-based, and therefore “success” requires evidence of completing the program. The goals are intentional; individuals extend their professional knowledge by engaging and interacting with learning resources and activities in a way that challenges previous assumptions and leads to a change in practice. This process will empower educators to make informed decisions about the practices and technologies that will best suit the needs of their students and their own continuing professional learning needs.

In the context of Ontario Extend, educators attained badges with articulated criteria as evidence of successfully achieving learning outcomes and completing the program.

Theories of Learning and Professional Learning Programs

As noted by Steinert (2012), theory is noticeably absent from the literature of professional learning. A personal request we made to a popular and very active listserv in August 2018 for resources that discuss theoretical frameworks for faculty development or professional learning programs did not yield any responses. Therefore, we decided to follow a constructivist approach to the design and facilitation of the Ontario Extend program, grounded by the belief that learning occurs when learners are actively involved in a process of knowledge construction. We incorporated aspects of several learning theories, including self-directed learning, social learning, situated learning, and cognitive apprenticeship.

Self-directed learning was championed in Alan Tough’s 1971 book, *The Adult's Learning Projects*. At the time of publication, it was heralded as a fresh approach to theory and practice in adult learning. Tough emphasized the importance of learners taking control of and planning their learning episodes. Building on this thinking, Knowles (1975, 1984) noted that adult learners have accumulated a foundation of life experiences and knowledge and they want it be acknowledged. Both approaches underscore that adult learners want to choose what they learn and when they learn it, and wherever possible, they want the learning to be self-directed.

This does not mean that learning takes place in isolation from others. Self-directed learning may involve activities with others; shared resources; facilitators to encourage, enable, and extend learning, or to provide feedback and prompt varied ways of thinking. Hiemstra (1994) suggests that self-direction is best viewed as a “continuum or characteristic that exists to some degree in every learner and learning situation” (p.1).

Social learning theory (Bandura, 1971) and self-efficacy (Bandura, 1977) offer other schemas with which to integrate the cognitive and social aspects of professional learning. Watson’s (2013) social learning research concludes that a space to experiment with and explore different ways of doing things in a context where learners are given “permission” to try something new, and are supported while doing so, is critical to learning. Teachers also benefit from having a space in which to experiment and explore different ways of teaching, and they value contexts that are designed to facilitate this.

Situated learning theory (Lave & Wenger, 1991) postulates that we learn best by performing tasks and solving problems in an environment that reflects the multiple ways in which knowledge will be put in place in professional practice. The theory of cognitive apprenticeship (Collins, Brown & Newman, 1987) adds to this by emphasizing that people learn from each other through observation, imitation, and modelling. Cognitive apprenticeship theories suggest that the learning environment must enable learners to acquire, develop, and use cognitive tools in activities authentic to the domain in which the knowledge and skills will be applied. Cognitive apprenticeship aims to make thinking visible so that learners can observe, enact, and practise implicit knowledge (Brown, Collins & Duguid, 1989).

Free Range and Networked Learning

When designing the Ontario Extend Program, in addition to theories of learning, we also considered the concept and pedagogical views of free-range learning and connectivism:

- Glenda Morgan and colleagues refer to free-range learners as “experiential”; learners who realize that they have a need to learn but are not very likely to set aside specific times to study (Morgan et al., 2012). They prefer not to enrol in a course with start, end, and due dates. A program that enables free-range learning provides a basic structure but allows varied opportunities for learners to discover or learn on their own.
- Connectivism (Siemens, 2005) emphasizes the role of social and cultural contexts in how and where learning occurs, and proposes that networks are key to learning.

Grounded in the theories of learning and the concepts noted above, we set as a goal for Ontario Extend to appeal to both learners who want a structured approach so they engage with the activities sequentially in the order that they are presented, and also to those who want “just-in-time-learning” with a very specific personal goal in mind.

Building the Framework: Extending Digital Skills

We examined three schools of thought on which to ground Ontario Extend and build the framework: anatomy of the 21st century educator, digital capability, and interconnectedness between learning and technology.

Anatomy of the 21st Century Educator

Simon Bates (2016) provides a model for the anatomy of the 21st century educator that encompasses the knowledge, skills, and attitudes identified as the foundational skills required to “thrive (and not just survive) in a digital world” (Coldwell-Nelson, 2018; Martin & Grudziecki, 2006). The model (see Figure 2) proposes that all educators must have:

- An understanding and appreciation of what research has to say about how people learn.
- The ability to curate, develop, use, and share appropriate educational resources.
- Skill in discerning the possibilities—and limitations—of technology to support teaching and learning.
- Professional learning networks through collaborations with other disciplines.
- A scholarly approach to teaching.
- A willingness to experiment: to try, reflect, and learn from new approaches, pedagogies, and technologies to support learning (S. P. Bates, 2016).

