Preparing Teachers

as

Curriculum Designers

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Introduction

This volume is the product of the collaboration of participants at the Tenth Working Conference of the Canadian Association for Teacher Education that was held at Wilfrid Laurier University from October 24–26, 2019. Following the format of previous working conferences, authors submitted in advance a three-page summary of their current research on the theme Preparing Teachers as Curriculum Designers. Authors were asked to consider how their research related to one of the following questions:

- **Student Engagement**: In what ways does your teacher education program prepare graduates to design engaging learning experiences? What innovative pedagogies and assessment strategies have been found to be especially effective in promoting deep learning and design approaches that translate into practicum?

- **Instructional Design:** Consider Backward Design, Inquiry Based Learning, Universal Design for Learning, Concept-based Curriculum, etc. In what ways do these, or other particular instructional design approaches, guide teacher candidates' design of learning experiences in your teacher education program? How and to what extent do principles of design thinking inform the design and evaluation of curriculum in your teacher education program?

- **Disciplinary Thinking**: What "pedagogies appropriate to the discipline" frame the curricula in your teacher education program (e.g., historical thinking in Social Studies, scientific thinking in STEM, and so on)?

- **Practicum/School Divisions:** How do planning frameworks in local school divisions influence planning in your teacher education program? In what ways are collaborations between your teacher education program and area school divisions supporting research and practice in schools?

Participants whose chapter proposals were accepted were divided into three working groups of authors whose research was related and summaries of the research were shared by the editors, with the authors in each group. At the conference, group members met to discuss one another's work, pose questions, and offer suggestions and recommendations on expanding or strengthening their work. Complete chapters were submitted in February 2020 and the editors distributed these for double blind review. This volume includes the final versions of these chapters.

Working Conference Theme: Preparing Teachers as Curriculum Designers

Researchers and educators in teacher education are tasked with creating the contemporary conditions and contexts for learning that engage learners in actively constructing relevant understandings, competencies, and diverse literacies required for navigating effectively a complex and changing world. However, while social, technological, and political transformations and change in society are rapid, many educational processes, including curriculum development, can take much longer. Broadly defined and used, curriculum describes the values, content, and aims that bound an education system and the range of educational and organizational processes and learning sponsored within it (Williamson, 2013). With the shift from an industrial to a knowledge society, greater emphasis has been put on education to cultivate socio-cognitive competencies associated with knowledge work and the production and sharing of information, ideas, and knowledge rather than material things (Williamson, 2013). In this context, the uptake of design thinking and emergent curriculum have taken root and have begun to thrive.

Design thinking as a constructivist learning design in education has generated much interest in emergent curriculum, but also some uncertainty (Henriksen et al., 2020; Lahey, 2017; Scheer et al., 2012). Broadly speaking, design thinking in education is an approach to inquiry that combines instruction and construction (Scheer et al., 2012); teachers seek to engage learners in analyzing and evaluating real-life problems and scenarios in order to generate solutions by

thinking and acting like a designer. A creative approach to assessing and addressing problems, design thinking offers an agile and responsive approach to engaging learners in understanding the problems, people, and products in challenging situations or scenarios to create and achieve a preferred alternative. "By thinking like a designer—for example by examining how students experience aspects of school, much as a professional designer might use products, physical spaces, or other artifacts—teachers might better understand challenges and identify ways to move forward" (Henriksen et al., 2018, p. 210). A design thinking approach to curriculum acknowledges multiple representations, various forms of engagement and expression, as well as the possibility of diverse solutions and outcomes, which can lead to tension within standardized programs of study in K-12 and preset pathways in post-secondary education.

To make design thinking accessible for educators outside of design fields of study, such as architecture, business, and manufacturing, some organizations have developed step-by-step guides and linear descriptions of robust design processes (Johannsson-Skoldberg et al., 2013). For example, the Hasso Plattner Institute of Design at Stanford (d.school) (2020) and IDEO (2012) have provided frameworks that are often applied to educational challenges. According to the Stanford Design Thinking model, these steps and key activities include:

- Empathy: gain an empathic understanding of the problem you are trying to solve by gathering information and immersing oneself in the context.
- Define: synthesize the information gathered in the first step to clearly describe the problem.
- Ideate: generate possible solutions to the problem.
- Prototype: develop scaled down versions of the solutions to carefully investigate solutions.
- Test: assess and further refine the best solutions to the problem.

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IDEO uses a similar set of steps and demonstrates how their framework can be used to solve educational problems related to curriculum, spaces, processes, and systems: Discovery, Interpretation, Ideation, Experimentation, and Evolution. Critical to both the d.school and IDEO models is empathy—understanding what the end user needs and designing solutions to meet those needs. The extensive field of user-centered or human-centered design also prioritizes the user and their needs. These methods also have a common framework along with an iterative cycle of investigation, observations, ideation, rapid prototyping, and testing (Norman & Draper, 2014). Each iteration in human-centred design incorporates observations and lessons learned into the next cycle until an appropriate solution is found or the time for the design task runs out.

Design frameworks can provide scaffolds for educators to incorporate design thinking processes and goals into curriculum across disciplines. However, the oversimplification of the design process and design thinking processes as linear, step-by-step paths to follow in business and education has raised concerns that these design models are not based on substantive research (Christensen et al., 2016; Johannsson-Skoldberg et al., 2013).

Henriksen et al. (2020) present some distinct applications of design thinking in education. First, *design-based research,* a signature research methodology from the Learning Sciences, is the empirical study of educational problems and interventions as design solutions during iterative implementations. *Learning by design* refers to ways people learn or construct subject matter knowledge as they engage in design processes, often through project-based learning. *Teachers as designers* (Mishra & Koehler, 2006) is a phrase that refers to how teachers come to see themselves as designers of learning experiences, such as in the backward design approach advocated by Wiggins and McTighe (2005) in which teachers determine the purpose of an activity and consider design before planning and implementation. Brown et al. (2020) extend the teacher as designer idea in a description of teachers' design-based professional learning, which

involves continuous cycles of teachers designing learning tasks and analyzing evidence-based work with peers during and between sessions…. Design-based approaches to professional learning seek to create spaces where collaborative, dynamic, and iterative learning cycles can unfold in content-rich environments, and teachers can engage critically with both their colleagues and experts in the field to design solutions to the complex problems of teaching unfolding in their own unique contexts. (p. 3)

The impetus for the working conference theme, *Preparing Teachers as Curriculum Designers*, emerged initially from the *Teaching Effectiveness Framework* (Friesen, 2009) which includes as its first two principles:

- Effective teaching practice begins with the thoughtful and intentional design of learning that engages students intellectually and academically.

- The work that students are asked to undertake is worthy of their time and attention, is personally relevant, and is deeply connected to the world in which they live. (p. 4)

These ideas align well with Dede's (2010) in-depth review of twenty-first century skills in which key competency areas are defined, including twenty-first century content, learning and thinking skills, ICT literacy, and life skills. Dede emphasized that core subjects and knowledge orientation are very important, particularly in relation to the need for deep learning. However, he also emphasized that collaboration—increasingly done through digital media—and a critical ability to filter rapidly massive amounts of incoming data and extract information valuable for decision-making and problem-solving (described as a "contextual" capability) are important aspects of twenty-first century skills.

To make stronger connections with twenty-first century competencies (Erstad & Voogt, 2018), opportunities to develop these competencies within core subjects need to be identified

as well as interdisciplinary themes within and across subjects. The alignment between interdisciplinary themes and design thinking reflects contemporary societal issues and can foster learning in ways that are responsive to the needs of the current society. The main competencies across different twenty-first century competency frameworks are collaboration, communication, ICT literacy, and social and/or cultural competencies including citizenship, as well as creativity, critical thinking, and problem-solving (Erstad & Voogt, 2018), all of which align with design thinking. A basic tension is the relation between twenty-first century competencies and core knowledge domains, often related to the discussion whether "know-how" is nowadays more important than "know-what." The argument put forward is that most knowledge that has to be learned at school—as prescribed in the curriculum—is likely to become outdated very quickly in today's world (Williamson, 2013).

Intentional and contemporary program designs that prepare new teachers as designers of learning who create meaningful, relevant, and challenging learning opportunities for their students is core to the work of teacher educators (Brown et al., 2020). Ongoing professional development for practicing teachers to become designers of learning who can create the conditions for learners to engage in design is also core to teacher education (Friesen & Jacobsen, 2015). Graduate education and design-based research on teacher designs that sponsor and study change and innovation in K-12 schools (Becker, 2019; Jacobsen, 2014; Lambert, 2016; Roberts, 2019) is also core to teacher education. The editors were curious about the ways in which researchers in teacher education across Canada were addressing the important challenge of preparing teachers as curriculum designers. We were fascinated and encouraged by the range of research contributed by authors whose scholarship delves into many different questions and

issues related to design processes, design thinking, and teachers as curriculum designers in the diverse and multifaceted field of teacher education.

An Overview of the Book Chapters

As this brief review of background literature demonstrates, there are numerous interpretations of the term design in education and not surprisingly, each of our authors took up the term design in slightly different ways.

The first section of the book includes chapters focused on the broad design of a teacher education program. Ott and Hibbert were curious about how assessment designs teachers and how a programmatic shift to pass/fail assessments could create more space for professional inquiry and agency amongst their teacher candidates. The chapter spotlights a *Research and Assessment* course in which teacher candidates documented their learning in a Professional Practice Record and Annual Learning Plan. All teacher candidates were assigned to small groups where, with the support of Master Teacher Mentors (experienced educators who were associate teachers, graduate students, and instructors), they were inducted into the habits of professional learning. This course and forthcoming changes to assessment in the program aim to foster professional agency in teacher candidates.

Broad, Sidani, and Richards sought student voice to renew the design of their graduate entry-to-practice teacher education program. Beginning with faculty-driven curriculum mapping data, they identified challenges in the program structure and were then able to seek deeper consideration from candidates on issues of curriculum, pedagogy, and program structure. The program was built on Wiggins & McTighe's (2005) backward design model to align with the Ontario curriculum and to provide program coherence. Using a hiking metaphor to illustrate the iterative and recursive path they travelled, the authors demonstrate the complexity of program renewal.

Applying the Stanford Design Thinking model, MacMath, Sivia, and Britton generated an intentional programmatic approach to develop more socially just educators. They began by *empathizing* with the needs of the community where their graduates were likely to teach, *defining* the problem from a variety of perspectives including those of their teacher candidates, *ideating* to reflect on existing challenges related to social justice in the program, *prototyping* a variety of program innovations, and *testing* by analyzing candidates' responses to questions that assessed the impact of their program innovations. Their protoype details an extensive series of learning experiences throughout the ten-month program designed to create a stronger social justice orientation in teacher candidates. The teacher candidates' responses suggest that the program innovations were impactful and provided strong coherence with social justice as a continuous thread throughout the program.

The last chapter of the section, contributed by Brown and Jacobsen, relates to the design of teacher education programs and assesses the potential for a micropracticum embedded in a teacher education program prior to a formal practicum. A micropracticum is defined as "a short-term scaffolded practice teaching experience in an authentic classroom setting." The authors incorporated design-based research to provide cyclical evaluations of the micropracticum as a source of usable knowledge to inform teacher education. Student participants were responsible for collaborating on the design of a month-long unit enabled by technology, enacting that design with high school students, and subsequently reflecting upon their learning. Their narratives provide a strong rationale for the inclusion of micropracticum in teacher education programs to help teacher candidates to use learning technology, develop classroom management approaches, apply theory to practice, and experience the complexities of teaching.

The second section of the book describes a variety of unique collaborations that helped to prepare teachers as curriculum designers. Thanks to the Rideau Hall Foundation and a set of

resources entitled *Education for Innovation*, Black, Jarvis, and Cantalini-Williams were able to

engage their teacher candidates and others in designing curriculum for an authentic audience.

Teacher candidates were invited to create educational resources to align with two publications:

Innovation Nation: How Canadian Innovators Made the World Smarter, Smaller, Kinder, Safer,

Healthier, Wealthier, and Happier (Johnston & Jenkins, 2017) for emergent readers; and

Ingenious: How Canadian Innovators Made the World Smarter, Smaller, Kinder, Safer,

Healthier, Wealthier, and Happier (Johnston & Jenkins, 2017) for older readers. All resources

included an innovation cycle with comparable components to other design models: Inquire,

Ideate, Incubate, Implement, and Impact. Teacher candidates benefitted from the opportunity to

apply the design cycle, plan for an authentic audience (future teachers and students), create

shared synergy through collaborative planning, and see the direct connection between their work

and teaching practice.

The following chapter, by Holden et al., is written by university teacher educators and

school board representatives who together collaborated to create professional learning

communities that support preservice and inservice teachers in instructional design through

design-based thinking. All preservice teachers at the University of Calgary Werklund School of

Education participate in a mandatory course on design-based thinking. Preservice teachers in this

project had the opportunity to be paired with a partner teacher who was interested in student-

centred design; together they attended workshops and collaborated to apply these principles in

the classroom during a practicum experience. The collaboration provided in-depth professional

learning for preservice and inservice teachers.

Ayer and Badley and a group of preservice and inservice teachers together offer a unique

perspective on design thinking by applying Alexander's (1979) architectural design principles to

the design of learning experiences. The authors argue that just as buildings must have centres,

boundaries, coherence, variety, and repetition, these and other principles have relevance for the design of classroom learning experiences. The co-authors participated in workshops applying architectural principles to planning; they then considered how instructional design differs from instructional planning and how design might precede instruction. For most of these teachers, applying architectural design principles helped to simplify and enrich the depth of their planning.

While many chapters in this book focus on preservice teachers, Smith's research followed a team of inservice teachers who volunteered to be facilitators of professional learning for their colleagues throughout the province of Manitoba. Interviews with team members were analyzed using a phenomenological approach to explore their lived experience as designers and facilitators of learning experiences for their colleagues. The analysis discusses how professional learning strengthened the agency of these teacher leaders, the practices of their highly effective teams, and how their professional practice was continuously improved.

The final chapter in section II focuses on Universal Design for Learning, a well-known framework for designing accessible curriculum for students with diverse abilities (CAST, 2018). Harkins and colleagues include the narratives of two teachers during their final practicum and their first year of teaching to understand their experiences of implementing a UDL framework in their teaching. Both teachers identified the increased level of student engagement when they applied UDL principles in their teaching; further, when all students were offered choices in their learning, differences were celebrated as normal. The authors caution that school leaders need to provide sufficient time for planning, collaboration, and professional learning if they expect teachers to successfully apply UDL in their classrooms.

Finally, section III includes chapters where the authors explore the development of teachers as curriculum designers in academic disciplines. Based on a previous study of science educators, Link and Falkenberg propose a "capabilities-development-with-nature pedagogy"—

an approach to teaching science that focuses upon the development of students' capabilities for well-being. Integrating outdoor education and a Reggio Emilia model, the curriculum is based on students' curiosity about the natural world and provides opportunities for creative work and student-led research. They present recommendations for reframing science teacher education to promote well-being education.

Straub and Maynes consider how preservice teachers' conceptions of citizenship can be deepened through the use of concept maps to develop conceptual understanding in Social Studies. Situated in constructivist learning theory and phenomenographic research, their study aims to demonstrate how teachers can build upon students' prior conceptions to develop more complex understandings. They argue that concept maps vary in sophistication and that teachers can enrich students' conceptual understanding by modelling these various types of concept mapping. Straub and Maynes argue that teacher educators who cultivate a rich conception of citizenship in their teacher candidates are more likely to produce teachers who can cultivate rich understandings of citizenship in their own students.

The final chapter in the volume, authored by Becker and Jacobsen, employs design-based research to examine the experiences of one grade six teacher as she, together with Becker, explored the potential of maker spaces and making for envisioning new ways of teaching and learning across the curriculum. Maker spaces and making are described as promising learning environments for enacting inquiry-based approaches to learning. They found that making helped the teacher to think about disciplines and disciplinary ways of being, to explore curriculum in diverse and interesting ways, to engage in creative pedagogy, and to consider her teaching practice differently. However, teachers require support and robust technology to engage in the risk-taking necessary to integrate making in their teaching and to respond to constraints, such as provincial exams and skeptical colleagues.

This volume examines a variety of ways in which Canadian teacher educators are preparing teachers as curriculum designers. The working conference dialogue and this publication aim to enhance and extend communication, collaboration, and critical analysis among Canadian teacher educators; it also seeks to contribute to research and practice that will inspire teachers and teacher educators to design learning that "engages students intellectually and academically …[and that] is worthy of their time and attention, is personally relevant, and deeply connected to the world in which they live" (Friesen, 2009, p. 4).

References

Alexander, C. (1979). *The timeless way of building*. Oxford University Press.

Brown, B., Friesen, S., Beck, J. & Roberts, V. (2020). Supporting new teachers as designers of learning. *Educational Sciences, 10*(8), 1–14. https://doi.org/10.3390/educsci10080207

Center for Applied Special Technology (CAST). (2018). *Universal Design for Learning guidelines version* 2.2. http://udlguidelines.cast.org/

Christensen, K. S., Hjorth, M., Iversen, O. S., & Blikstein, P. (2016). Towards a formal assessment of design literacy: Analyzing K-12 students' stance towards inquiry. *Design Studies, 46*, 125–151. https://doi.org/10.1016/j.destud.2016.05.002

Dede, C. (2010). Comparing frameworks for 21st century skills. In J. Bellanca & R. Brandt (Eds.), *21st century skills* (pp. 51–76). Solution Tree Press.

Erstad, O., & Voogt, J. (2018). *The twenty-first century curriculum: Issues and challenges.* Springer International Handbooks of Education, 19–36.

Friesen, S. (2009). *Teaching effectiveness: A framework and rubric*. https://www.galileo.org/cea-2009-wdydist-teaching.pdf

Friesen, S., & Jacobsen, M. (2015). *A design-based approach to teachers' professional learning*. Education Canada. https://www.edcan.ca/articles/a-design-based-approach-to-teachers-professional-learning/

Henriksen, D., Gretter, S., & Richardson, C. (2020). Design thinking and the practicing teacher: Addressing problems of practice in teacher education. *Teaching Education*, *31*(2), 209–229. https://doi.org/10.1080/10476210.2018.1531841

IDEO (2012). *Design thinking for educators, 2nd edition*. https://designthinkingforeducators.com

Institute of Design at Stanford (2020). *Bootcamp bootleg*. https://dschool.stanford.edu/resources/the-bootcamp-bootleg

Johansson Sköldberg, U., Woodilla, J., & Çetinkaya, M. (2013). Design thinking: Past, present and possible futures. *Creativity and Innovation Management, 22*(2) 121–146.

Johnston, D., & Jenkins, T. (2017). *Ingenious: How Canadian innovators made the world smarter, smaller, kinder, safer, healthier, wealthier, and happier.* McClelland & Stewart.

Johnston, D., & Jenkins, T. (2017). *Innovation nation: How Canadian innovators made the world smarter, smaller, kinder, safer, healthier, wealthier, and happier.* McClelland & Stewart.

Lahey, J. (2017). How design thinking became a buzzword at school. *The Atlantic*. https://www.theatlantic.com/education/archive/2017/01/how-design-thinking-became-a-buzzword-at-school/512150/

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017.

Norman, D. A., & Verganti, R. (2014). Incremental and radical innovation: Design research vs. technology and meaning change. *Design Issues, 30*(1), 78–96.

Scheer, A., Noweski, C., & Meinel, C. (2012). Transforming constructivist learning into action: Design thinking in education. *Design and Technology Education: An International Journal*, *17*(3), 1360–1431. https://ojs.lboro.ac.uk/DATE/article/view/1758

Wiggins, G., & McTighe, J. (2005). *Understanding by design, 2nd edition*. Association for Supervision and Curriculum Development.

Williamson, B. (2013). *The future of the curriculum: School knowledge in the digital age*. The MIT Press.

Part 1: Designing Teacher Education Programs

Designing Assessment for Professional Agency in Teacher Education

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Abstract

How does assessment design teachers? This question signals a theoretical engagement with sociomaterial and complexity orientations to practice in teacher education. We draw on these perspectives as part of a programmatic shift to a pass/fail formative assessment system designed to make space for professional inquiry. Within this framework of assessment *as* learning, an innovative course, "Research and Assessment," creates an inquiry space for learning with and from teacher candidates and mentor teachers about professional learning and program improvement. This chapter outlines the rationale and the methods for these shifts to assemble our teacher education program for the emergence of professional agency.

Résumé

Comment l'évaluation conçoit-elle les enseignants? Cette question signale un engagement théorique conformément aux concepts de sociomatérialité et de complexité dans la formation des enseignants. Nous nous inspirons de ces perspectives dans le cadre du passage au système d'évaluation formative réussite/échec conçu pour stimuler la recherche professionnelle. Cette conception de l'évaluation comme forme d'apprentissage a donné naissance à un cours novateur, « la recherche et l'évaluation », qui crée une aire d'investigation où les candidats enseignants et les enseignants mentors échangent leurs connaissance sur l'apprentissage professionnel et l'amélioration des programmes. Ce chapitre discute de la pertinence et des méthodes de ces

changements pour arrimer le programme de formation des enseignants avec l'essor de

l'agentivité professionnelle.

At a workshop on assessing teaching innovations held at Western University's Centre for Teaching and Learning in 2019, I (Mary) sat at a table with a diverse group of instructors from the humanities, social sciences, medical, and general sciences. As a representative of the Faculty of Education, I shared that our initial teacher education program (ITE) was beginning a process of shifting to a pass/fail approach. Looks of surprise flickered across faces and someone burst out in disbelief: "But how will you know if they are qualified?" I stammered out something about how measurements materialize effects. If we wanted teacher candidates to perform as professionals, then we needed to stop measuring them as students. Only the physics professor understood me. I wasn't prepared for this question because it seemed self-evident that it doesn't matter if *we* know. It matters if *they* know.

This chapter engages with the question: How does assessment design teachers? "We" are participants in a Teacher Education Design team working to review and re-vision Western's ITE program to better prepare teachers as curriculum designers in the 21st century. Mary, writing in first person "I," is the coordinator of a central actor in this story, a course on Research and Assessment re-designed as a mentoring program for professional inquiry and growth. My co-author, Kathy, is the Associate Dean of Western University's teacher education program. The chapter has a pivot point. Looking back, we describe the rationale and method for the re-design of assessment practices in this program. Looking forward, I analyze some key data points coming out of the mentor program through sociomaterial and complexity theories to consider how these practices might foster the emergence of professional agency in teacher candidates.

Looking Back: Disassembling Practice

In Canada, as elsewhere, there is a sense of urgency to prepare highly qualified, effective teachers who can educate students for the complexities of learning in the 21st century (Campbell et al., 2018). To this end, in 2015 the province of Ontario extended the initial teacher preparation

program from one to two years. As faculties of education in Ontario adapted to this change, at the same time they were reeling from two other changes. Operating funding for teacher education was cut by 30%, while enrollment in graduate education was increased without the hiring of additional faculty. Within these demands and constraints of institutional requirements and budget cutbacks, faculties of education developed programs to address accreditation standards set by the Ontario College of Teachers (OCT, 2020) with the Ministry of Education, alongside the university outcomes required by the Higher Education Quality Council of Ontario (HEQCO, 2020). In our teacher education program, this led to a burgeoning of 83 courses taught by over 100 instructors, most of them hired part-time on year-to-year contracts according to university human resources policy. It also led to over 700 teacher candidates converging for weeks at a time in a building that was already bursting at the seams due to expanded enrollment in other programs. Our two-year program is highly competitive, attracting top candidates on the basis of our employment record, innovations in alternative field experiences, and teaching specialties. However, both student and instructor feedback on the new program raised strong concerns about curriculum gaps, overlaps, and a general lack of cohesion.

Program Mapping

Our role as teacher educators is to help teacher candidates develop a sophisticated understanding (Kennedy, 2016) of the relationship between richly designed educational environments, teacher agency (Priestley et al., 2012; Sherman, 2013), and student learning. Western's ITE program intends to offer an integrated curriculum that:

(a) is defined in term of bodies of knowledge so that it fits in a university context,

(b) explicitly addresses the persistent challenges of teaching so that it can overcome novices' naïve conceptions of teaching, and

(c) relies heavily on representations of teaching practice that enable novices to discover the relationships between means and ends. (Kennedy, 2016, p. 15).

Following Kennedy (2016), program staff mapped the curriculum across the courses in our program according to institutional knowledge requirements (HEQCO outcomes), OCT professional competencies, 21st century learning practices (Canadians for 21st century learning, 2012), and the ability to move beyond the school and into the community.

Backward Mapping

Using principles of backward mapping for reform initiatives (Elmore, 1980; Fiorini, 1997), we also reviewed all elements of the program in terms of stakeholders and critical problem sites. A Teacher Education Design (TED) group was formed which included full time faculty, part-time instructors, and program staff who work closely with students and school boards. Fiorini (1997) suggests that the advantages of designing reform with stakeholders is the ability to proceed incrementally and iteratively, affording responses with discretion and flexibility at sites of change. Elmore (1980) advises that a backward map should identify "the one or two critical points in a complex organization that have the closest proximity to the problem and [describe] what needs to happen at those points to solve the problem" (p. 607). In our findings, we consider what complexity theories can contribute to understanding how complex forms of practice emerge in teacher education (Davis & Sumara, 2012; 2006). But we don't just consider people at critical points in complex organizations. We draw on sociomaterial theories of practice such as Latour's (2005) and Suchman's (2007) approaches to actor-network theory (ANT) to understand how space, time, and materials are also stakeholders in our program. These perspectives on emergence and practice will be fleshed out in the section on "Reassembling Agency." To prime readers for our usage of these terms, "emergence" refers to a

dynamic process of growth and change; "practice," to the notion that a practice is a dynamic

assemblage of social and material actors.

Knowing that cohesion is a critical actor in effective ITE (Darling-Hammond et al.,

2013), the TED group reviewed the program maps looking for points of disconnect and rupture.

The instructors in the group repeatedly drew our attention to gaps between the curriculum as

intended in course syllabi and as practiced through the availabilities of rooms, timetables, and

resources. We also saw many overlaps in multiple assignments tracking the same outcomes

rather than building on each other. As we considered relations between these gaps and overlaps

that might constellate as critical points for change, it seemed that some discontinuities between

the profession as presented through our curriculum and as enacted in practice were

disassembling our efforts to provide an integrated, cohesive ITE program. One such disconnect

was related to our teacher candidates positioning "more as students going through assessment

hoops than as professionals engaging in self-assessment to direct their learning" (Hibbert et al.,

in press).

Assessment in Teacher Education

Surely the key function of a teacher education program is to help teacher candidates make

the transition from students to teachers. However, the mapping of our ITE program revealed a

stark disconnect: While teachers in Ontario engage in assessment *as* learning (Earl, 2013;

Ontario, 2010a; 2010b) to improve their practice, the institutional structures of the ITE looked a

lot like undergraduate assessment *of* learning to our teacher candidates. We could see they were

being driven—sometimes crazy—to achieve high grades rather than taking risks to stimulate

growth (Hargreaves et al., 2002). Assessment expressed through the dominant grades discourse

"constructs learners as passive subjects … [as] students are seen to have no role other than to

subject themselves to the assessment acts of others" (Boud, 2007, p. 17). We could see that grades were a critical actor in disassembling agency for teacher candidates in our program.

We believe that assessment practices should prepare candidates for the system they are moving *into* rather than the one they are coming out of. Once in practice, teacher performance appraisal (TPA) in Ontario is designed to provide "teachers with meaningful appraisals that encourage professional learning and growth" (Ontario, 2012, n.p.). The TPA process affords teachers professional judgement in self-directing their learning by reflecting on documentation and feedback to develop Annual Learning Plans (ALPs). Agency in professional judgement is the heartbeat of teacher professionalism.

Looking Forward: Reassembling Agency

The result of the TED review is to shift to a pass/fail approach in our ITE program, which has since passed university senate approval and will be implemented with the incoming cohort in 2020. We propose that a pass/fail assessment framework will enable both instructors and teacher candidates to focus their efforts on developing the professional competencies needed for a more seamless transition into practice (Hibbert et al., in press). Following the initial teacher education that teacher candidates receive through our Bachelor of Education, the Ontario Ministry of Education provides a New Teacher Induction Program (NTIP) as the "second job-embedded step along a continuum of professional learning" (Ontario, 2019, n.p.). Evaluation of their success in the NTIP program is governed by the TPA system. Upon successful completion of the NTIP program, annual learning plans (ALP) are required. In the next sections of the chapter, we describe why and how we are re-designing an existing course on research and assessment as the basis for inducting teacher candidates into these habits of assessment as learning, and as a research and development site for learning in our program.

Re-Designing EDUC 5013 "Research & Assessment"

The research and assessment course was initially developed to meet OCT accreditation standards and added as a second year course taught in lecture format to 250 primary-junior/junior-intermediate (PJ/JI) candidates and 120 intermediate-senior (IS) candidates in our auditorium space as an 18 hour, one-term .25 credit course. The program design review helped us understand that the space/time/matter of the course did not afford opportunities to deeply engage with the questions new teachers have about assessment.

First of all, feedback from students indicated that they wished they had the course in their first year so they could apply it to their first three practica instead of the final one. Their assignments demonstrated that they understood basic principles, such as the purpose of assessment for, as, and of learning. But what they wanted to know was the *how*: how to give feedback, how to differentiate assessment, how to weigh different kinds of evidence to determine a grade. We could not do more than a surface treatment of assessment practicalities in the large lecture format.

We also noticed the teacher candidates' questions tended to focus on feedback and evaluation concerns directed to improving student work, rather than seeing student work as feedback for improving instruction (Black & Wiliam, 2009; Earl, 2013). Assessment *as* learning was a missing piece. Another concern, following Bennett (2011), is that the generic discourse on principles of formative assessment overlooks the fact that assessment is a complex set of practices related to different subjects, different learning situations, and different learners. For example, a curriculum designed to emerge in response to the interests and inquiries of learners requires different assessment practices than assessment in a prescribed curriculum (Stooke, 2015). Or take the issue of subject-specific assessment: Assessing mathematical thinking requires a different skill set than doing a diagnostic reading assessment or evaluating a form of

writing. Our teacher candidates are introduced to evaluation criteria and assessment practices in their curriculum and pedagogy courses in first year, but in the second year the course work centres on specialization topics (for example, international education) which are not always linked closely enough with curriculum courses to make extensions to that learning. We also know that despite the assumption that they will learn the "how-to" of assessment and evaluation on practicum, not all experiences afford the same quality of opportunity (DeLuca et al., 2019), especially if teacher candidates don't know what they don't know enough to seek it out.

Sometimes it takes a lot of working through problems to come to obvious conclusions. We realized that based on their practicum and course experiences, teacher candidates would have different questions about assessment, not to mention other professional competencies. We re-designed the course as a small group format spread over the two-year program led by Master Teacher Mentors (MTM). Mentors are working or retired teachers or principals from K-12 contexts in local school boards who are paid a stipend to facilitate their group(s). Through the mentor groups, teacher candidates learn to document their practice in a Professional Practice Record (PPR – Lowenberg-Ball & Cohen, 2014), identify questions and issues for further learning, and develop annual learning plans to focus the practicum experiences which come at the end of year one and two. The development and review of the practice record and learning plan through this process is intended to scaffold teacher candidates into the professional framework for evaluation in Ontario's new teacher induction and teacher performance appraisal policies. Re-designed as a mentoring program, the research and assessment course is rooted in the premise that teacher professional practice *is* a practice of research and assessment. The course calendar description remains the same:

> Teacher Candidates learn how to gather information about their own students to serve in planning and assessment. They learn to use the iterative process of inquiry and data-based

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decision making to facilitate student learning and to use research in reflecting on their

own practice. (.25 credit)

The mentors follow small groups of 12 teacher candidates during the two-year program through 16 two-hour meetings, which roughly happen on a bi-weekly basis, while teacher candidates are in the faculty. Each group is a convenient, yet purposeful mix of candidates with similar schedules across cohorts (PJ/JI/IS) and specialities (such as international education, mathematics through the arts, early childhood education, and more). The goal for this mix is to learn with and through difference. The MTM program is designed to facilitate four key experiences through four organizing structures of the course syllabus, the Ontario College of Teachers competencies, the practice record, and the annual learning plan. The key experiences are:

1. Participation in a caring professional learning community;

2. Documenting practicum and course work in the PPR and mapping onto competencies;

3. Researching practice by engaging in collaborative reflection and feedback; and,

4. Integrating practice by articulating new learning goals for the annual learning plan based on evidence from documentation, reflection, and feedback.