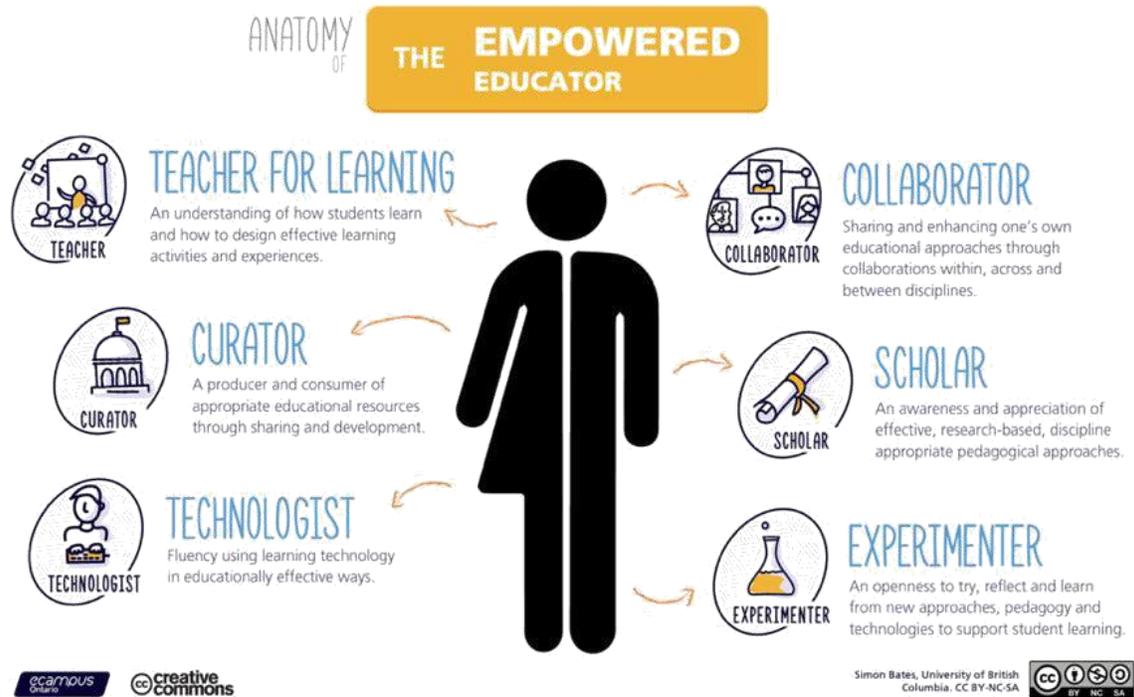


Figure 2. Anatomy of the 21st century educator (S. P. Bates, 2016), as adapted by eCampusOntario

This “anatomy” and the belief that the impact on learning should be the primary motivator for creating technology-enabled and online learning experience are part of the contextual framework in which the Ontario Extend program is grounded.

Digital Capability

The Ontario Extend Program comprises resources and activities that challenge educators to explore different modes and formats for teaching and learning, to create and collaborate using digital technology tools, and to discern what approaches work best for their specific contexts as they design online and technology-enabled learning experiences. The program is by no means all-encompassing, but it does reflect many of the core themes outlined in a wide range of digital skills and competencies models (Allboardhe.org, 2015, pp. 19-25). It also fits with the work done by JISC, the second school of thought we relied on, in developing its own digital capability framework (2018), which states that:

Building on our previous work on developing digital literacies for staff and students and through a consultation with a range of stakeholders using our co-design approach, we identified the current challenges institutions face when developing the digital capabilities of their staff and students. Our digital capability framework describes the skills needed by staff from a wide range of academic, administrative and professional roles to thrive in a digital environment. (JISC, 2018, p. 1)

Figure 3 illustrates the JISC framework.

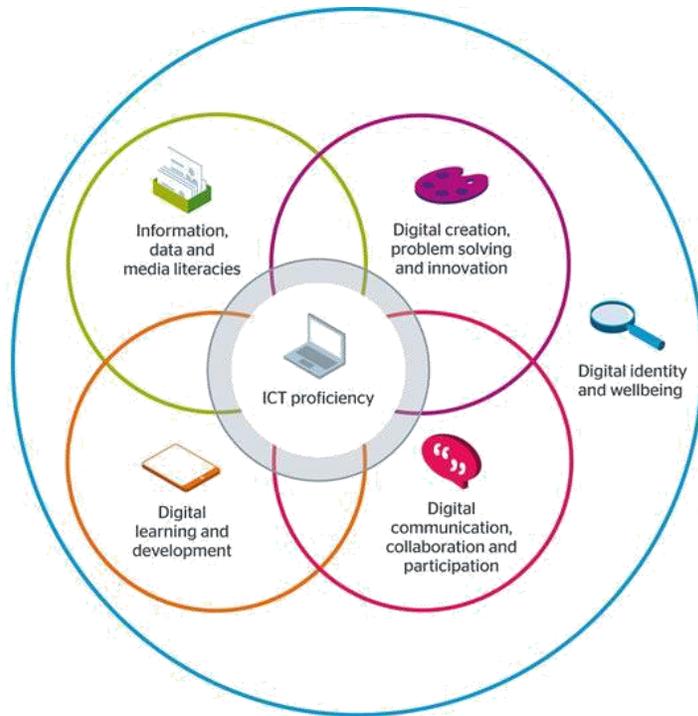


Figure 3. Digital capability framework (JISC, 2018)

Interconnectedness of Learning and Technology

The third school of thought, a conceptual model representing the interconnectedness of learning and technology and the recursive process that underlies it, emphasizes the need that we set out to address in the Ontario Extend program. New technologies that will impact learning continue to emerge, so it was essential to use a model that illustrates a continuous process, as is illustrated in Figure 4.

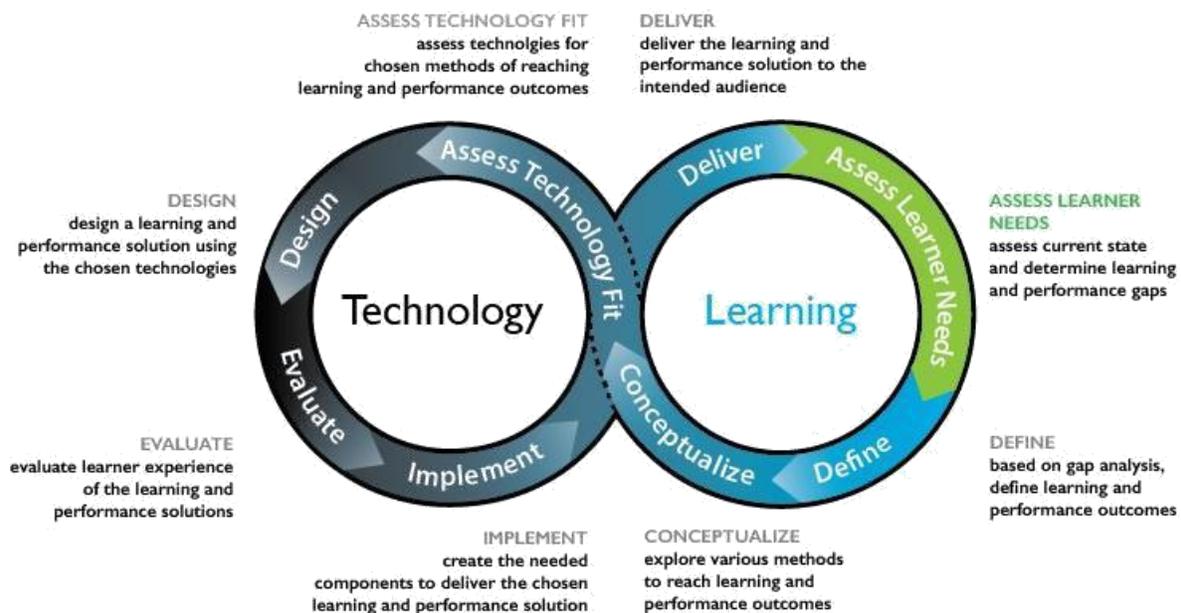
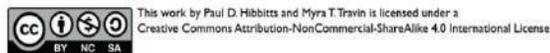


Figure 4. Model of interconnectedness of learning and technology (<https://opentextbc.ca/teachinginadigitalage/hibbits-and-travin-model-2/>)



Ontario Extend is designed to use a collaborative approach to knowledge building, skill development, and resource sharing to support the technology-enabled learning initiatives of institutions. The intention is for the program to provide the resources and activities to extend the digital knowledge and skills of educators (all academic staff, administrators, and faculty) and provide a foundation for developing resources and shaping curricula that is enabled or enhanced by technology tools. As technology tools change and the skills of educators evolve, so will the ways in which the Ontario Extend resources are used. The program is and always will be a work in progress.