Figure 1

Mentor Program Structure

Over 40 mentors model and facilitate professional inquiry (Timperley, 2015). As such, they coach their mentees on ways to: document their learning in course work and practica; map the learning onto the OCT competencies; set goals for further professional learning; draw on opportunities for reflection and incorporation of feedback from instructors, associate teachers, mentors, and peers; and experience appraisal as guest principals review their plans at the end of term two and four.

We believe this coaching and appraisal model fosters professional agency for our teacher candidates by shifting the focus from evaluation to *validation* through the justification of their growth plans with other colleagues. In the next section, we describe our methods and findings for making this claim.

Design-Based Research in the MTM Program

The MTM program is designed for the emergence of professional practice, which is a complex phenomenon. Complexity theories describe a range of phenomena studied in physical, biological, cognitive, and computational sciences which can grow, change, and reproduce in both patterned and unpredictable ways—the emergence occurs dynamically as the system reiterates and not mechanically as a set of inputs with predictable outputs (Osberg et al., 2008). A complexity is a non-hierarchical relation of multiple agents, such as a network, an organization, an ecosystem, or a lifeform. Complexity thinking also has many resonances and overlaps with theories of organizational change and innovation (Damschroder et al., 2009). The study of complex phenomena therefore has many implications for the study of learning and curriculum development (Davis & Sumara, 2006; Doll, 2008). Complexity theories also have affinities with sociomaterial theories of practice, which take a similar view of the dynamism in practice making (Law, 1999; Suchman, 2007). What a sociomaterial perspective, such as actor network theory (ANT), adds is attention to the agencies of more than human actors in a complex practice. As the coordinator of the MTM program, I was responsible for developing a syllabus for the course and formats for the PPR and ALP. In order for the course requirements to become a vehicle for emergent professionalism, rather than a set of mechanical tasks to be checked off a list of outcome statements, I needed to share a vision for the mentors and teacher candidates which afforded both guidance and agency, and I needed to plan myself out of the program for it to become self-sustaining.

Data Collection

To develop an emergent space for professional growth, I researched the program in development, following the actors (Latour, 2005) of the course syllabus, the PPR, and the ALP, as I/they participated in making and reiterating the program through:

- a summer orientation session with the mentors

- meetings and phone conversations with 15 mentors who could not attend the orientation

- a slideshow orientation to the program

- meetings with program staff about the technology and format for the PPR

- the creation of a screen-capture video about using the PPR

- over 100 emails or responses to emails of various stakeholders from August 2019—present

- announcements on the course website

- dinner and coffee conversations with four groups of mentors to invite their feedback and answer questions

- visits to more than 10 groups to answer questions about the PPR and ALP

- two workshops for teacher candidates on how to use the digital platform (Microsoft OneNote) provided for the PPR

- five individual meetings with students to answer questions

- filling in for mentors on six occasions, including for the final ALP reviews

I also used my notes, answers to frequently asked questions, and responses to feedback from mentors, teacher candidates, teacher education program staff, and external reviewers as data for design-based research (DBR, Jacobsen, 2014), which, in turn, designs products and experiences iteratively through cycles of trial, error, and refinement. In all this, I found the concept of *vitality* (Davis & Sumara, 2006) useful in my planning and research.

Findings: The DNA of the Mentor Program

In what follows I reflect on frequently asked questions and answers to show that the organizational structures, or DNA, of the program are vitalities which participate in professional agency for the long-term. The understanding of DNA as an organizing structure for replication

with variation is a commonplace in discussions of living systems. But it might be less common in education settings to be accepting of variation and change, which is essential to ongoing viability (Davis & Sumara, 2006).

Frequently Asked Questions

The most commonly asked questions by mentors and teacher candidates alike were at heart about one concern: Am I doing this right? Seeking to provide space for different possibilities to flourish within the organizational DNA of these structures, my answers fleshed out the features and expectations of the syllabus, the practice record, the annual learning plan, and the group meetings.

As a Mentor, What is My Responsibility for the Course Syllabus?

The course syllabus was designed in blocks to highlight milestones: understanding the OCT competencies and ethical standards; setting up the PPR; preparation for the first practicum; de-briefing after each practicum; preparation of the annual learning plan; and, a final meeting to discuss the plans as a group with external reviewers. Mentors had many questions about what they should do in each session with their mentees. My answers centered on two principles: Mentors use their expertise and judgment to respond to the needs of their mentees, but also make room for the experience of learning through discussion with other group members to be a co-teacher. Their primary responsibility was to facilitate a safe space for thinking differently:

> EDUC 5013 Research and Assessment is based on the principle that assessment is *for* learning when teachers and students are co-learners with strong relationships. Mentors will develop norms for group meetings and criteria for participation with TCs. Building trusting relationships and a safe, confidential space for sharing and risk-taking is paramount.

Creating space for mentors to experiment and offer suggestions was also important. Many of the mentors who had professional connections outside of the program made their own decisions to co-plan. For example, two mentors invited a group of principals to a shared meeting to provide even more individualized support, as the teacher candidates in their group were in the development stage of their ALPs. I also worked to connect mentors virtually by visiting groups and sharing ideas in an online forum:

Thanks to year 1 mentors who offered these great suggestions based on their meetings last week!

- Snowball reflections: Write a lingering question or something you would do differently about your practicum. Crumple into a ball and snowball them into a circle. Everyone takes a different snowball to read and as a group discuss possible next steps,

- Organizing practicum experiences by common headings into a group doc,

- Think/pair/share highs and lows from practicum while mentor documents on whiteboard, then mapping the highs and lows onto the competencies as both evidence of growth and next steps,

- Telling competency stories: Pick one from the list and tell a story from your practicum that demonstrates it in action—using documentation to illustrate,

- Using group time to work on ALPs together,

- Mentor modeling creating their own ALP based on the group meetings.

Finally, I sent out suggestions as milestones were approaching:

Year 1 TCs had their first four weeks of practicum in November/December! Now that the rubber has hit the road, they need time to debrief and the mixed cohort nature of the MTM group gives them a wonderful opportunity to learn from each other. I suggest documenting their experiences in some way (perhaps asking them for ideas on how to do

this!) and using it as data to guide your further group meetings. If they have documented examples of student work from their practicum, you have a rich source of data for inquiries such as moderated marking, bumping up strategies, etc. They will also have many sources of evidence of growth towards the professional competencies by now, so the January meetings are the time to help them start sorting them out in preparation for thinking about next steps.

What is the Difference Between the PPR and ALP?

At first, I had many meetings with mentors to untangle these acronyms, and then more workshops and visits to groups to explain the purpose of the practice record to the teacher candidates. I had to disrupt the notion that the PPR was an end in itself, that there was one right way to organize it. As one mentor commented after a meeting, it is not about the form, it is about the habits. The purpose of the PPR is to provide a field for coaching teacher candidates to develop good habits of record keeping.

Figure 2

Professional Practice Record
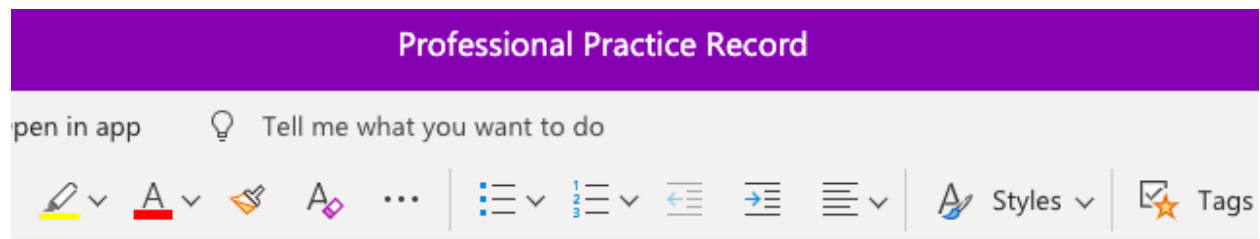
The PPR is a platform for keeping examples of documentation, reflection, and feedback needed for the framework of the TPA process. Our university platform for secure, privacy-protected data storage is Microsoft Office 365. We decided to use the Office application Onenote (www.onenote.com) because it functions as a digital binder, replacing the requirement in our ITE program for teacher candidates to keep a practicum binder for their observations and lessons plans. The cloud-based and collaborative design will allow more seamless sharing of work between TCs, associate teachers, course instructors, and practicum consultants in the future. We created group notebooks with sections for organizing documentation, keeping records of reflection and feedback, and resource materials and templates for the annual learning plans. However, we found that some teacher candidates preferred using other methods of record keeping, and that mentors also had some constraints on their access to the group notebooks, dependent on their connection to the university and their personal familiarity with the platform.

We also expect that the PPR will become a living document for many teacher candidates to carry into the profession. To provide both structure and variation, I made it clear in further communications about the PPR that:

> TCs must archive/share digital documentation of students in their PPR for data privacy protection. [University] does not have arrangements with Google to protect from data mining, as many school boards do. TCs are welcome to bring in actual artefacts from coursework and practicum to discuss in their groups as well, and many times this makes for a better conversation. TCs should also keep backup copies of digital documentation.

> Mentors can help TCs appreciate the ethical implications of sharing examples of student work. However, it is NOT essential that mentors use OneNote. There are many ways for TCs to share documentation, and you are also welcome to use other online platforms for group discussions without sharing visual images, such as Twitter and Google Docs. The notebooks do however have a "Collaboration" space that functions like a Google Doc. If you want to use your notebook, let me know and I can meet with you to show you how very quickly.

In summary, I posted in an email announcement to all the mentors: "We want the technology to serve the process, not drive it."

What Does a Good ALP Look Like?

> At the outset of the program, mentors were given this guidance:

> The Mentor and Mentor Group can help teacher candidates develop their ALPs by:

> Discussing/sharing examples of ways a competency can be documented in practice.

> The Mentor will offer guidance on which competencies to focus on, taking depth, exposure, year in the program, and individual learning needs into account. It is not necessary to work towards all eight of the competencies required of new teachers,

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particularly in year one. It is more important that TCs get experience with tracking their professional growth, participating in a professional learning community, using feedback productively, and learning to value going deeper rather than wider in their learning by re-visiting and re-visioning earlier work.

And yet, this question about the quality of an ALP was the most pressing and ongoing concern by far. There were many variants, such as: How many competencies should I/they be working on? What is the correct format for the ALP? How many examples of documentation should I include? Should I be focussing on competencies I haven't been exposed to yet, or things I know I can do better? The next email excerpt responding to one of the mentors highlights these concerns:

> Yes, they can choose any competency. The green ones are highlighted for NTIP, but I don't want them to feel overwhelmed or limited. Low floor, high ceiling. "Is the next step in regard to the competency they focused on in the ALP or is it a brand-new competency and how they plan to tackle that one?" It really depends—my first question to a TC would be, do you really think at this stage you have mastered a competency to the point where there is no next step? Obviously, all of us should still be working on every aspect of our practice. On the other hand, at this point exposure is an issue, so a next step could well be trying something new. There isn't a right or wrong answer, as long as their next step(s) is based in some form of evidence and has some actionable quality to it. "If they choose to report on 1–3 competencies does that mean they have to do the ALP three separate times for each one?" The presentation would cover all aspects of their ALP, but the way the form is set up, it would make sense to do one for each. The form is just a graphic organizer for them.

I found the overall concern with doing ALPs correctly somewhat surprising since the course was self-evaluated; as both a pilot project in shifting to the pass-fail system in our ITE program, and on principle that in order to develop the capacity for self-regulated learning in students, teacher candidates needed to develop that capacity in themselves. I saw this anxiety in large part as an artifact of the performance-driven mindset of the grades discourse we have all been steeped in as students and teachers. There was also, as I said to one mentor who was dealing with challenges in her group: "The anxiety of not knowing what you don't know, until you get the chance to articulate what you do know and then make a plan." In each group that invited me to speak about the ALP, there would come a moment when I saw faces and shoulders visibly relax:

> The ALP is your plan. You have professional discretion, but your mentor is here to help. If it is based in evidence, if it is actionable in your next practicum, and if it matters to you, then it is a good plan.

But the format of the plan also has material agency. The first template we provided was a copy of the ALP in the TPA document (Figure 3). It provides structure in the column headings, with much room for variation. The feedback I got from some of the mentors and teacher candidates was that for a first-time experience, they needed a higher degree of structure. The second template (Figure 4) added two bullet points each for documentation, reflection, and feedback, and broke the action plan into more defined considerations. I emphasized that the more structured template was intended to be "low floor, high ceiling," so that it would set a baseline expectation, but not a limitation. Most importantly, we want teacher candidates and mentors to realize that like the PPR, the ALP is not a form to be completed correctly. We see the ALP as a formative space, a graphic organizer for having a professional conversation. Teacher candidates were encouraged to present their ALPs visually, using examples from their documentation. The answer to the question about what to include was also constrained by having five minutes to

present followed by discussion, another "enabling constraint" (Davis & Sumara, 2006) which

participates in focussing the plans.

Figure 3

ALP Templates 1

Practice Domain	Competency	Sources of Evidence	Next Steps (Include plan and timeline)
		Work samples from course work or practice teaching (possible examples: lesson plans, unit plans, learning materials you created or re-designed, teaching videos): Reflections (possible examples: changes made to lesson plans after teaching, reflective journals, notes after mentor group discussions): Feedback (possible sources: Associate Teachers, Instructors, Mentors, Peers):	

Figure 4

Annual Learning Plan, Template 2

DOMAIN:	COMPETENCY:		
DOCUMENTATION	**WORK SAMPLES** from course work or practice teaching (possible examples: lesson plans, unit plans, learning materials you created or re-designed, student work samples, assessment methods, teaching videos) • ITEM/DATE/WHY THIS? • **REFLECTIONS** (possible examples: changes made to lesson plans after teaching, reflective journals, notes after mentor group discussions) • SOURCE/DATE/WHY THIS? • **FEEDBACK** (possible sources: Associate Teachers, Instructors, Mentors, Peers) • SOURCE/DATE/WHY THIS? •		
NEXT STEPS	**PLAN** • WHAT AND WHY?	**INSIGHT** • HOW WILL I SELF-ASSESS MY GROWTH? • WHO ELSE CAN PROVIDE FEEDBACK?	**TIMELINE** •

Why Does My Group Have Different Expectations Than Other Groups?

I have found in my own experience as a teacher that as inclusive as educators strive to be in accommodating different learners, we struggle to be accepting of different learning situations. Students, teachers, principals, and parents alike, we compare and we judge. Along with concerns about creating the "right" ALP, there was some apprehension about having an external reviewer participate in the discussions of the plans. This was another affective sticking point in the MTM program that I needed to work hard to defuse and reframe in responses to questions by some mentors, teacher candidates, and reviewers. On a visit to one of the groups, I said, "each group is

its own ecosystem," a message which the mentor later told me resonated. The following quotes from emails to teacher candidates encapsulates the reframing:

> The purpose of the external "review" is to have a principal who hasn't been part of the process take part in the group discussion of the plans as a set of fresh eyes. It also gives you an added edge to be able to articulate your ideas to an interested, but uninformed professional. Your presentation sounds good as is. Feedback from external reviewers so far is that they really want to help the conversations go deeper, and that requires vulnerability.

> There is some purposeful variation in specific expectations of the mentors. It's important for you to understand this is normal. Each group will vary based on the needs and prior experiences of the mentees and the experience of the mentor. Some teacher candidates, especially towards the end of the program when they've had a number of different placements, are quite capable of developing a plan that addresses multiple competencies. If some mentors expect more, it is because they feel confident in their mentees and in themselves as coaches to support them to do more. It's not about having different expectations or higher expectations but supported expectations.

Although the reviewers were messaged in advance that their role was not to evaluate individual plans but to participate in a conversation about learning from the plans, a few wondered afterwards why plans between the groups varied, and what the criteria for the plans should be. Reviewers also need multiple exposures to become full participants in the ALP process. In preparation for the next round of reviews, we sent a message with a higher degree of structure:

> Please note that we are not asking you to evaluate their individual plans. We find the opportunity to justify these learning plans to another professional is a helpful step for the

TCs in focussing the plan and identifying resources. Our goal is also to facilitate deeper

discussions about learning across the plans. These year 1 TCs have had one practicum

plus course work and their task is to use examples of documentation, reflection, and

feedback to identify learning goal(s) they can work toward in their next two placements.

We use the format for annual learning plans in the TPA/NTIP process as a baseline and

the mentors provide guidance through their areas of expertise, which means the plans

group to group will vary somewhat if you are participating in more than one group. The

mentor groups are also mixed cohorts so that IS and PJ can learn from each other. When

they return in the fall, the TCs will be reflecting on these plans and further refining them

with their mentors. We ask that you provide suggestions as applicable and help to make

connections from their individual plans to the kinds of school growth planning and

professional learning you engage with your staff. Our hope is that you will also learn

about the kinds of professional learning opportunities new teachers are seeking.

Adoption of a design innovation is never one and done (Rogers, 2003). The MTM innovation in

our Research and Assessment course is designed to assemble the conditions for the emergence of

professional agency. We know that leadership, trialability, and consistent and persistent

messaging are some of the keys to organizational change (Damschroder et al., 2009). It is not

surprising that sharing the vision for this change takes multiple iterations to diffuse, although it

may be helpful to other teacher educators to see it documented. The participation of material in

assembling practice has also been well-theorized, particularly in the literature on science and

technology studies (Latour, 2005). This expanded notion of participation is explored further in

the discussion. However, it is less common to weave understandings of complexity and

materiality together in education literature (Fenwick et al., 2011), which is a generative area for

research in curriculum making. I began this section with two design problems. The first was assembling a vision, but the second has long-term implications. How does an assemblage for professional agency become self-sustaining?

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Discussion: Nurturing Agency

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Understanding the MTM program as an ecosystem designed to reproduce itself through structure and variation nurtures professional agency. Nurture is vital. In order to facilitate professional growth, we must care for its complexity. Our findings in disassembling and reassembling teacher candidate agency illustrate three kinds of caring for agency: disruption, resonance, and participation.

Disruption

Disruption lays the groundwork for growth. There are many assumptions about grades and performance designed into education systems. Dis-entangling learning from grades by shifting to a pass/fail assessment framework in our teacher education program is a shovel in the ground for producing professionals rather than reproducing students. But to echo Wenger (1998), learning cannot be designed, it can only be facilitated or frustrated. Challenging mentor/mentee assumptions about enacting the syllabus, the practice record, and the annual learning plan the correct way is a necessary disruption to facilitate variation. However, we also found, not surprisingly, that some learners were frustrated by less direction. Within the enabling structures of the PPR and ALP, we needed to design in some scaffolded constraints in the form of baseline templates. Although notions of disruption and constraint seem unfavourable to growth and innovation, Davis and Sumara (2006, p. 149) argue that enabling constraints are proscriptive for emergence: "They stipulate what one must not do in order to remain viable … This affords an unexplored space of possibility."

The review process for the ALPs is also an enabling constraint. There are two things we ask teacher candidates *not* to do with the design of their learning plans: making a plan without drawing on documentation, reflection, and feedback; and submitting their ALP forms for evaluation. In this way, the plans can be iterated through conversation and validation. We ask them to see their plans as "living documents" (Mentor) which change with them through practice. Agency is exploration and expansion of the space of possibility.

Resonance

From an actor-network standpoint, a resonant practice is a set of relations which begin from a central point and expand outward, attuned to the centre, but not dependent on it (Sørensen, 2009). In complexity theories, the notion of de-centralized networks offers a related concept: Networks are more robust and have long-term viability, that is, they demonstrate complexity when "agents are able to affect and be affected by their nearest neighbours (Davis & Sumara, 2006, p. 105). In the MTM program, mentors who were co-located by previous work associations (faculty instructors, principals who had worked together on other projects, teachers who knew each other) were more likely to work together to co-plan their mentor group meetings. These designs drew on background experience which inevitably created variation on the pattern of the program. Sometimes groups of mentors wanted to connect with me as the coordinator to test out their ideas, to make sure they were resonating with the structure of the program. But caring for this resonant space meant sometimes having to step back from the centre. Nurturing resonance paradoxically means encouraging some noise. When I initially heard the concerns from some mentors and teacher candidates about variations on the criteria for the ALPs, I have to confess my first instinct was to call a group meeting. Were we veering from vibrancy into chaos? I decided to intervene individually with the message about the group ecosystems, because I felt a central message might stop the flow of plan development in the groups at that point. Noise—

random events or contextual exchanges of information and energy in and around neighbouring agents in a complexity—is vital for triggering possibilities (Davis & Sumara, 2006).

But who is my neighbour? "Although undeniably important, personal and group interactions for their own sake may not be as vital as is commonly assumed … the neighbours that must interact with one another are ideas, hunches, queries, and other manners of representation" (Davis & Sumara, 2006, p. 142). In the next section, we attune to ways that "other manners of representation"—the forms used for the ALP and PPR—also participate as actors in the MTM program.

Participation

The MTM program can be likened in many respects to a community of practice model (CoP, Wenger, 1998). Theories of CoP inform the OCT standard that teachers participate in professional learning communities of disciplined inquiry to advance school improvement goals (Ontario, 2010b, p. 20). However, a limitation to the CoP model is that it does not adequately account for power relations that voice or silence particular knowledges and practices (Clarke, 2015), or attend to the ways that materials not only position us in practice, but configure practice (Suchman, 2007).

According to Fenwick and colleagues, a sociomaterial perspective on encouraging human participation in communities of practice "becomes far more a matter of attunement to things seen and unseen ... than a brute assertion of human intention and control" (Fenwick et al., 2012, p. 7). Mentors varied in the ways they participated with the human and material participants in their groups. The forms of the syllabus, the OCT competency statements, the PPR, and the ALP were reiterations, not reproductions. Suchman (2007) discusses product forms as "plan and situated action." There is always a contingency to design. Notice also that form is both plan and actor. The digital notebook sections of the PPR and the boxes and bullet points in the ALP template

voice particular knowledges and practices. The design of the group experience around collaborative reflection on different questions of practice is also an actor in staging conditions for multiple voices. The norms of community practice designed into these space/time/matters of the MTM program are the forms which reiterate as variations on a theme. Although such noise is necessary, we also need to care for the silences. Mentors work to support their mentees' professional growth, but to what extent? What else might participate in the formation of professional agency? What is being over, under, and not supported in the mentor groups, and in our ITE program, writ large (Smith, 2010)? The research described through the mentor program approach to research and assessment in this chapter is part of an ongoing design-based study to understand and nurture the emergence of professional agency across the teacher education program. Theories of complex collective action continue to support these efforts.

Davis and Sumara (2006) discuss the importance of repertoire and improvisation in an intelligent collective, which might be a better way to characterize the MTM program than a community of practice: "The intelligent unity is one that generates a diversity of possibilities and that has a mechanism [repertoire] for critically debating the merits of those possibilities" (Davis & Sumara, 2006, p. 86). At different scales then—teacher candidate, mentor group, MTM program, ITE program—we seek to attune ourselves to agency. How might we continue to explore and expand the space of possibility in our profession as educators? Going forward, we now have ethics consent to do pedagogical documentation in the mentor groups as data for our teacher education program, so that we can continue our care for this work through "visible listening" (Rinaldi, 2012).

Conclusion: Complicities

This chapter tells the story of two related design problems: assembling and sustaining a vision for professional agency through Western's ITE program. In assembling this vision, we

began with Darling-Hammond and colleagues' (2013) claim that one of the most difficult challenges in university-based teacher education programs is achieving coherence and integration. We recognized that we must make a shift away from a world of "courses" and begin to think about all courses as they relate to practice (Boud, 2007). We realized our assessment *of* teacher candidates was complicit in their practice.

If we do not foster teacher agency, we rob our teacher candidates of the opportunity to fully develop as agentive professionals. If we do not foster teacher agency capabilities, we risk graduating teachers who are merely "docile bodies" (Foucault, in Dwyer, 1995) performing in a system that they ought to understand to use in critical and sophisticated ways. If we do not foster teacher agency, we relinquish an opportunity to prepare capable professionals ready for a complex system of practice. Shifting to pass/fail and assessment *as* learning frameworks is explicitly tied to how these will sustainably affect TCs in their professional practice well beyond our program. It matters if *they* know.

Considering the sustainability of making space for assessment as learning, we re-designed our required research and assessment course as an innovative mentor program which inducts teacher candidates into habits of professional learning. Mentor programs attempting to integrate theory with practice come and go in teacher education (Martin, 2017, Kiggins & Cambourne, 2007). The key, as Suchman (2007) summarizes, is reiteration of responsibility:

> Reiteration or reconfiguration is the cultural and political project of design in which we are all continuously implicated. Responsibility in this view is met neither through control nor abdication but in ongoing practical, critical, and generative acts of engagement (p. 286).

But it also matters if *we* know. A sustained approach to professional learning must outlast initial contributions by program designers. Professional agency is an emergent phenomenon which

grows *and* changes over time. We used ideas from complexity theories about structure, variation, and vitality to provide the enabling constraints for ongoing, generative engagement. Using examples of forms in our MTM program, we showed how sociomaterial perspectives can promote more critical thinking and practical tinkering with the ways that materials also participate in making space for agency.

We must care for the emergence of agency, even and especially when it acts unpredictably (Latour, 2011), because a complexity is a complicity: "Implication, complicity, and complexity are all derived from the Indo-European 'plek'—to weave, plait, fold, entwine … we are woven into what we research, just as it is woven into us" (Davis & Sumara, 2006, p. 16). Professional agency is a complicated unity of multiple agencies that we participate in disconnecting and re-assembling in our teacher education program.

References

Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability*, *21*(1), 5–31.

Bennett, R. E. (2011). Formative assessment: A critical review. *Assessment in Education: Principles, Policy & Practice, 18*(1), 5–25.

Boud, D., & Falchikov, N. (2007). *Rethinking assessment in higher education: Learning for the longer term*. Routledge.

Campbell, C., Clinton, J., Fullan, M., Hargreaves, A., James, C., & Longboat, K. D. (2018). *Ontario: A learning province* (Findings and recommendations from the independent review of assessment and reporting). Ontario Ministry of Education.

Canadians for 21st Century Learning and Innovation. (2012). *Shifting minds*. C21 Canada. http://www.c21canada.org/wp-content/uploads/2012/11/Shifting-Minds-Revised.pdf

Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsh, S. R., Alexander, J. A., & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. *Implementation Science*, *4*(50), 1–15.

Darling-Hammond, L., Newton, S.P., & Wei, R.C. (2013). Developing and assessing beginning teacher effectiveness: The potential of performance assessments. *Educational Assessment, Evaluation and Accountability, 25*(3), 179–204.

Davis, B., & Sumara, D. (2006). *Complexity and education: Inquiries into learning, teaching and research*. Lawrence Erlbaum Associates.

Davis, B., & Sumara, D. (2012). Fitting teacher education in/to/for an increasingly complex world. *Complicity*, *9*(1), 30–40.

Doll, W. E. (2008). Complexity and the culture of curriculum. *Educational Philosophy and*

Theory, *40*(1), 190–212.

Dwyer, P. (1995). Foucault, docile bodies and post-compulsory education in Australia. *British Journal of Sociology of Education, 16*(4), 467–477.

Earl, L. M. (2013). *Assessment as learning: Using classroom assessment to maximize student learning* (2nd ed.). SAGE Publications.

Elmore, R. F. (1980). Backward mapping: Implementation research and policy decisions. *Political Science Quarterly, 94,* 601–616.

Fenwick, T., Edwards, R., & Sawchuk, P. (2011). *Emerging approaches to educational research: Tracing the sociomaterial*. Routledge.

Fenwick, T., Nerland, M., & Jensen, K. (2012). Sociomaterial approaches to conceptualising professional learning and practice. *Journal of Education and Work*, *25*(1), 1–13.

Fiorino, D. J. (1997). Strategies for regulatory reform: Forward compared to backward mapping. *Policy Studies Journal*, *25*(2), 249–265.

Hargreaves, A., Earl, L., & Schmidt, M. (2002). Perspectives on alternative assessment reform. *American Educational Research Journal*, *39*(1), 69–95.

Hibbert, K., Ott, M., & Swift, J. (in press). Assessing teacher candidates for professional practice. In J. Kitchen & D. Petrarca (Eds.), *Initial teacher education in Canada* (2nd ed.). Canadian Association for Teacher Education CATE Polygraph.

Higher Education Quality Council of Ontario. (2020, June 10). *Learning outcomes*. HEQCO. http://www.heqco.ca/en-ca/OurPriorities/LearningOutcomes/Pages/Home.aspx

Jacobsen, M. (2014). Design-based research. *Education Canada*, *54*(5).

Kennedy, M. (2016). Parsing the practice of teaching. *Journal of Teacher Education, 67*(1), 6–17.

Kiggins, J., & Cambourne, B. (2007). The knowledge building community program: A

partnership for progress in teacher education. In T. Townsend & R. Bates (Eds.),
*Handbook of teacher education: Globalization, standards and professionalism in times of
change* (pp. 365–380). Springer.

Latour, B. (2005). *Reassembling the social*. Oxford University Press.

Latour, B. (2011). Love your monsters: Why we must care for our technologies as we do our
children. In T. Nordhaus & M. Shellenberger (Eds.), *Postenvironmentalism
and the Anthropocene* (pp. 17–25). Breakthrough Institute.

Law, J. (1999). After ANT: Complexity, naming and topology. *The Sociological Review*, *47*(S1),
1–14.

Lowenberg Ball, D., Ben-Peretz M., & Cohen, R.B. (2014). Records of practice and the
development of collective professional knowledge. *British Journal of Educational
Studies, 62*(3), 317–335.

Martin, A. K. (2017). In search of ways to improve practicum learning: Self-study of the
teacher educator/researcher as responsive listener. *Studying Teacher Education*, *13*(2),
127–144.

Ontario College of Teachers (2020). *Standards of practice*. OCT.
https://www.oct.ca/public/professional-standards/standards-of-practice

Ontario. (2010a). Growing success: Assessment, evaluation and reporting
in Ontario's schools. Ontario Ministry of Education.
http://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf

Ontario. (2010b). *Teacher performance appraisal technical requirements
manual.* Ontario Ministry of Education.
http://www.edu.gov.on.ca/eng/teacher/pdfs/TPA_Manual_English_september2010l .pdf

Ontario. (2012). Teacher performance appraisal system. Ontario Ministry of Education.

http://www.edu.gov.on.ca/eng/teacher/appraise.html

Ontario. (2019). The new teacher induction program. Ontario Ministry of Education.

http://www.edu.gov.on.ca/eng/teacher/induction.html

Osberg, D., Biesta, G., & Cilliers, P. (2008). From representation to emergence: Complexity's

challenge to the epistemology of schooling. *Educational Philosophy and Theory*, *40*(1),

213–227.