Overview of Ontario Extend

The topics covered in the six Ontario Extend modules are based on the Anatomy of 21st Century Educator (S. P. Bates, 2016):

- Teacher for Learning
- Technologist
- Curator
- Collaborator
- Experimenter
- Scholar

Beyond the six modules, another key element of the Extend Program is the Domain of One's Own project (Wired Magazine, 2012), which provides a way for educators to have a digital space that is entirely their own in which to experiment and to practise the attributes.

Details for each of the modules are available at <https://ecampusontario.ca/extend>. Educators are encouraged to share ideas and respond to daily activities via Twitter and the Extend Activity Banks.

Successful completion of the Extend activities, which demonstrate achievement of the outcomes for each of the program modules, is recognized with digital badges, as illustrated in Figure 5.

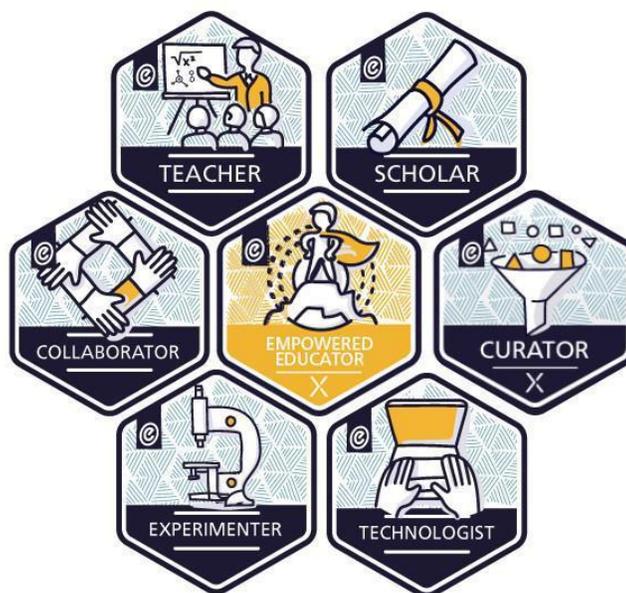


Figure 5. Ontario Extend digital badge system

Enabling Connections and Expanding Professional Learning Networks

In addition to the modules of Ontario Extend, another key component of the program is using tools and strategies to enable connections among and between educators to expand their professional learning networks.

One of the popular tools used by educators today is Twitter. Among educators who are active on Twitter, there is a strong belief that it is a valuable tool for building a professional learning network to connect with others worldwide, thereby allowing educators to learn from each other and keep up-to-date on what is happening in education, and to share resources (Ross, Maninger, LaPrairie & Sullivan, 2015). Anecdotal evidence and mainstream conversations also suggest that Twitter has the potential to provide an open online space to support professional learning. Jenkins, Ito, and boyd (2015) posit that online social networks enable self-directed learning and participatory practices, which are key goals of the Ontario Extend program.

A question that was continually asked throughout the first iteration of Ontario Extend was, What needs to happen for educators to use social media, and in particular a platform such as Twitter, so that is “easy” and offers opportunities to extend professional networks and enable connections with other educators?

Many articles have explored the ways in which educators could use Twitter to complement their professional learning. There is, however, a dearth of research that explores the “complexities of professional learning in online spaces” (O’Keeffe, 2017, abstract) and that examines the reasons why, for so many, Twitter is a barrier to participation in a program that requires its use.

Our experience shows that some of the challenges of using Twitter include lack of boundaries between the personal and professional, lack of prescriptive or exemplary practices, concerns about

data collection and privacy, and increased political tensions. Each of these factors weighed differently against potential positive outcomes noted by scholars (Tweet @olgamariab Olga Belikov, October 23, 2018). In future iterations of Ontario Extend, the challenge of using Twitter and ways of overcoming the barriers to its use will be investigated and analyzed.

Design Principles for Resources

Throughout the work of the development team, ongoing conversations took place about design and the embedding of intentional design principles into the resource materials. As we reviewed literature on learning theory and digital literacy, we identified a series of principles and embedded them in our development process: These principles include:

1. Focus on digital skills.
2. Ground in constructivism and activity-based learning.
3. Enable self-directed and self-driven learning.
4. Build a digital professional presence (and confidence).
5. Engage learners in social, collaborative, and community-building activities.
6. Encourage risk taking and experimentation.
7. Generate resources to impact teaching practices.
8. Create an open, adaptable, and customizable resource.

Implementing Iteration 1 of Ontario Extend

With the above principles embedded, we offered the Ontario Extend program to three groups of education practitioners. A cohort of 30 participants from Northern Ontario assembled in Toronto in August 2017, the Summer Institute, for the initial offering over two and a half days. We determined that it was easier for these educators to assemble in Toronto than in any of the four major northern communities because of travel and accommodation logistics.

Two additional cohorts assembled in in spring 2018. On March 29 Fleming College (Peterborough) hosted Extend East, which comprised 29 in-person and 22 virtual participants for a one-day introductory event, followed by a 12-week online experience that spent two weeks on each of the six modules using a self-directed learning approach with community engagement through Twitter. A similar format was used for Extend West at Lambton College (Sarnia) on May 8, which was also followed by a 12-week online experience. There were 33 in-person and 35 virtual participants in this cohort.

In addition, the University of Windsor adapted the Ontario Extend materials to work within its learning management system as a component of a new faculty on-boarding process in spring 2018. The Windsor example demonstrated the opportunity to work collaboratively with centres for teaching and learning on institution campuses and to use the Extend resources to complement existing professional programs.