Priestley, M., Edwards, R., Priestley, A., & Miller, K. (2012). Teacher agency in curriculum

making: Agents of change and spaces for manoeuvre. *Curriculum Inquiry, 42*(2),

191–214.

Rinaldi, C. (2012). The pedagogy of listening: The listening perspective from Reggio Emilia.

In C. Edwards, L. Gandini & G. Forman (Eds.), *The hundred languages of children:*

The Reggio Emilia experience in transformation (pp. 233–246). Praeger.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Sherman, S. C. (2013). *Teacher preparation as an inspirational practice: Building capacities*

for responsiveness. Routledge.

Smith, K. (2010). Assessing the practicum in teacher education – Do we want candidates and

mentors to agree? *Studies in Educational Evaluation*, *36*(1–2), 36–41.

Sørensen, E. (2009). *The materiality of learning: Technology and knowledge in educational*

practice. Cambridge University Press.

Stooke, R. (2015). Re-educating the educator's gaze: Is pedagogical documentation ready for

school? In M. Hamilton, R. Heydon, K. Hibbert & R. Stooke (Eds.), *Negotiating spaces*

for literacy learning: Multimodality and governmentality (pp. 77–96). Bloomsbury

Academic.

Suchman, L. (2007). *Human-machine reconfigurations: Plans and situated actions* (2nd ed.*).*

Cambridge University Press.

Timperley, H. (2015). Professional conversations and improvement focused feedback: A review
of the research literature and the impact on practice and student outcomes. Australian
Institute for Teaching and Learning. https://www.aitsl.edu.au/docs/default-source/default-
document-library/professional-conversations-literature-review-oct-
2015.pdf?sfvrsn=fc2ec3c_0

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge
University Press.

Curriculum Renewal and Teacher Candidate Voice:
Creating a Trail While Climbing It

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Abstract

In this chapter, the authors describe how student voice and other sources of data informed the renewal of a graduate entry-to-practice teacher education program. The chapter is an account of an evaluative case study examining how student data aligned with, and diverged from, other data to shed light on the program and inform our interpretations and analyses of the curriculum. Students' development as researchers was a particular area of focus in the renewal process, and it is used in this chapter as an illustrative example of how student data informed curriculum renewal and program development. Preliminary analysis indicates that drawing on faculty-driven curriculum mapping data along with candidate feedback allows deeper consideration of curriculum, pedagogy, and program structure. The chapter concludes with initial insights from engaging with multiple sources of evidence throughout the iterative curriculum renewal process.

Résumé

Dans ce chapitre, les auteurs expliquent comment la voix des étudiants, alliée à d'autres sources de données, ont influencé le renouvellement d'un programme de formation des enseignants au niveau des études graduées. Une étude de cas évaluative leur permet de comprendre comment les résultats d'une enquête menée auprès d'étudiants se rapprochent ou s'éloignent d'autres données, afin d'apporter certains éclaircissements sur le programme de formation et d'en guider les

interprétations et les analyses. Cible particulière de la refonte du programme, la formation des étudiants comme chercheurs réside au cœur de l'étude et les données tirées de l'enquête démontrent leur influence dans le renouvellement du curriculum et l'élaboration du programme d'études. Une analyse sommaire indique que la schématisation par les enseignants des données du programme d'enseignement, accompagnée des commentaires des candidats, invite à un examen plus approfondi du programme d'études, de sa pédagogie et de sa structure. Le chapitre se termine par une réflexion préliminaire sur l'interaction de multiples sources de données tout au long du processus itératif de la refonte du programme de formation.

Curriculum design in teacher education is complex. There are multiple demands and perspectives from regulatory bodies, stakeholders, and teacher candidates, and there are also multiple ways in which understanding of the profession is applied in the design of a program (Flores, 2016). In *Accord on Teacher Education*, the Association of Canadian Deans of Education (ACDE, 2017) states that "professional educational practice involves an evolving constellation of knowledge, skills, and attitudes" (p. 3), emphasizing the dynamic and responsive nature of learning to teach. To add to the complexity, teacher candidates engage with the program's designed curriculum as learners while, at the same time, they learn to be critics and experts in curriculum design. Within programs, they are learning how to design and implement curricula as educators. The teacher education program curriculum is required to integrate professional, theoretical, and disciplinary knowledge bases, along with research and the scholarship of higher education (Bransford et al., 2005; Darling-Hammond et al., 2005). As our students learn to become curriculum designers, the program designers also learn from our students about the development of the teacher education program curriculum (Klette & Hammerness, 2016).

The Master of Teaching (MT) program at the University of Toronto, a graduate entry-to-practice teacher education program, embarked on a process of curriculum renewal in 2017. This chapter describes the journey of learning through the analysis of student voice in relation to program data, and we offer some insights about curriculum development and renewal that have been gained along the way. We liken the experience to hiking our way through a challenging terrain; as we will describe throughout the chapter, the trail was rarely clear or linear, but iterative and recursive, with many stops and even stumbles along the way. To investigate the ways in which teacher candidates inform the development and design of a teacher education program curriculum, we pursue the question: How does student voice inform, interact with, and

illuminate a curriculum renewal process? To respond to this question, we describe our navigation

of the early stages of curriculum renewal. The curriculum renewal process is necessarily

comprised of iterative cycles of institutional inquiry: These require the collection and analysis of

data at each stage of the review process in order to assess and inform current program elements,

and plan the next steps (Arafeh, 2016; Jacobsen et al., 2018). Drawing from our evaluative case

study, we provide an account of our process to demonstrate how data and input gathered from

teacher candidates have been critical in shedding light on, and informing our interpretations and

analyses of the curriculum. We focus on the preparation of teaching candidates as researchers as

a specific example of how student voice interacts with other program data to support discussions

on curricular change.

Our History: Surveying the Head of the Trail

The MT program has been in existence at the University of Toronto since 2000, one of

the only two graduate entry-to-practice programs in Ontario. Program graduates are

recommended to the Ontario College of Teachers for certification and also receive a Master of

Teaching degree. The program began as a pathway for K-6 elementary teachers and over time

expanded to include two additional teaching divisions, Junior/Intermediate (Grades 4–10) and

Intermediate Senior (Grades 7–12). In 2013–2014, the program had an enrolment of about 150

candidates in a two-year, four-semester program.

As a result of provincial regulatory changes in 2014, all teacher education programs in

Ontario were required to double the program length to four semesters, increase to 80 days of

practicum in settings using the provincial curricula, and, for the first time, incorporate mandatory

core content in Curriculum, Pedagogical and Instructional Practices, and Knowledge of the

Teaching Context (O. Reg. 347/02, 2014). The new content emphasized coherence, the explicit

integration of theory and practice, the use of research in teaching and learning, and centering

equity (Ontario College of Teachers [OCT], 2017; O. Reg. 347/02, 2014; Petrarca & Kitchen, 2017).

As the enhanced teacher education program was legislated to begin by September 2015, rapid and significant change occurred at every Ontario faculty of education (Petrarca & Kitchen, 2017). The new policy requirements necessarily affected programs differently. While every program was required to address knowledge construction, particularly with greater emphasis on equity in respect of research and teaching, unique challenges emerged for the MT program. The program already fulfilled the four-semester and 80-day practicum length requirements and much of the specified content. The MT was also required to ensure that courses address graduate-level learning expectations. The Degree Level Expectations for all graduate programs, in Ontario, include: Depth and Breadth of Knowledge, Research and Scholarship, Application of Knowledge, Professional Capacity and Autonomy, Communication Skills, and Limits of Knowledge with specified levels of complexity in each domain (Ontario Council of Academic Vice-Presidents [OCAV], 2010).

In response to the above considerations, particularly as part of the university's Strategic Mandate Agreement emphasizing research intensity, it was determined that the two large consecutive and concurrent Bachelor of Education programs would be retired, and teacher education would be offered only at the graduate level. Absorbing some of the allocated enrolment of the Bachelor of Education programs, the Master of Teaching program enrolment more than tripled in size. This growth added to the complexity of addressing required changes, particularly scaling up while maintaining graduate-level research requirements.

In 2015, the MT program added a fifth semester to become a 20-month graduate teacher education program serving approximately 800 candidates in 27 cohorts. The increased number of students put pressure on the curriculum, particularly where preparation as researchers was

concerned. To adapt to the increased scale of the program, the Master of Teaching Research Paper that spanned the two years with a more traditional supervisory relationship was moved to two course-based research papers. In order to adapt to program requirements of both OCT and OCAV, two elective courses were added to the curriculum to allow deeper exploration of an area of research interest, while the existing research courses were altered in organization and supervision. The number of courses offered necessarily increased and, at the same time, the sequence of courses became more varied to respond to larger numbers. The practicum structure remained largely unchanged; however, the substantial increase in placements intensified demand and pressure on partnerships and the infrastructure within a graduate department (McDougall et al., 2017).

A few examples of the program structure for different cohorts are outlined in Figure 1 below for each of the three divisions—Primary/Junior (PJ), Junior/Intermediate (JI), and Intermediate/Senior (IS). Each colour in the model represents a unique course. The only segments of time shared by all candidates are the placements (blue) and breaks (grey); all other courses are offered in a variety of patterns to each of the 27 cohorts. The complexity of offering a wide range of required courses to such a substantial number of students necessitated that certain courses were offered at different points in the program and for varied lengths of time (for example, some courses are offered in a compressed six-week format in the summer, some in a 12-week format, and some across two terms in a 24-week format). The program structure, as we would discover, is one of the most challenging issues for students and faculty alike.

Figure 1

Model of the MT Cohort Structure
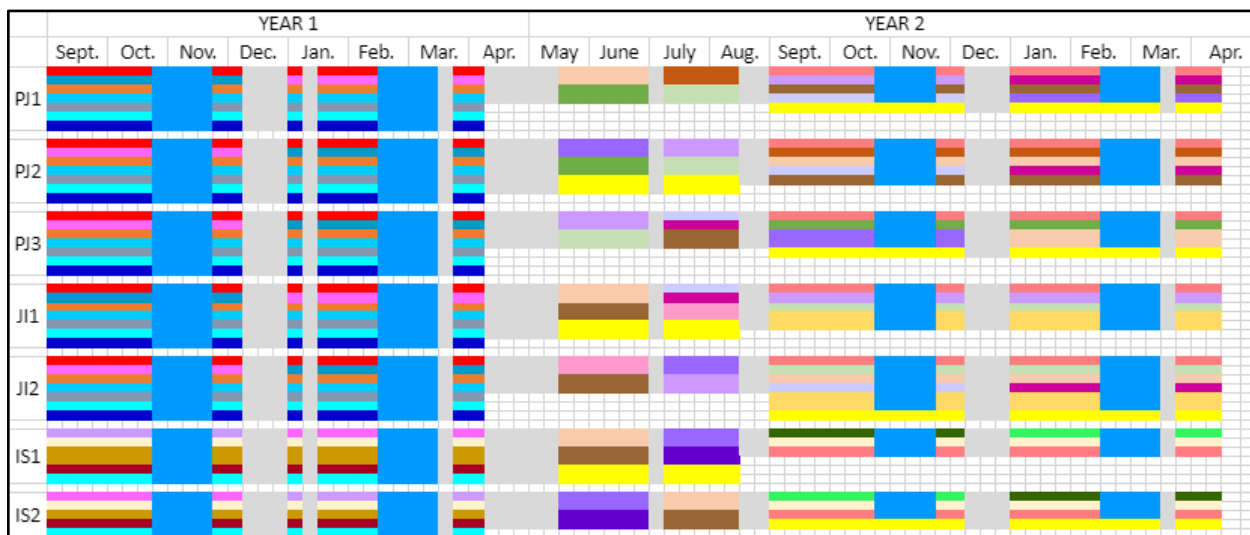
Self-Study and External Review Response: The Impetus for the Hike

Self-studies prepared for the Ontario College of Teachers' accreditation and an intensive institutional academic planning process pointed to a need to review the program's swift transition and expansion in scope and scale. Focus groups (including students, faculty, and community) held with reviewers identified concerns about the changes, and the 2016 exit survey of candidates pointed to issues related to the growing pains. The concerns were relayed by the reviewers in their recommendations and were heard by the leadership team. Here are two of the recommendations in the OISE External Review (2016) linked to the student concerns:

- The MT needs a complete curriculum review, including a clear set of graduate capabilities, strong contributions from appropriate faculty, and clarity regarding its relationship to the M.Ed.

- A clear engagement strategy needs to be developed with alumni, schools, governments, and other leading institutes to strengthen research, teaching, and the student experience, and to enhance national and international collaboration, and impact on policy.

Voices of graduating students in the 2016 annual exit survey suggested to:

- consult students regarding major changes to the program, increase consideration for student voice and concerns, and improve communication with students, and

- avoid major restructuring of program after students have enrolled with certain expectations (e.g., research supervisors, etc.).

Data Collection Methods: Signposts on the Trail

Our data are drawn from an in-depth single case study of coherence in teacher education (Creswell, 2014; Yin, 2018). Given the evaluative nature of the work, this design allows insight, discovery, and interpretation of on-going data (Merriam, 2009). An evaluative case study approach is useful for addressing questions in which "deep and multiple understandings of existing situations are needed in order to consider improvement" (Merriam, 2009, p. 49).

Teacher candidates are key sources of information about the programs they are experiencing (Worrell et al., 2014). Their voices are foregrounded and captured through extensive annual program surveys. The surveys include scaled quantitative items and open-ended questions related to the program vision of excellence in teaching and research, practicum experiences, integration of research in teaching, and practices and concepts related to equity. Though it has been refined throughout the curriculum renewal process, the program's annual exit survey of graduating candidates has been a key instrument for gathering data from, and accessing, student voice (Ludlow et al., 2008) since the program's inception. Ludlow et al. (2008) suggest that surveys can inform understanding of programs and candidates' experiences when utilized over time with intention. Items remain for longitudinal data collection purposes with specialized sections added to address areas of further interest. Yin (2018) asserts that surveys can offer data that can be viewed as equivalent to information obtained through interviews. Surveys are particularly useful for a large number of respondents. Each year 25–35%

of the approximately 800 teacher candidates respond to the surveys providing robust data sets. In this chapter, data from surveys administered between 2016 and 2019 are utilized.

In addition to student voice, data sources also include faculty and MT community partners. Since 2017, perspectives of faculty in various teaching and program leadership roles have been captured in ongoing documentation of program and curriculum development meetings; curriculum mapping data and program development meeting notes have been the primary sources utilized for this chapter. The meeting notes provide perspectives on the student experience from program leaders and faculty who work closely with candidates and hear their stories and experiences during classes and through our online communities (Table 1).

Table 1

Overview of Data Informing This Chapter

Student midpoint survey	2018 (n=137); 2019 (n=213)
Student exit survey	2016 (n=96); 2017 (n= 102); 2018 (n=159); 2019 (n=153)
Student electives survey	2017 (n=192)
Course Leads meetings (meeting notes, action items, reviewed expectations, shared professional learning artifacts, course curriculum maps)	5 meetings per year (2017–2018 to present)
Program-wide meetings and retreats (meeting notes, documented actions, posted shared professional learning, and teaching resources)	4 meetings per year (2017–2018 to present)
Program Development Working Group meetings (meeting notes, program curriculum maps, communications)	8 meetings per year (January 2018 to present)
Visioning Advisory Committee (meeting notes, recommendations, reviewed vision, and expectations, communications)	2–3 meetings per year (January 2017 to present)

Data analysis is ongoing and iterative, and themes from the data are shared at program meetings to inform our planning and piloting. The quantitative survey data are displayed using a tool within the survey software, and then are analyzed for patterns. Qualitative data from open ended questions are thematically analyzed using NVivo. Coding was utilized to identify patterns and the strength of the themes, while patterns were assessed through comparative analysis. Meeting notes, along with instructor and student handbooks, were also analyzed for evidence of themes that emerge in the other sources.