Evaluating the Ontario Extend Program: Iteration 1

After implementing the first iteration of Ontario Extend, we set out to evaluate it with a view to identifying strengths and weaknesses that could be remediated by redesigning selected program elements in subsequent iterations.

Design-Based Research as a Guide to Evaluation

We used an iterative design-based research model to evaluate the prototype Extend modules and facilitation process, and to identify a set of design principles to inform further development and implementation of the program. We chose this method because it “is a research methodology aimed to improve educational practices through systematic, flexible, and iterative review, analysis, design, development, and implementation, based upon collaboration among researchers and practitioners in real-world settings, and leading to design principles or theories” (Wang & Hannafin, 2005, p. 2).

This view is supported by other researchers. Amiel and Reeves (2008) have stated that when doing research in education, to evaluate the use of a tool or a phenomenon, researchers must also analyze the principles that guide their research and the values that are promoted by their agendas. Wang and Hannafin (2005) further note that “researchers in design-based research processes collaborate intimately with participants to achieve theoretical and pragmatic goals that will ultimately change educational practices in a maximum extent” (Wang & Hannafin, 2005, p. 1).

Regardless of the model used, it is difficult to evaluate any learning experience and, in particular, those experiences related to professional learning. Questions soon arise: where does the power reside with determining what is valued, rewarded, and considered justifiable or meaningful to learn, and therefore what should be evaluated?

The challenge of extending our skills, knowledge, and attitudes to enhance technology-enabled learning experiences is complex. We had no preconceived notion that the Ontario Extend Program might be the solution to doing so. We viewed the program as a starting point: one that would require adaptation and contextualization over time in different contexts. We believe that there is no single linear or single stage based on a progression from novice to expert and, as Webster-Wright (2009) posits, that learning happens in different ways depending on interest and driven by practice.

Our research, therefore, focused on examining and analyzing the experiences of the Ontario Extend Program through the lens of the program developers, facilitators, and participants, rather than on evaluating the delivery of the program. The aim was to identify the professionals’ experiences of their participation in the program, focusing on the context, complexity, diversity, and their objectives for participating. The purpose was to gain insights about ways to adapt the resources and activities so that they would be more relevant and linked to practice. How did engaging in this program impact professional knowledge used in practice? How did that learning happen? What was the process for learning? These were our questions.

The Research Framework

Ten years ago, Amiel and Reeves (2008) argued a point that is still pertinent today:

Much research in educational technology still ignores the complex interaction between technological interventions, the roles of educational institutions such as schools and universities, the purposes of education, and the meaning of research. Many educational technology researchers adhere to a value-free discourse regarding the role of technology... Researchers must begin to question their research methods due to the complexity of the environment under study. Investigations of how a “tool” does or does not affect educational outcomes are too simplistic.

Second, researchers must question the values that are guiding research agendas, actively engaging with practitioners in constructing what constitutes valuable research, in order to help direct technological development rather than react to it. (p. 32)

Amiel and Reeves (2008) proposed that engaging in design-based research provides a framework that allows research and practice to be intertwined. This approach begins with both the researchers and practitioners examining the problems. Grounded in a theoretical framework, solutions can be developed. Next is an iterative process of exploring, evaluating, and refining the innovation/educational technology tool solutions in practice. The goal of this research is not just evaluation, but a continuous reflection to refine the innovation as well as the methods and design principles used along the way.

Figure 6 compares this approach (bottom half of figure) to a predictive research approach (top half of figure) that starts with the hypotheses, based on existing theories, then moves to an experiment phase designed to test the hypotheses.

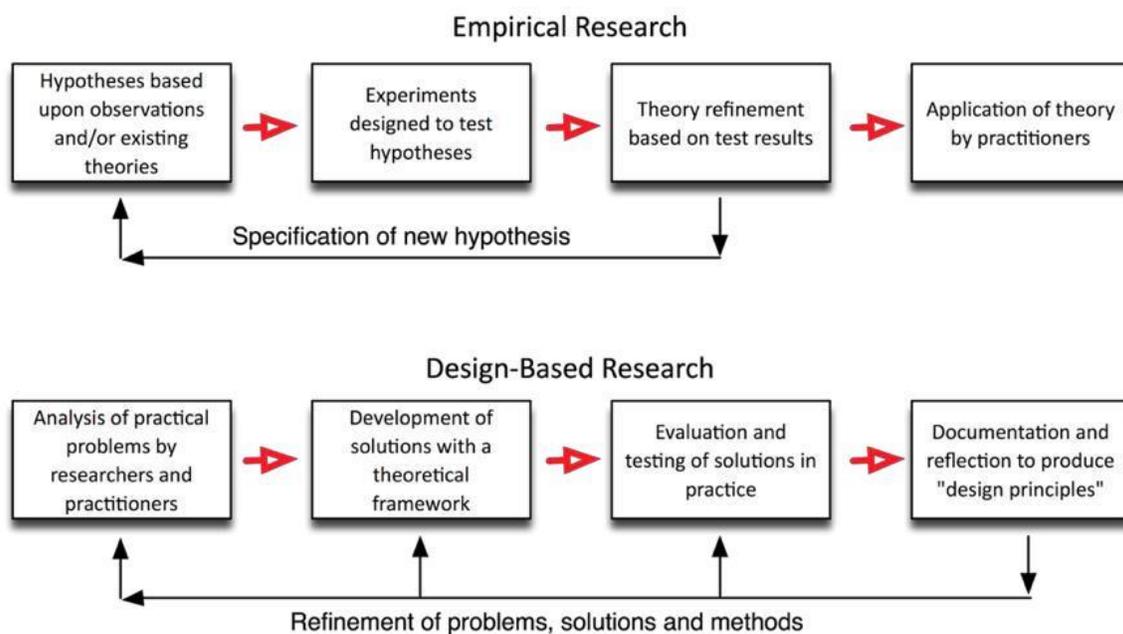


Figure 6. Comparison of empirical research and design-based research processes (adapted from Reeves, 2006)

Questions Asked

Two research questions guided our initial inquiry:

1. What pedagogical values and practice influences do educator-participants report after their interactions with the Ontario Extend professional learning program?
2. What changes or improvements do Ontario Extend participants recommend to the program design, program materials, and/or facilitation strategy/approach to training?

The Research Participants

There were three cohorts in Iteration 1: 30 participants in the Summer Institute (face-to-face), 50 in Extend East (face-to-face and online), and 51 in Extend West (face-to-face and online). Among those three cohorts, the persistence and attrition differed.

It was easy to keep the Summer Institute participants on task through guided sessions over two and a half days because we had multiple facilitators and everyone worked in the same space over the allotted time period. However, feedback from that initial cohort indicated that the compressed time frame was insufficient to effectively receive, practise, and process the Ontario Extend materials.

The cohorts in Extend East and Extend West suffered attrition from the outset, with participation levels dropping immediately to 35 and 37 respectively after the initial face-to-face and virtual introductions. Even with a stated requirement of a minimum of 18 hours participation over a 12-week time frame, some participants were not able to commit or sustain their engagement with the Extend program.

Findings

Our intent from the beginning of Extend was to find a design format that suited the needs of educators for developing fundamental skills with technology-enabled learning by exploring the six attributes of 21st century educators identified by Simon Bates (2016). The program focused initially on the digital fluency, while building the confidence of the participants to explore the six attributes and develop a set of personal skills that would be valuable in their own classrooms.

We had hoped that the outcomes of the program would help us to understand the pedagogical value of the program from the perspective of the participants, and also gain insight into refining the Extend resource materials and the facilitation models we had tested in Iteration 1.

At the conclusion of the Extend East and West cohorts, we asked for voluntary participation in a survey and follow-up interviews from participants and the developer-facilitator team members. Our purpose was to elicit thinking about pedagogical value and recommendations for refinement of the Extend program for subsequent iterations. We received 16 responses to the survey from active participants and two responses from participants who dropped out. We conducted 12 interviews ranging from 20 to 40 minutes with a voluntary sample of program participants and developer-facilitators. Survey and interview responses were coded for analysis using the Dedoose qualitative analysis software environment.

Assessing pedagogical values and practice influences

Our ambition to answer the pedagogical value question was not fully realized. While the data showed that the conceptual approach we had employed with Extend was congruent with the needs of faculty and instructors, we did not have enough data to draw any firm conclusions about the ways in which participants changed their practice based on what they learned in the program. However, there were individuals who indicated that following the program they had moved from exploring the six attributes to implementing and testing new ideas in their classrooms. The Twitter stream (@OntarioExtend) and the Extend blog environment (<https://extend-domains.ecampusontario.ca>) provide numerous examples of reflective practice of the sort we had hoped to more generally describe across the cohorts. We will explore a more focused approach to documenting practice changes in Iteration 2 of Extend.

Improving the program design, resources, and the facilitation model

What the data did demonstrate more explicitly were the design principles that we might refine and test in Iteration 2 of Ontario Extend. We have aligned our findings from our survey and interview data from Iteration 1 with the initial design principles, and then identified recommendations for Iteration 2 (see Table 1).

Iteration 2 of Ontario Extend is planned for January to March 2019, and there will be a subsequent iteration for francophone educators later in spring 2019.

Table 1. Emergent Design Principles and Recommendations from Iteration 1 of Ontario Extend

Design Principles	Findings from Iteration 1	Recommended changes for Iteration 2
Focus on digital skills	<ul style="list-style-type: none"> Anatomy of a 21st Century Educator (S. P. Bates, 2016) is a useful framework that resonated with participants 	<ul style="list-style-type: none"> Connect digital skills with research on digital fluency and requirements for research-informed practice using technology-enabled learning
Ground in constructivism and activity-based learning	<ul style="list-style-type: none"> Some activities were too difficult for some educators engaged in building fundamental skills User requirements/base IT skill level should be articulated Too many Daily Extend activities and purpose of those activities are not always clear to participants 	<ul style="list-style-type: none"> Rethink timing of introduction of Twitter and Domain of One's Own until later in the program Reinforce multiple entry points and multiple exit points for all participants, so that participation can be tailored to needs Limit Daily Extend activities to "work" week and target them to pedagogical practices
Enable self-directed and self-driven learning	<ul style="list-style-type: none"> Guidance needed to set context of self-directed learning Provide explicit criteria for earning badges and how to build and evidence portfolio 	<ul style="list-style-type: none"> Use videos and advance organizers to situate the learning outcomes of each module Use a structured approach at the beginning of a cohort to provide context and clarify time requirements Promote badges as a motivator to complete the activities for each module Make badging requirements clearly articulated and transparent
Build a digital professional presence (and confidence)	<ul style="list-style-type: none"> Need to scaffold the learning to build confidence in open praxis Find ways to encourage participants to share discipline specific resources created for the Daily Extend activities 	<ul style="list-style-type: none"> Emphasize a shift in thinking from professional development to professional learning Intentionally focus on reflective practice
Engage learners in social, collaborative, and community-building activities	<ul style="list-style-type: none"> Having a diversity of voices and experiences was a strength Competitive activities may deter some who feel they can't keep up with the front runners It's easy to get lost in the "open spaces" 	<ul style="list-style-type: none"> Provide more support to encourage the use of social media tools. Where possible, arrange for educator-learners to have access to mentors to encourage better participation in the program As much as possible the activities should be related to teaching practice
Encourage risk taking and experimentation	<ul style="list-style-type: none"> The activities are both simple and challenging Asking participants to publicly share work can be perceived to be a "high-risk" activity 	<ul style="list-style-type: none"> Provide better scaffolding and peer support mechanisms to encourage and support experimentation Use focused strategies that support risk taking Have opportunities for sharing in a space that is not "open" to the public
Generate resources to impact teaching practices	<ul style="list-style-type: none"> Discipline specific ideas and examples of work are needed 	<ul style="list-style-type: none"> Strengthen the curation and evaluation process for resources generated by Extend participants Engage on-campus teaching and learning centres to champion the use of the Extend program and adapt it to institutional contexts Ensure criteria for digital badges can be related to praxis
Create an open, adaptable, and customizable resource	Ease of adaptability/portability across modules is an asset of the program	<ul style="list-style-type: none"> Experiment with alternative delivery platforms, including more structured environments such as Open edX that can be used to scale the delivery process beyond cohort sizes of 30 to 40 participants Build relationships with teaching and learning centres for sustainability, and to promote the program and extend its reach

Conclusion and Recommendations

Changing Mindsets: The Need for Empowered Educators

The 2018 National Survey of Online and Digital Learning Report has released some findings prior to its December 2018 release date (see <https://onlinelearningsurveycanada.ca> for data highlights and more about the upcoming report). The study reports that 73% of institutions surveyed identified inadequate training and support as the main barrier to building capacity for technology-enabled and online learning. However, we know there are myriad well-designed programs offered at teaching and learning centres, or their equivalents, in colleges and universities across Ontario. So, we are left wondering what exactly are the inadequate supports that these survey respondents perceive as being the barrier? What is it that they believe they do not know? And, what would a program look like that could address these perceived barriers?