Initial Consultation to Plan the Renewal Process: An Attempt to Establish a Trail

The curriculum renewal process for the MT program began in 2017 with a view to increase the coherence of our courses and reduce redundancy, and to deepen the program's focus on research and the research opportunities afforded to Master of Teaching students (OISE Academic Planning, 2017). From the beginning, the overarching values of consultation and collaboration were drivers of the process. The curriculum renewal process began with the creation of a Visioning Advisory Committee with membership from faculty in the MT program, other OISE departments and support units and, most importantly, students. Other community partners such as officials from the Ministry of Education also participated in meetings. The Visioning Advisory Committee consisted of 15 members, three of whom were MT students or alumni who represented the voices of their constituency (one student represented first-year students, another spoke for second-year students, and an alumni member offered the perspective of program graduates). The Visioning meetings focused upon two-way communication and gathering institutional data. While a variety of recommendations were brought forward, this chapter focuses on the ones related to research preparation. The following excerpt is from the students' suggestions:

- There are ways of reorganizing the program to address both OCT requirements and the "masterliness" of the program.

- Early courses should be mapped to teach students how to deconstruct articles. Timing of this is so important. They should be early in the program to encourage a kind of way to think critically and effectively throughout the program.

- How about a research literacy thematic cohort?

- How about a research pathways approach (MT Visioning Advisory Committee, 2017)?

A communication to the OISE community from the Visioning Advisory in June 2017 indicated

the following areas for attention and action:

- the role of research and connection to "masterliness" in teacher education, which has been defined as a state of advanced professional critical thinking linked to action and informed by research and evidence;

- addressing student experience; and

- focusing upon elements that can contribute to coherence-making and the interaction of theory, research, practice, field, and academy.

The conclusion of this consultation process was that in order to effectively "blaze a trail" forward, it was necessary to look back and take stock. The program leadership looked to well-established curriculum analysis processes inspired by the seminal concept of backward design, as outlined by Wiggins and McTighe (2005) in their text *Understanding by Design.* The Ontario curriculum is built on backward design and is a key element of the teacher education curriculum experienced by teacher candidates in the program. While most institutions have their own variation of the process, curriculum analysis cycles usually involve some form of program visioning, establishment, or revision of program learning outcomes, curriculum mapping (or similar analytical tool), and implementation planning (Centre for Teaching and Learning, n.d.; Dyjur et al., 2019; O'Neill, 2015). The institutional model for curriculum renewal at the University of Toronto follows a similar cycle (Richards, 2018), as seen in Figure 2.

Figure 2

University of Toronto Model of Curriculum Renewal Process
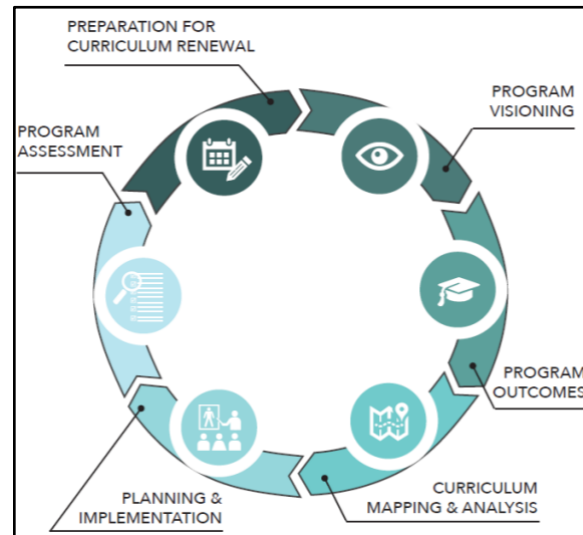
While models built on the concept of backward design display a theoretical simplicity (Biggs &

Tang, 2011; Fink, 2013), the reality is often much more complex. Even with a theoretical

understanding at the beginning that the process would be iterative, hiking the trail meant living

within oftentimes messy sub-cycles or deeper exploration of particular terrain, which is better

represented by the revision to the U of T model below (Figure 3).

Figure 3

Revised U of T Curriculum Renewal Model
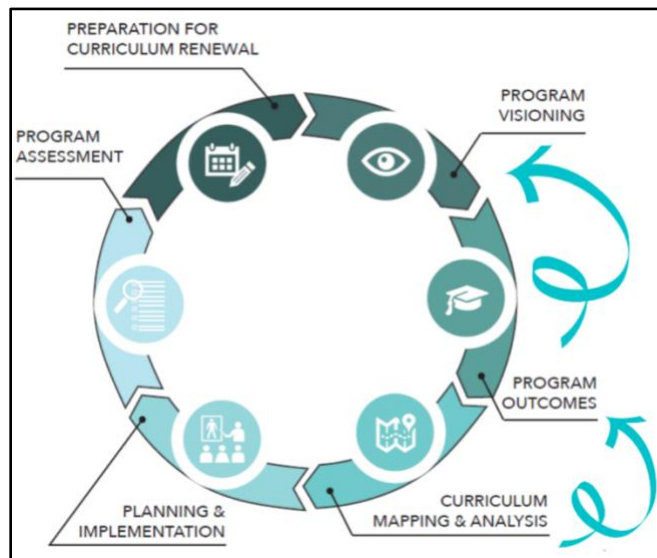
Establishing a New Program Vision and Learning Expectations: Entering the Woods

Guided by the Visioning Advisory consultation, the Program Development Working

Group (PDWG) began re-crafting the program's overall vision in January 2018. PDWG was

comprised of 14 program and course leaders who represented both continuing and non-

continuing faculty with administrative and teaching roles across elementary and secondary

panels, and in curriculum and foundational courses. Several were Course Leads (a role

established to address the scope and size of the program) who worked with instructor teams to

develop shared course expectations, share resources, pedagogies, and assessments, and maintain

shared knowledge among the team. PDWG members were experienced teacher educators and

scholars, most also possessing teaching credentials and relationships with schools. The rich and

important diversity of knowledge bases, research approaches, and orientations to education

within the group is reflected in the renewed vision:

> Teaching excellence and scholarly research are the mutually reinforcing pillars of the
>
> Master of Teaching program. Our graduates are outstanding teachers and future

educational leaders who consult, critique, create, and mobilize educational research. As a

community, our faculty, students and graduates share a deep commitment to all learners

and the building of a more just, equitable and sustainable world. (OISE, 2020)

As the vision indicates, the program is built around a commitment to adult learning and

the recognition of the social constructivist underpinnings of our program (Beck & Kosnik, 2006;

Darling-Hammond, 2006). We understand our candidates to be constructing meaning and

professional knowledge from their experiences. We are guided by Darling-Hammond et al.

(2005) who frame the curriculum for teacher learning around a cognitive map or conceptual

framework of teaching that involves content, process, and context with clear overarching

purposes identified in a shared vision. We draw upon Grudnoff et al. (2017) and their conceptual

framework for equity-centred teacher education. The framework articulates both content and

process for curriculum in teacher education and emphasizes the need for:

> selecting worthwhile content and designing and implementing learning opportunities
>
> aligned to valued outcomes, adopting an inquiry stance and taking responsibility for
>
> professional learning, using evidence to scaffold learning and improve teaching, and
>
> recognizing and addressing classroom, school and social practices that reproduce
>
> inequity. (p. 324)

Following the establishment of the renewed program vision, PDWG began brainstorming a list

of the program graduates' intended knowledge, skills, attitudes, and approaches in order to

analyse the curriculum through the lens of the renewed vision. Establishing a shared

understanding of our task was critical, and debates and discussions began immediately regarding

the meaning of terms. While PDWG did not dispute the need to articulate program graduate

"learning," the term "learning outcome" communicated a narrow and instrumental frame to

many members. The discussion of outcomes as a finite, technicist, or competence-oriented

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endpoint did not capture the complexity of teaching for PDWG members. The discussions uncovered a tacit but shared conception of the program curriculum. We affirmed that constructivist, experiential, and negotiated elements of curriculum inform our program; that the program views candidates as learners who make sense of the content and practices within contexts and through the lenses of their locations and identities. We came to understand our curriculum as an amalgam of process-oriented, experiential, integrated, reflexive, and social critical conceptions of curriculum (O'Neill, 2010; Ornstein & Hunkins, 2017; Toohey, 1999). Eventually, the term program expectations was adopted, as it would be understood by candidates as both an aim and an aspiration.

PDWG worked in various configurations to develop the program expectations (PEs) and, in addition to using the program vision consultation data as a base, also consulted the teacher education literature and professional regulations. Along with the Grudnuff et al.'s (2017) article on teaching for equity in teacher education, other articles and studies on learning to redesign teacher education were particularly helpful as aspirational and informed "guides" (e.g., Anagnostopoulos et al., 2018). A set of 31 PEs were painstakingly agreed upon and trialed with Course Leads and instructors. The initial 31 PEs were used to develop and revise shared items on the annual surveys of students. Eventually the number of PEs were reduced to 23 and shared with our Visioning Advisory Committee and the community more widely.

Meanwhile … Overturning Rocks …

Students were not directly involved in the original development of the program expectations, though candidate input during the visioning consultation informed the process. The draft program expectations were shared in program handbooks and course outlines. As referenced in the data collection section above, seeking student feedback on an annual basis was a longstanding process in the MT program; all graduating students were invited to complete an

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exit survey to provide insight on their experiences with the program. Following the revision of the program expectations, it became clear that the existing exit student survey did not provide pointed feedback on how students developed coherence in the area of importance to program stakeholders.

In April 2018, the exit survey was adapted to address curriculum renewal aims. Items modeled on an international study conducted by Canrinus et al. (2017) were added in order to gain information around candidates' experiences of program coherence. Examples include: "I saw connections among ideas and concepts across programme courses," and "The programme articulated a clear vision of teaching and learning" (p. 332). Existing items around their sense of preparedness were reworded to align with the 23 new program expectations, and questions regarding the role of courses in their development as teachers and researchers have also been adapted to foreground the program's vision and emphases. For example, the survey asked students to respond on a Likert scale to questions such as "The MT program did a good job of helping me to apply research and theory to practice," and "How much opportunity did you have to make connections with and about research across courses?". Student were also asked to rate their professional learning in a number of areas such as:

- knowing how to access, evaluate, and apply research to issues of practice;

- applying findings from my research to issues of practice;

- knowing how to gather data and evidence to inform and improve teaching; and

- integrating pedagogical practices that support equity, social justice, and environmental sustainability, recognizing and investigating your own social locations, biases, (dis)advantages and predispositions in relationship to your teaching and research.

These revisions to the exit survey were also embedded in the new midpoint survey which was implemented to gain a sense of students' experiences and learning in the program at the end of

year 1. It was viewed as important to understand programmatically how the first two semesters, which are similar in course sequence, supported learning as the complex variability in course sequencing increased in semesters 3, 4, and 5. We wanted to investigate more anecdotal reports from candidates about the varying learning trajectory across the five semesters. The surveys offered opportunities to gather data about innovations or pilots that pertained only to one year; for instance, an online self-directed Quantitative Research module was piloted and abandoned as a result of useful candidate survey feedback.

Mapping the Curriculum to the Program Expectations: Tangled in the Brambles

Continuing to assess the terrain in order to move forward, mapping of the existing courses onto the revised program expectations began. Where the exit and midpoint surveys captured the student perspective on how the program is experienced, curriculum mapping provided the faculty perspective. Mapping is intended to provide an overall view of how elements of the program connect to the intended program goals and to offer a framework for analysis that leads to further questions, as well as offering some insights (Harden, 2001). Course Leads worked with their faculty teams to link course content, assessments, and teaching and learning practices to the final 23 program expectations.

The Course Leads also examined the "intensity," or complexity, of various expectations. As we tried multiple ways to engage in this exercise, it became increasingly evident that it was very challenging for the Course Leads to determine the "end of course" intensity or engagement, given the variable sequencing of courses—an issue that was also identified by the teacher candidates in exit survey data (see Figure 1 for the example of cohort structures). The sequence in which a given cohort took a course had a significant impact on how that course engaged with the program expectations, and it was therefore challenging for Course Leads to definitively identify the level of engagement with the PEs.

Candidates' open comments in the surveys paralleled concern about course sequencing. For example, "Why was my technology course placed during my final semester after 3 practica?" Timing and integration of candidate research within the program were also raised in the comments. Some excerpts include: "The research paper is due too early in the year and around the practicum," and "We should have the research program go through the summer to help refine research project. You lose the momentum and there is quick turnaround for coding." "Our Anti-discriminatory course offered potential to look at the hidden curriculum and ways in which education can be oppressive. This in turn allowed me to approach my research including different perspectives and my own positionality. I would recommend that you integrate Anti-Discrimination education into all courses." Faculty believe that anti-discriminatory education is foundational within courses, but the feedback from candidates indicates that their capacity to see and make strong integrative connections may vary based on where the dedicated course sits in the program.

A significant learning moment occurred at a Course Leads meeting when we attempted to map the "growth over time" of one selected Program Expectation. The PE captured a core program intention to prepare teachers who view research and inquiry as a lens for approaching their instructional practice. Course Leads were challenged to consider the ways in which the PE "Adopt an Inquiry stance that is grounded in research and evidence-based practice" was taken up and demonstrated in their courses. Despite multiple courses indicating attention to the PE (as shown in Table 2 below where each X underscores engagement of the PE in a course), it was challenging for any Course Lead to confirm that their course intention was for students to demonstrate the expectation autonomously, at an entry to profession level.

Table 2

Excerpt From MT Program Preliminary Curriculum Map

Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Critically access, evaluate & synthesize educational research from a range of epistemological & methodological approaches	X		X	X	X					X	X		X	X	X	X	X	X	X		X		
Engage in data collection, analysis & the mobilization of research in respectful ways that consider communities & context	X			X									X										
Adopt an inquiry-oriented stance that is grounded in research & evidence-based practice		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X			X	X

Our mapping work was guided and supported by multiple visualizations and views of the program, such as the one above, and the maps have been helpful tools to make our current understandings of the program visible. Perhaps unsurprisingly, our experiences with mapping have closely aligned with other accounts in the literature. Similar to the findings in Uchiyama and Radin (2009) and Metzler et al. (2017), engagement in curriculum mapping enabled more connections among Course Leads around the vision of the program. Fruitful discussions have resulted within course teams, across the program, and in the Program Development Working Group regarding the issues of variable sequencing, structure, coherence, and meaning-making for candidates. While we have known that the program is complex, the possibilities afforded by seeing, sharing, troubling, and unpacking concrete representations in course teams and across divisions has deepened shared commitments and led to more openness for change.

Looking back to Table 2, it seems that most faculty feel their courses promote an inquiry-oriented stance. However, attention given in the program to the collection, analysis, and

mobilization of research appears to be comparatively minimal. This led us to question the "triple-barreled" nature of the expectation as many Course Leads indicated that it was "mobilization" that caused them to pause. We have troubled ideas of "mobilization" as an instructor community and within the MT Research Committee, questioning whether mobilization must be overtly shared or published, and whether collaborative professional learning and/or changed practice are also expressions of mobilizing knowledge gained from research. Mapping helped us to identify expectations that contained multiple concepts, had overlapping ideas or actions, or lacked specificity. The maps, resulting in more clearly stated expectations, have allowed us to consider how the vision and expectations are enacted and experienced, and how our program is organized to achieve these.

Looking at the Trees as Well as the Forest: A Deeper Look at Teacher Candidate Data

Focusing on research preparation in the program provides an illustrative example of the interaction of multiple data sources, and particularly student voice, in our curriculum renewal. Review comments and student input pointed to the need to examine the area and to "deepen the program's focus on research and the research opportunities afforded to Master of Teaching students." Research is foundational in all teacher education, but in particular in graduate entry-to-practice programming governed by the University of Toronto School of Graduate Studies: "Every course in the program is reviewed, approved and governed in accordance with the policy and grading requirements set by the School of Graduate Studies. This is one mechanism that assures graduate level academic standards" (McDougall et al., 2017, p. 160). Centering research connected to teaching and equity is not just stated in the vision. The faculty, candidates, and leadership teams are all keenly aware of the opportunities and ongoing efforts inherent in bringing this vision to life.