As previously noted, Coldwell-Neilson (2018) have defined digital literacy as “the ability to identify and use technology confidently, creatively and critically to effectively meet the demands and challenges of living, learning and working in a digital society” (p. 3). This aspect of digital literacy (or digital fluency) has been the focus of Ontario Extend and the purpose of this study. Undoubtedly, teaching and learning in technology-enhanced or fully online spaces have specific requirements associated with content creation, resource acquisition, facilitation of learning experiences, and design of effective assessments. It is our belief that there may be fundamental conceptions of technology use that are precursors to the successful use of more targeted training programs available through institution-sponsored programs for faculty development.

The Ontario Extend Program proposes a framework and a series of challenges that focus on extending knowledge about, and skills required for, designing and developing a spectrum of technology-enabled learning experiences. It calls on us to change our mindset about the foundation that is required to enable and enhance teaching and learning in 2018 and beyond. Extend is intended to help shift our perceptions about the ways that capacity-building professional learning programs in our institutions might be designed if we want to change our practices.

The focus of the Ontario Extend Program is on the personal and professional digital skills that are needed in order to make better decisions about teaching and learning with technology tools. Extend is grounded in the belief that digital fluency is a process, not a product, and that learning to teach effectively with technology requires an experiential learning approach that:

- Connects digital skills with research on digital fluency and requirements for research-informed practice using technology-enabled learning.
- Has clearly articulated IT skill levels required for active participation in the different programs.
- Explicitly articulates the criteria for completing the program.
- Provides guidance using advance organizers to set the context for learning.
- Offers activities that are both simple and challenging.
- Offers anytime, anywhere access, and wherever possible has multiple entry and exit points.
- Offers resources that are current, relevant, and grounded in the research on learning and that have practical implications through examples and illustrations.
- Uses announcements and reminders providing information about the program’s schedule and tasks to keep the participants engaged and on track.
- Scaffolds the learning to build confidence in open praxis.

As we adapt and revise professional learning programs designed to build digital skills that are required for all educators, we offer a word of caution about evaluating those programs using research that aims to compare them: it may be time for us to stop the practice of asking and researching whether one modality of learning works better than another. Decades of research has shown that ultimately there appears to be no significant difference in student outcomes among traditional, technology-enabled, or online learning (<http://nosignificantdifference.org>).

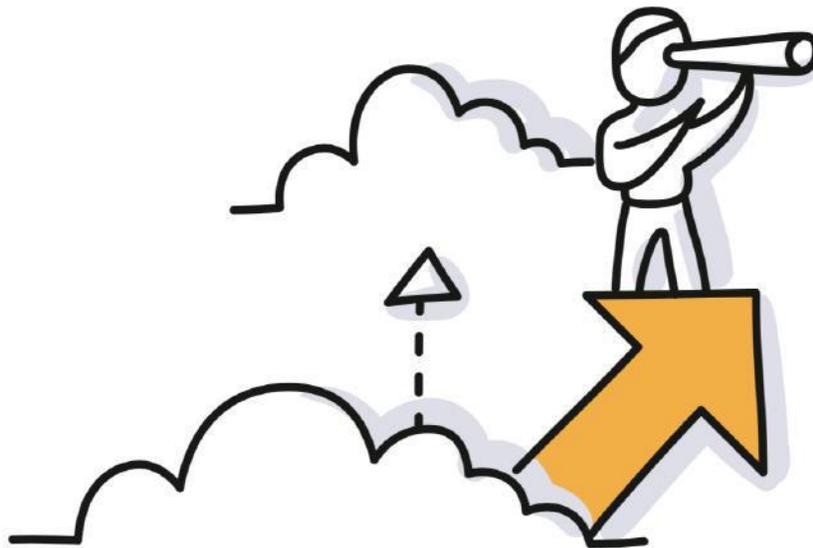
Our goal should be to analyze the ways in which programs are designed in order to gain a deeper understanding of what works well and what doesn't, and not simply to seek proof that the program works. The research should aim to articulate the design principles of a program and to gain evidence that can inform future development and implementation decisions for it and similar programs. This type of information advances both the practical and theoretical understanding of ways to design educational initiatives to enable and enhance our praxis in a constantly evolving, technology-mediated world.

Open Praxis

The Ontario Extend Program provides a hands-on opportunity for educators to experience the activities and resources developed for the professional learning program and to develop a strategy for integrating its open resources within their own institutional professional learning programs.

The Ontario Extend resources are intended to be a starting point: an activity-oriented set of challenges to stimulate further thought and collaboration.

All of the resources are openly licensed (CC BY-NC-SA) and are available for institutions to adapt, reuse, and remix.