As suggested by Jacobsen et al. (2018), we "gathered multiple forms of data to examine individual courses, as well as the integration of the courses" (p. 48). The curriculum maps have been robust and generative sources of data, but the corresponding findings from the student data help to illuminate and contextualize the faculty perspective. We see ways in which the student data sets align with the findings from the curriculum map data, and the ways in which they diverge. The quantitative survey data suggest that the majority of students consider engagement with research in the program to be strong, but a significant number feel there is room for improvement. The following graph (Figure 4) shows responses from the exit survey of 2019 on questions related to the research program expectations. The stem for the items graphed below asked respondents to rate their professional learning in the program in several areas.

Figure 4

Student Responses to "Rate Your Professional Learning in the Program in the Following Areas…"
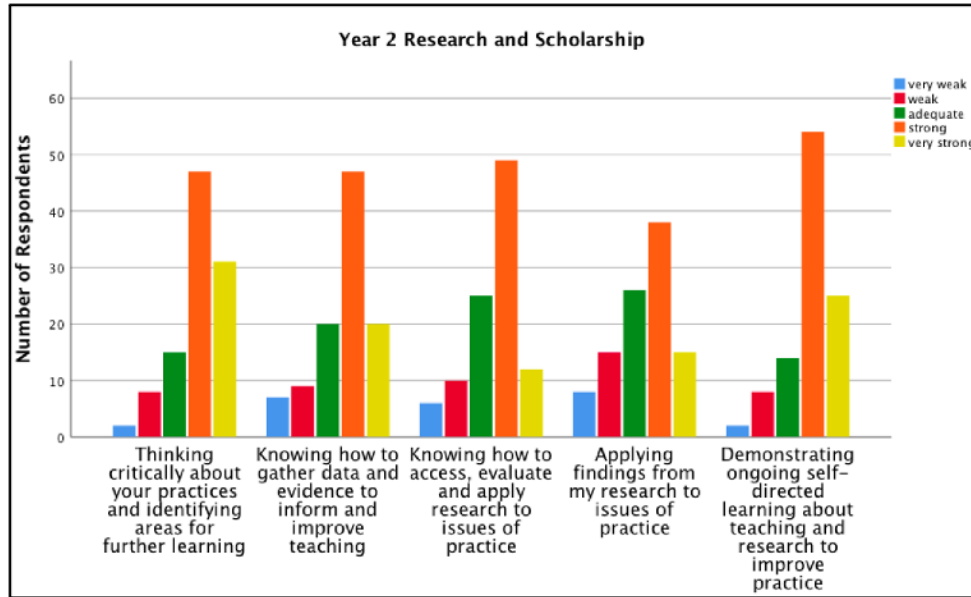
Responses from Figure 4 offer an interesting opportunity for comparison with the mapping data. The emphasis on inquiry stance seems to be reinforced, but the results stand in contrast to the map on data collection and analysis. It appears candidates feel that the program offers preparation in collecting, analyzing, and acting upon data and evidence, whereas the instructors consider those skills to be less intensively addressed in the program. It also seems that they feel relatively prepared to identify learning needs and seek out research. However, the current items do not include reference to mobilization of research. We have identified this as an area for further investigation. We also want to explore further the item around the use of students' own findings. These responses lead to questions about the type of research in which they engage and the ways in which they define or understand their findings as credible, valuable, and actionable.

A question from the coherence section of the 2019 exit survey asked candidates how much opportunity they had in the program to make connections with, and about research across courses. These data support the instructors' sense that more can be done (Figures 5 & 6).

Figure 5

Responses About Research Across Program From Year 1 Students
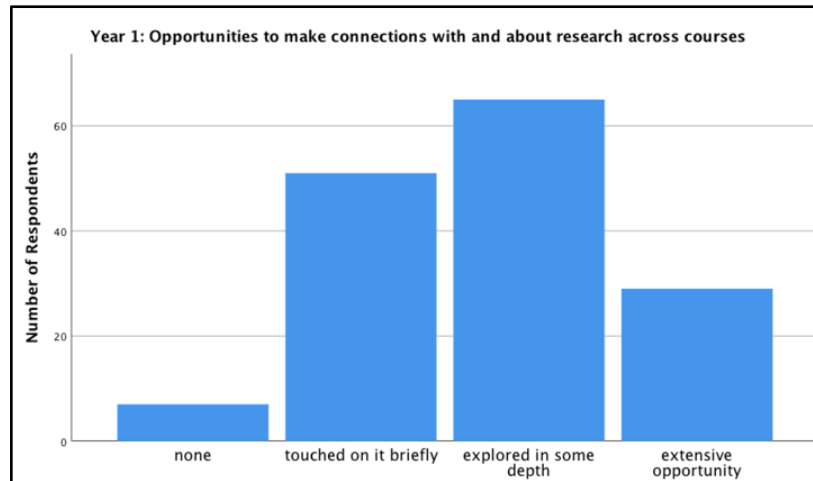
Figure 6

Responses About Research Across Program From Year 2 Students
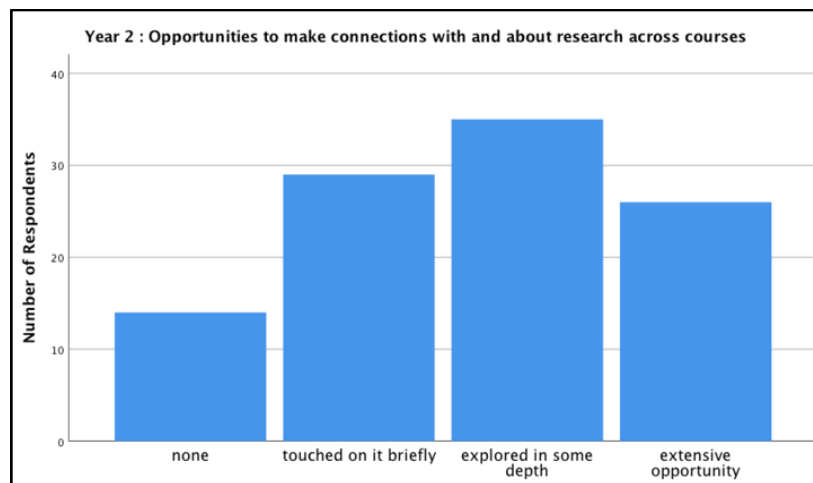
The data have given us pause, as it appears that candidates at the end of the program indicate fewer opportunities to make connections with, and about research across the program than students at the end of Year 1. As course and program leaders, we have hypothesized about

possible interpretations of these results: Do these data relate to the complex and variant structure of the Year 2 experience? Do they resonate with the need for greater cross-program knowledge raised by instructors at our retreat? Have we been explicit enough in our efforts to foreground research connections? We are planning to seek open-ended comments on how candidates have opportunities to make connections with, and about research across courses throughout the degree.

Open-ended comments from the exit survey have been instructive. Candidates articulated the value of research-based assignments that allow depth. Candidates acknowledged that research "was an integral part of curriculum courses" and "helped [them] to understand the teaching strategies being taught." However, at times the integration of research was seen as "repetitive and doesn't inspire deep reflection." These data speak directly to concerns expressed by instructors and captured in some of the course and program maps. The following quotes from the survey provide a snapshot of how students perceive the engagement with research across the program:

- I am not sure if this could be possible but dividing MT students into research courses based on self-perceived development/understanding in research may be beneficial or a personal research advisor for a small group of students (that are similar in research). Often there is a large degree of difference between students in the research classes (never doing research to those who have already written a thesis). I found it was difficult for the teacher to optimally challenge all students and meet the needs of a diverse group. It would have also been nice to be able to collaborate with students of similar topics that were outside my cohort.

- The research component of the program should be expanded and enriched. I was continuously frustrated throughout the program at the limitations placed on our research studies.

- I was lucky enough to participate in a pilot project and gleaned a lot from that experience and I think you should make this more widespread.

- For the research course, I would recommend that the professor stay the same for the two years as they can provide valuable feedback on your progression with your research.

The Program Development Working Group, and particularly the Course Leads responsible for the research courses, have worked to investigate and incorporate this feedback. Year 1 instructors do stay with a cohort in Year 2 when possible, given the contingent staffing for some of these courses. Efforts to build upon the pilot involving students on faculty research teams have continued. In the coming year, as we experiment with more focused research discussions, Year 2 candidates will have opportunities to engage in sessions with faculty experts in cross-cohort and division sessions that focused on research interest, in replacement of four of the classes. Additionally, the Course Leads for the Year 1 and Year 2 research courses have been developing consistency across sections of the courses, and assessments are fully shared between sections. Nonetheless, the research instructors often echo the concerns of the candidates regarding capacities to meet individual needs and differentiate for candidates with widely divergent backgrounds in research and a myriad of topics, so further attention to this issue is still required. For the 2019 exit survey, respondents were asked to identify the top five courses that supported this development, instead of being asked to rank each course's value in relation to their development as researchers. The open-ended comments from these changed items reveal interesting data about the impact of courses beyond Research 1 and 2. For example, the elective courses were cited. "Both [electives] encouraged me to adopt a research lens and to use research

to understand my experiences." "The annotated bibliographies and research we completed in our Technology course were helpful in learning how to conduct research." These responses offer insight for our Course Leads and instructors into the ways in which the candidates are constructing research knowledge and building skills in courses across the program.

There is no doubt that the student data have caused us to consider and rethink our work with research in, and across the program, among other areas of concern. Drawing upon data in the exit survey, we see a range of responses that both align with, and support program intentions, while also prompting new questions. Additionally, when candidates are asked about the courses that support their development as researchers and as teachers, there is variance by division, which may be connected to the greater variability in sequence in our elementary pathways. The open-ended responses add helpful perspectives and further illuminate variation, which is anticipated in our understanding of curriculum since process and candidates are active agents in learning; the open-ended responses also yielded unanticipated and potentially unhelpful divergences. These responses highlight an area for attention in our program.

Reflections and Insights: Stopping for a Drink of Water

In this chapter we have offered our experiences navigating the terrain of curriculum renewal in a graduate entry-to-practice teacher education program. While curriculum renewal and mapping may be viewed as a straightforward process, engagement in the exercise in dialogue with candidate feedback has led to reconsiderations of aspects of curriculum, pedagogy, relationships, and program structure. The curriculum renewal journey has led to both expected and unexpected places, and we have seen our landscape with new eyes as a result of the interplay of mapping our intended curriculum and the experienced curriculum of our candidates. We have found that charting the path has been a source of incredibly useful data, and that incorporating the voices and lived experiences of the candidates alongside faculty perspectives has been

essential. These multiple and diverse data sources, and the actual process of considering renewal, have allowed us to inquire into the intended and lived curriculum of the program, and our expedition must continue. Adapting *Hiking as an Analogy to Life* by Rolayne Sellers (n.d.), we conclude this chapter with the main lessons we learned so far on our foray through the often-wild terrain of curriculum renewal.

Hiking is Healthy and Challenge is Strength-Building

The exertion of wide exploration and attentive listening to our teacher candidates has been worthwhile. It has given us new views and information, led to some early helpful change, and built greater shared knowledge and understanding of our program. We are committed to continuing the data collection with candidates and the work with Course Leads, instructor, and program committees.

Never Hike Alone

Collaboration is key. Not only have the insights we have gleaned so far been a direct result of collaboration with students, faculty, and other stakeholders, but collaboration and the interest of the collective has been critical to sustaining a long-term and challenging process. The multitude of perspectives has ensured a consistent questioning of assumptions and protected the project from insular decision-making. Teacher candidates have willingly responded to our surveys and requests for involvement in focus groups, and communicated through regular meetings with student representatives. They are accompanying us on this journey and often leading our learning.

Look at How the Old Forest and the New Forest Interact and Need Each Other

At the beginning of the curriculum renewal process, there was a sense of trepidation from the working group about bringing up "the BEd days," as if it was necessary to leave them behind in order to move forward; however, the team recognized that there were useful learnings to glean

from the earlier programs, and value in considering how we might blend the old with the new to be responsive to students' needs.

If You Get a Rock in Your Shoe, Stop and Get it Out

When we began the journey in January 2017, we did not think that we would still be in the analysis phase three years later. Several times we had to pause, take stock, and reorient our path. When we saw repeatedly how challenging it was for Course Leads to determine when candidates might develop proficiency in an area of our program expectations, we recognized a need to stop and think about the sequencing of courses; it took us in a different direction, but we continued on with the process nonetheless. Now we are seeing the inextricable nature of program expectations and program organization and structure (O'Neill, 2015).

Don't Get So Busy Watching the Path That You Don't Remember to Look Up and See the Scenery and View

We are making the most of the process and not just lasering in on the end goal. We are seeing progress as we continue through the woods: The program expectations have been integrated into the student handbook; instructors are referencing them in course outlines and talking about them explicitly with students; we see the program vision referenced in meetings as a touchstone—for example, in a program that centres equity, how does our program address learning about implicit bias? Do our cohort structures create safe and inclusive spaces for all of our candidates? What do the candidates tell us in the surveys and student meetings? Student data and the program maps have informed discussions around changes to research courses, practicum evaluation, and the redeveloped MT Research Journal. We are collectively "re-viewing" many aspects of our environment.

Make Sure You Take Water and Snacks

We are refreshed by the sometimes challenging "diet" of data from students and colleagues. Program development is nourished by systematic and intentional data collection from candidates over the course of the program (Canrinus et al., 2019). We have richer and more nuanced data as divisional differences, differences in trajectories of course sequence and the way the curriculum is experienced by candidates, have been vividly articulated. Research from our program and from the broader literature fed the development of plans and informed decision-making processes and implementation.

Looking ahead, we wonder if the overt and deliberate work that has been done to seek candidates' input, to use the research, and to communicate program design has resonated with our candidates and may support their work in planning curriculum. We hope that by regularly seeking to understand the lived curriculum through feedback, explaining when and how these data are being used, and when they cannot be acted upon, we have been transparent and developed understanding and trust. We hope that the program work on curriculum involving the candidates may cause them to also seek the input and lived experience of their students to inform their planning. We will continue to ask them what they are finding and learning on their "trails."

References

Anagnostopoulos, D., Levine, T., Roselle, R., & Lombardi, A. (2018). Learning to redesign teacher education: A conceptual framework to support program change. *Teaching Education, 29*(1), 61–80. https://doi.org/10.1080/10476210.2017.1349744

Arafeh, S. (2016). Curriculum mapping in higher education: A case study and proposed content scope and sequence mapping tool. *Journal of Further and Higher Education*, *40*(5), 585–611. https://doi.org/10.1080/0309877X.2014.1000278

Association of Canadian Deans of Education. (2017). *Accord on teacher education*. http://csse-scee.ca/acde/wp-content/uploads/sites/7/2017/08/Accord-Initial-Teacher-Education.pdf

Beck, C., & Kosnik, C. M. (2006). *Innovations in teacher education: A social constructivist approach*. State University of New York Press.

Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university*. Open University Press.

Bransford, J., Darling-Hamond, L., & LePage, P. (2005). Introduction. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 1–39). Jossey-Bass.

Broad, K. Stewart Rose, L., Lopez, A., & Baxan, V. (2013). Coherence as a verb. In L. Thomas (Ed.), *What is Canadian about teacher education in Canada? Multiple perspectives on Canadian teacher education in the twenty-first century* (pp. 234–258). Canadian Association for Teacher Education.