Bibliography

- Allboardhe.org. (2015). Towards a National Digital Skills Framework for Irish Higher Education. *All Aboard: Enabling & Empowering Staff & Students to Flourish in the Digital Age*. Retrieved from <http://allboardhe.org/DSFramework2015.pdf>
- Allan, M., & Grudziecki, J. (2006). DigEuLit: Concepts and tools for digital literacy development. *Innovation in Teaching and Learning in Information and Computer Sciences*, 5(4), 249-267. doi: 10.11120/ital.2006.05040249
- Ambrose, S. A., & Bridges, M. W. (2010). *How Learning Works: Seven Research-Based Principles for Smart Teaching*. San Francisco: Jossey-Bass.
- Amiel, T., & Reeves, T. C. (2008). *Design-based research and educational technology: rethinking technology and the research agenda*. *Educational Technology & Society*, 11(4), 29-40. Retrieved from https://pdfs.semanticscholar.org/7e4c/d713fecb6223cb7b78cb4dd5ae2253904eea.pdf?_ga=2.61530860.1509087248.1536086458-1424564471.1536086458
- Bandura, A. (1971). *Social Learning Theory*. New York: General Learning Press. Retrieved from http://www.asecib.ase.ro/mps/Bandura_SocialLearningTheory.pdf
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191-215. Retrieved from <https://www.uky.edu/~eushe2/Bandura/Bandura1977PR.pdf>
- Bates, A.W. (2015). *Teaching in a Digital Age: Guidelines for Designing Teaching and Learning*. Vancouver, BC: Tony Bates Associates Ltd. Retrieved from <https://opentextbc.ca/teachinginadigitalage/>
- Bates, A.W. (2018). The 2017 national survey of online learning in Canadian post-secondary education: methodology and results. *International Journal of Educational Technology in Higher Education 2018*, 15(29). Retrieved from <https://doi.org/10.1186/s41239-018-0112-3>
- Bates, S. P. (2016, September). *The 21st Century Educator*. Keynote speech at the Symposium for Effective Teaching presented at UOIT, Oshawa, Ontario. Retrieved from, https://www.slideshare.net/EdPER_talks/the-21st-century-educator-65570909
- Bell, S., Benatti, F., Edwards, N. R., Laney, R., Morse, D. R., Piccolo, L, & Zanetti, O. (2018). Smart cities and M3: rapid research. Meaningful Metrics and Co-Design. *Systemic Practice and Action Research*, 31(27), 27-53. Retrieved from <https://doi.org/10.1007/s11213-017-9415-x> Available from <https://link.springer.com/article/10.1007/s11213-017-9415-x#citeas>
- Boyer, E. L. (1990). *Scholarship Reconsidered. Priorities of the Professoriate*. Washington, DC: The Carnegie Foundation for the Advancement of Teaching.
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32-42. Retrieved from <https://core.ac.uk/download/pdf/4826414.pdf>

- Coldwell-Neilson, J. (2018). *Decoding digital literacy*. Retrieved from, <http://www.decodingdigitalliteracy.org/digital-literacy.html>
- Collins, A., Brown, J. S., & Newman, S. E. (1987). *Cognitive apprenticeship: teaching the craft of reading, writing and mathematics (Technical Report No. 403)*. Cambridge, MA: Centre for the Study of Reading, University of Illinois. January, 1987. Retrieved from https://www.ideals.illinois.edu/bitstream/handle/2142/17958/ctrstreadtechrepv01987i00403_opt.pdf?sequence
- Dahlstrom, E. (2015). *Educational Technology and Faculty Development in Higher Education*. Louisville, CO: ECAR. Retrieved from <https://library.educause.edu/~media/files/library/2015/6/ers1507-pdf.pdf>
- Dreyfus, H. L., & Dreyfus, S. E. (1986) *Mind over Machine. The Power of Human Intuition and Expertise in the Era of the Computer*. New York: The Free Press.
- European Union. (2014). *Report to the European Commission on new modes of learning and teaching in higher education*. Luxembourg: Publications Office of the European Union. Retrieved from http://ec.europa.eu/dgs/education_culture/repository/education/library/reports/modernisation-universities_en.pdf
- Fisher, K. (2010). *Technology-enabled active learning environments: an appraisal*. Paris: CELE Exchange, OECD. Retrieved from <http://www.uwo.ca/wals/pdf/technology-enabled.pdf>
- Gagne, R. (1985). *The Conditions of Learning (4th ed.)*. New York: Holt, Rinehart & Winston.
- Gilster, P. (1997). *Digital Literacy*. New York: John Wiley & Sons.
- Grabove, V., Kustra, E., Lopes, V., Potter, M. K., Wiggers, R., & Woodhouse, R. (2012). *Teaching and Learning Centres: Their Evolving Role Within Ontario Colleges and Universities*. Toronto: Higher Education Quality Council of Ontario. Retrieved from, <http://www.heqco.ca/SiteCollectionDocuments/TL%20Centres%20ENG.pdf>
- Grand-Clement, S., Devaux, A., Belanger, J., & Manville, C. (2017). *Digital Learning: Education Skills in the Digital Age*. Santa Monica, CA: RAND Corporation and Corsham Institute. Retrieved from https://www.rand.org/pubs/conf_proceedings/CF369.html
- Helleve, I. (2010). Theoretical foundations of teachers' professional development. In J. O. Lindberg, & A. D. Olfsson (Eds.), *Online Learning Communities and Teacher Professional Development: Methods for Improved Education Delivery*. IGI Global. Available from https://www.researchgate.net/publication/242087166_Theoretical_Foundations_of_Teachers%27_Professional_Development
- Hiemstra, R. (1994). Self-directed learning. In T. Husen & T. N. Postlethwaite (Eds.), *The International Encyclopedia of Education (2nd ed.)*. Oxford: Pergamon Press. Retrieved from <http://ccnmtl.columbia.edu/projects/pl3p/Self-Directed%20Learning.pdf>
- Hubball, H., & Clarke, A. (2010). Diverse methodological approaches and considerations for SoTL in higher education. *The Canadian Journal for the Scholarship of Teaching and Learning*, 1(1). <http://dx.doi.org/10.5206/cjsotl-rcacea.2010.1.2>

- Huber, M. T., & Hutchings, P. (2005). *The Advancement of Learning: Building the Teaching Commons*. San Francisco, CA: Jossey Bass.
- Jacob, W. J., Xiong, W., & Huiyuan, Y. (2015). *Professional development programmes at world-class universities*. Palgrave Communications. Retrieved from http://www.academia.edu/26263514/Professional_development_programmes_at_world-class_universities.
- Jenkins, H., Ito, M., & boyd , d. (2015). *Participatory Culture in a Networked Era: A Conversation on Youth, Learning, Commerce, and Politics*. Cambridge: Polity Press.
- JISC (2014). *Quick guide—Developing students’ digital literacy*. Retrieved from https://digitalcapability.jiscinvolve.org/wp/files/2014/09/JISC_REPORT_Digital_Literacies_280714_PRINT.pdf
- JISC (2018). *Building digital capability: building capability for new digital leadership, pedagogy and efficiency*. Retrieved from <https://www.jisc.ac.uk/rd/projects/building-digital-capability>
- Kilian, J. Sarrazin, H. & Yeon, H. (2005). *Building a design-driven culture*. McKinsey & Company. Retrieved from <https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/building-a-design-driven-culture>
- Kirkwood, A., & Price, L. (2013). Technology-enhanced learning and teaching in higher education: what is ‘enhanced’ and how do we know? *A critical literature review. Learning, Media and Technology*, 39(1), 6-36. Retrieved from <https://doi.org/10.1080/17439884.2013.770404>
- Knowles, M. (1975). *Self-Directed Learning*. Chicago: Follet.
- Knowles, M. (1984). *Andragogy in Action*. San Francisco: Jossey-Bass.
- Lave, J. & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Lopes, V., & Dion, N. (2015). *Pitfalls and potential: Lessons from HEQCO-Funded research on technology-enhanced instruction*. Toronto: Higher Education Quality Council of Ontario. Retrieved from <http://www.heqco.ca/SiteCollectionDocuments/Technology@Issue.pdf>
- Martin, A. & Grudziecki, J. (2006). DigEuLit: concepts and tools for digital literacy development. *Innovation in Teaching and Learning in Information and Computer Sciences*, 5(4), 249-26. Retrieved from <https://doi.org/10.11120/ital.2006.05040249>
- McDonald, C. (2012). Understanding participatory action research: a qualitative research methodology option. *Canadian Journal of Action Research* 13(2), 34-50. Retrieved from https://www.researchgate.net/publication/274063607_Understanding_participatory_action_research_A_qualitative_research_methodology_option
- Morgan, G., Moskal, P., Wolf, A., Dziuban, C., McMartin, F., & Morrill, J. (2012). *Understanding student use of digital learning resources*. Presentation at 9th Annual Sloan Consortium Blended Learning Conference & Workshop, Milwaukee, WI. Retrieved from <https://www.ideals.illinois.edu/bitstream/handle/2142/30762/sloan-conf-2012-morgan.pdf>

- Nielsen, J. (1994). *Guerilla HCI: Using discount usability engineering to penetrate the intimidation barrier*. Retrieved from <http://useit.com>
- Nielsen, J. (1999). *Voodoo usability*. Retrieved from <http://useit.com>
- Ödalen, J., Brommesson, D., Erlingsson, G.O., Schaffer, J.K., & Fogelgren, M. (2018): Teaching university teachers to become better teachers: the effects of pedagogical training courses at six Swedish universities. *Higher Education Research & Development*. Retrieved from <https://doi.org/10.1080/07294360.2018.1512955>
- OECD. (2016). *Innovating education and educating for innovation: the power of digital technologies and skills*. Paris: OECD Publishing. Retrieved from <http://dx.doi.org/10.1787/9789264265097-en>
- O’Keeffe, M. (2017). Exploring higher education professionals’ use of Twitter for learning. *Irish Journal of Technology Enhanced Learning*, 2(1). Retrieved from <http://journal.ilta.ie/index.php/telji/article/view/11>
- Ontario Public School Boards’ Association. (2013). *A vision for learning and teaching in a digital age*. Retrieved from http://www.opsba.org/SiteCollectionDocuments/OPSBA_AVisionForLearning.pdf
- Price, S. (2005). *Review of the impact of technology-enhanced learning on roles and practices in higher education*. Retrieved from <https://telearn.archives-ouvertes.fr/hal-00190147/document>
- Reeves, T. (2006). Design research from a technology perspective. In J. van den Akker, K. Gravemeijer, S. McKenney & N. Nieveen (Eds.), *Educational Design Research* (pp. 52-66). London: Routledge.
- Reeves, T., Herrinton, J., & Oliver, R. (2005). Design research: A socially responsible approach to instructional technology research in higher education. *Journal of Computing in Higher Education*, 16(2), 97-116. Retrieved from <http://treeves.coe.uga.edu/EDIT9990/JCHEDesignResearch05.pdf>
- Ross, C. R., Maninger, R. M., LaPrairie, K. N., Sullivan, S. (2015). The use of Twitter in the creation of educational professional learning opportunities. *Administrative Issues Journal: Connecting Education, Practice, and Research*, 5(1), 55-76.
- Schmidt & Carbol Consulting Group. (2014). *Faculty supports for online teaching*. Toronto: Council of Ontario Universities. Retrieved from <http://cou.on.ca/wp-content/uploads/2015/06/COU-Faculty-Supports-for-Online-Teaching.pdf>
- Sharpe, R., & Beetham, H. (2010). Understanding students’ uses of technology for learning: towards creative appropriation. In R. Sharpe, H. Beetham & S. De Freitas (Eds.), *Rethinking Learning for a Digital Age: How Learners Are Shaping Their Own Experiences* (pp. 85-99). London and New York: Routledge.
- Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, 2(1). Retrieved from http://www.itdl.org/Journal/Jan_05/article01.htm

- Smith, P. (2018). *Free Range Learning in the Digital Age: The Emerging Revolution in College, Career, and Education*. New York: SelectBooks.
- Steinert, Y. (2012). Perspectives on faculty development: aiming for 6/6 by 2020. *Perspectives on Medical Education*, 1(1), 31-42. Retrieved from <http://doi.org/10.1007/s40037-012-0006-3>
- Stigmar, M. (2010). Scholarship of teaching and learning when bridging theory and practice in higher education. *International Journal for the Scholarship of Teaching and Learning*, 4(2), Article 23. Retrieved from <https://doi.org/10.20429/ijsotl.2010.040223>
- Tough, A. (1971). *The adult's learning projects: A fresh approach to theory and practice in adult learning*. Toronto: OISE. Retrieved from <http://ietl.org/tough/books/alp.htm>
- University of British Columbia. (2017). *Flexible Learning*. Retrieved from <http://flexible.learning.ubc.ca>
- Van Den Akker, J., Gravemeijer, K., McKenney, S., & Nieven, N. (Eds.). (2006). *Educational Design Research*. London, Routledge.
- Wang, F., & Hannafin, M. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development*, 53(4), 5-23. Retrieved from https://www.researchgate.net/publication/225626676_Design-based_research_and_technology-enhanced_learning_environments_Educational_Technology_Research_and_Development_534_5-23
- Watson, S. (2013). *Understanding professional development from the perspective of social learning theory*. Presentation at Eighth Congress of European Research in Mathematics Education, Manavgat-Side, Antalya, Turkey. Retrieved from https://www.educ.cam.ac.uk/people/staff/watson/Watson_CERME8_2013_Proceedings.pdf
- Webster-Wright, A. (2009). Reframing professional development through understanding authentic professional learning. *Review of Educational Research* 79(2), pp. 702-739. doi: 10.3102/0034654308330970. Retrieved from <https://pdfs.semanticscholar.org/dc42/c8055632ab716d212a1db95e1318a5244c72.pdf>
- Wired Magazine (2012). *A domain of one's own*. Retrieved from <https://www.wired.com/insights/2012/07/a-domain-of-ones-own/>