Canrinus, E. T., Bergem, O. K., Klette, K., & Hammerness, K. (2017). Coherent teacher education programmes: Taking a student perspective. *Journal of Curriculum Studies*, *49*(3), 313–333. https://doi.org/10.1080/00220272.2015.1124145

Canrinus, E. T., Klette, K., & Hammerness, K. (2019). Diversity in coherence: Strengths and

opportunities of three programs. *Journal of Teacher Education*, *70*(3), 192–205.

https://doi.org/10.1177/0022487117737305

Centre for Teaching and Learning. (n.d.). *Curriculum design and renewal*. Queen's University.

https://www.queensu.ca/ctl/teaching-support/course-and-program-design/curriculum-

design-and-renewal

Craig, C. J. (2016). Structure of teacher education. In J. Loughran & M. J. Hamilton (Eds.),

International Handbook of Teacher Education (vol. 1, pp. 137–186). Springer eBook.

http://www.springer.com/gp/book/9789811003646

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed approaches* (4th

ed.). SAGE Publications.

Darling-Hammond, L. (2006). *Powerful teacher education: Lessons from exemplary programs.*

Jossey-Bass.

Darling-Hammond, L. (2014). Strengthening clinical preparation: The holy grail of teacher

education. *Peabody Journal of Education*, *89*, 547–561.

https://doi.org/10.1080/0161956X.2014.939009

Darling-Hammond, L., Hammerness, K., Grossman, P., Rust, F., & Shulman, L. (2005). The

design of teacher education programs. In L. Darling-Hammond & J. Bransford (Eds.),

Preparing teachers for a changing world: What teachers should learn and be able to do

(pp. 390–441). Jossey-Bass.

Dyjur, P., Grant, K. A., & Kalu, F. (2019). *Introduction to curriculum review*. Taylor Institute

for Teaching and Learning, University of Calgary.

https://taylorinstitute.ucalgary.ca/curriculum/resources

Fink, L. D. (2013). *Creating significant learning experiences: An integrated approach to designing college courses*. Jossey-Bass.

Flores, M. A. (2016). Teacher education curriculum. In J. Loughran & M. L. Hamilton (Eds.), *International handbook of teacher education* (pp. 187–230). Springer Press.

Grudnoff, L., Haigh, M., Hill, M., Cochran-Smith, M., Ell, F., & Ludlow, L. (2017). Teaching for equity: Insights from international evidence with implications for a teacher education curriculum. *Curriculum Journal*, *28*(3), 305–326. https://doi.org/10.1080/09585176.2017.1292934

Harden, R. M. (2001). AMEE guide no. 21: Curriculum mapping: A tool for transparent and authentic teaching and learning. *Medical Teacher*, *23*(2), 123–137. https://doi.org/10.1080/01421590120036547

Jacobsen, M, Eaton, S. E., Brown, B., Simmons, M., & McDermott, M. (2018). Action research for graduate program improvements: A response to curriculum mapping and review. *Canadian Journal of Higher Education*, *48*(1), 82–98. https://doi.org/10.7202/1050843ar

Klette, K., & Hammerness, K. (2016). Conceptual framework for analyzing qualities in teacher education: Looking at features of teacher education from an international perspective. *Acta Didactica Norge*, *10*(2), 26–52. https://doi.org/10.5617/adno.2646

Ludlow, L., Pedulla, J., Enterline, S., Cochran-Smith, M., Loftus, F., Salomon-Fernandez, Y., & Mitescu, E. (2008). From students to teachers: Using surveys to build a culture of evidence and inquiry. *European Journal of Teacher Education*, *31*(4), 1–19. https://doi.org/10.1080/02619760802420842

McDougall, D., Hewitt, J., Montemurro, D., Kosnik, C., & Cuckovic, B. (2017). Graduate teacher education at OISE: Transition to a five-term program. In D. Petrarca & J. Kitchen

(Eds.), *Initial teacher education in Ontario: The first year of four-semester teacher education programs* (pp. 155–171). Canadian Association for Teacher Education. http://cate-acfe.ca/polygraph-book-series/

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. Jossey-Bass.

Metzler, E., Rehrey, G., Kurz L., & Middendorf, J. (2017). The aspirational curriculum map: A diagnostic model for action-oriented program review. *To Improve the Academy*, *36*(2), 156–167. https://doi.org/10.1002/tia2.20062

MT Visioning Advisory Committee. (2017, April 21). *Summary Notes* [Meeting notes]. OISE. https://www.oise.utoronto.ca/mtvisioning/UserFiles/File/Summary_of_Meeting_Apr_21_-_MT_Visioning_Committee.pdf

OISE. (2020). *Why choose the Master of Teaching program?* https://www.oise.utoronto.ca/mt/Why_Choose_MT_.html

OISE Academic Planning. (2017). *What we've heard so far: OISE's academic planning process.* https://www.oise.utoronto.ca/oise/UserFiles/File/What_We_ve_Heard-March31-2017.pdf

OISE External Review. (2016). *2015–2016 External review: Summary of key findings & recommendations*. https://www.oise.utoronto.ca/oise/UserFiles/File/OISE_Review/OISE_External_Review_2015-2016_Summary_June_2016_Final.pdf

Ontario Council of Academic Vice-Presidents. (2010). *Quality Assurance Framework*. www.oucqa.ca/resources-publications/quality-assurance-framework/

O'Neill, G. (2010). Initiating curriculum revision: Exploring the practices of educational developers. *The International Journal for Academic Development*, *15*(1), 61–71. https://doi.org/10.1080/13601440903529927

O'Neill, G. (2015). *Curriculum design in higher education: Theory to practice*. UCD Teaching

    & Learning. https://researchrepository.ucd.ie/handle/10197/7137

Ontario College of Teachers. (2017). *Accreditation resource guide*. Author.

O. Reg. 347/02. (2014). *Accreditation of teacher education programs*.

    https://www.ontario.ca/laws/regulation/020347

Ornstein, A. C., & Hunkins, F. P. (2017). *Curriculum: Foundations, principles, and issues* (7th

    ed.). Allyn and Bacon.

Petrarca, D., & Kitchen, J. (Eds.). (2017). *Initial teacher education in Ontario: The first year of*

    four-semester teacher education programs. Canadian Association for Teacher Education.

    http://cate-acfe.ca/polygraph-book-series/

Richards, J. (2018). *A guide to curriculum renewal at the University of Toronto.* Office of the

    Vice Provost Innovations in Undergraduate Education.

    https://teaching.utoronto.ca/teaching-support/curriculum-renewal/

Sellers, R. (n.d.). *Hiking as an analogy to life.* https://www.rogerkallen.com/hiking-as-an-

    analogy-to-life/

Toohey, S. (1999). *Designing courses for higher education*. The Society for Research into

    Higher Education & Open University Press.

Uchiyama, K. P., & Radin, J. L. (2009). Curriculum mapping in higher education: A vehicle for

    collaboration. *Innovative Higher Education*, *33*(4), 271–280.

    https://doi.org/10.1007/s10755-008-9078-8

Wiggins, G., & McTighe, J. (2005). *Understanding by design* (2nd ed.). Association for

    Supervision and Curriculum Development.

Worrell, F., Brabeck, M., Dwyer, C., Geisinger, K., Marx, R., Noell, G., & Pianta, R. (2014). *Assessing and evaluating teacher preparation programs*. American Psychological Association.

Yin, R. K. (2018). *Case study research: Design and methods* (6th ed.). SAGE Publications.

Using Design Thinking to Cultivate the #Sociallyjustteacher:
What Can a Teacher Education Program Do?

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Abstract

In preparation for the 2018–2019 cohort year, a small teacher education department in western Canada implemented a curriculum innovation using a design thinking model around the question: What does it mean to be a socially just educator in the Fraser Valley? The department is situated in an area where most teacher candidates (TCs) who enroll in the Teacher Education Program (TEP) come with inherent privileges because of their race, social class, language, and sexual orientation. Consequently, TCs' privileges can limit their understanding of many of the social justice issues faced by students from minoritized and racialized groups whom they will teach. As faculty, we sought to explore how to address this problem within a 10-month program. We used the Stanford Design Thinking Model (empathize, define, ideate, prototype, and test; Henriksen et al., 2020) to create a 10-month curriculum map. This map intentionally sets out experiences, assignments, discussions, and readings that challenged TCs' understanding of social justice. To evaluate this design, we posed questions to TCs at the end of the program. This chapter outlines the design process, the curriculum map, and what we learned about the effectiveness of this design.

Résumé

En préparation pour la rentrée scolaire 2018-2019, un petit département en éducation d'une université de l'Ouest canadien a innové dans sa programmation didactique en façonnant un

modèle de conceptualisation autour de l'interrogation suivante : « que signifie être un/e éducateur/trice socialement juste dans la vallée de la Fraser? ». Le département est localisé dans une région où la majorité des enseignants candidats jouissent de privilèges liés à la race, à la classe sociale, à la langue et à l'orientation sexuelle. Ces privilèges risquent, en conséquence, de réduire leur capacité de comprendre les nombreuses injustices sociales dont sont victimes les élèves issus des minorités visibles et racialisées à qui ils enseigneront. À titre d'universitaires, nous souhaitions explorer la manière de traiter de cette question à l'intérieur du programme de dix mois. Nous avons utilisé le Stanford Design Thinking Model (développer l'empathie, définir, réfléchir, créer un prototype et tester : Henriksen et al., 2020) pour créer a parcours programmatique d'une même durée. Cet itinéraire repose sur un choix délibéré d'expériences, de tâches, de discussions et de lectures susceptibles de stimuler la conception de l'injustice sociale chez les enseignants en formation. À cet effet, nous avons interrogé ces derniers au terme du programme. Ce chapitre souligne le processus conceptuel, le parcours programmatique et le degré d'efficacité que nous retenons de ce modèle.

Introduction*

With the rapidly changing demographics brought on by globalization and worldwide migration, today's classrooms require teachers to be morally and ethically engaged with teaching for diversity and social justice. Villegas (2007) describes social justice education as preparing teachers to "be vigilant about the fairness and equity of the educational enterprise as a whole" (p. 371). However, despite efforts, social justice education often remains a "sprinkling of disparate bits of information about diversity into [an] established curriculum, resulting in the superficial treatment of multicultural issues" (Villegas & Lucas, 2002, p. 21). Teacher education programs (TEPs) tend to overlook teacher candidates' (TCs) cultural capital, and miss opportunities to interrogate entrenched beliefs about diversity and ethnic groups based on popular culture and media images, thus leading to limited and superficial knowledge (Allen & Hermann-Wilmarth, 2004; Gay, 2002). Meanwhile, Sleeter (2001) raises concerns regarding the absence of representation of diverse cultural groups in TEPs, resulting in the perpetuation of mainstream values, modes of communication, and learning patterns. All combined, these issues point to challenges teacher educators may face in promoting effective social justice education.

Our small western Canadian TEP attempts to address these challenges directly. At the outset, our program is guided by five values that are referenced in every course: social justice, reflective practice, critical mindedness, pedagogical sensitivity, and integration of knowledge and practice. The admission process utilizes an interview that attempts to screen applicant dispositions towards equity and diversity. The three-day mandatory program orientation includes an explicit explanation of the five program values including examples in practice. One of the first courses in the program, *Schooling in a Diverse Society*, addresses the "isms" and inherent

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hegemony of the hidden curriculum in schools that often perpetuates dominant practices and marginalizes underrepresented groups (Egbo, 2019). Another course, *Applications of Reflective Practice,* spans the entire program, and focuses on each TC's emerging teacher identity. In addition to explicit course work, faculty in the program collaborate to design course assignments and instructional activities that reflect the program values. Thus, TCs are constantly immersed in conversations and deliberations about social justice education.

Despite these existing measures, microaggressions (Sue, 2010) from individual or small groups of TCs persist. Within our program, these microaggressions took the form of non-participation, apparent resistance to being in an unfamiliar or dissonant learning space, comments or behaviour that suggest an inability to be open to diverse perspectives and worldviews, devaluing of individuals' lived experiences that differ from their own, patronizing comments, openly challenging content that questions the status quo, using language that further marginalizes individuals and groups, and explicit racist and discriminatory comments. As teacher educators working with future teachers who will be teaching diverse students, we find the prevalence of these behaviours in our program deeply troubling.

Recognizing this reality, our faculty as a whole sought to re-imagine and design a different approach. We began an inquiry with the following two questions: What relationships exist, if any, between TC's perspectives, their programmatic experiences, and the ways in which they enact (or plan to enact) social justice in the classroom?; and, is there value in using design thinking to generate an intentional programmatic model for encouraging the development of socially just TCs? As three faculty members in our program, we undertook a study that centres around these questions, and this chapter presents the outcomes relevant to TEPs and teacher educators.

<center>**Literature Review**</center>

Social Justice Education

Social Justice as a Concept

       Over the past several decades, social justice has become a central aim in educating teachers for the realities of today's diverse classrooms (Egbo, 2009; Gay, 2002; Gewirtz, 2001; James, 2010; Ladson-Billings, 1995; Villegas, 2007). While this aim is adopted by many TEPs, the phrase "social justice" remains contested, thus leading to different interpretations and conceptualizations in practice (Bassey, 2016; Mills & Ballantyne, 2016; North, 2006; Sturman, 1997). Surveying the literature reveals that interpretations of the concept fall predominantly into three areas: sociopolitical reality, equity and equality, and culturally relevant pedagogy.

       The sociopolitical interpretation sees social justice as a way to reform and alter societal values to adhere to the principles of fairness and liberation in order to benefit all members of society, in particular those who are typically disadvantaged by norms and expectations. Social justice viewed through the lens of equity focuses on creating systems and policies to bring access for all members of society to the same starting level. This is based on the premise that those who are disadvantaged begin well behind those who are advantaged, and equal treatment would result in the advantaged people still coming out "ahead" of others. Social justice recognizes that these oppressions exist in society, but that they can be addressed by reforming and altering participation frameworks, forms of recognition, and relationship structures in order to remove barriers. A third interpretation of social justice is the centrality of culturally relevant pedagogy in education (Ladson-Billings, 1995; 2005). This approach focuses on school knowledge, curriculum, and assessment practices that reflect the cultural habits, worldviews, and identities of

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students. These conceptions of social justice all address issues of fairness, equity, and participation.

Barriers to Implementing Social Justice Education

There are numerous potential challenges or barriers to implementing social justice education. First, many teacher educators view social justice education as secondary to the more important goals of teaching discipline-specific content and pedagogical methods (Egbo, 2009; Ladson-Billings, 2005; Sleeter, 2001). Consequently, some TEPs may teach *about* social justice education as a content area, yet may not adequately infuse social justice as a theme across the entire program. Thus, TCs' identity, beliefs, and practice are not consistently informed by values associated with social justice. Second, TEPs provide limited attention to acknowledging how "who you are" becomes "what you teach" (Palmer, 1997); one's complex cultural identity and lived reality informs how one envisions oneself as a teacher (Allen & Hermann-Wilmarth, 2004). Specific cultural knowledge about ethnic groups and their contributions to society and academia may be unavailable to TCs, further contributing to limited and/or superficial knowledge held by some TCs about other ethnic groups, cultural practices, and beliefs. According to Cochran-Smith (2004), Ladson-Billings (2005), and Sleeter (2001), another barrier emerges when the demographics of many TEPs (white, Christian, middle class) do not reflect the diversity of the K-12 classrooms where they will teach. This can significantly compromise some TCs' abilities to understand the diverse learning patterns, communication methods, and worldviews of their students. Finally, admission criteria for TEPs are often reported as being ineffective in selecting TCs who are "dispositionally ready to receive the instruction and experiences presented to them" (Garmon, 2004, p. 212). A pedagogy insufficiently focused on social justice, the limited attention to cultural identity, the homogeneity of TCs, and the challenge of screening for social justice

dispositions when admitting TCs collectively, paint a picture of teacher education that is potentially bereft of a context promoting social justice education.

Social Justice in Curriculum

Drawing on Ladson-Billings' (1994) original conception of culturally relevant pedagogy, Gay (2002) identifies three forms of curriculum: symbolic, societal, and formal, with the charge for teachers to infuse social justice education in all forms. The symbolic curriculum (symbols, images, statements, and other artefacts displayed in classrooms) should be selected to represent diverse ethnic groups, remaining sensitive to images that provoke diverse perspectives. The societal curriculum is the knowledge about cultures and ethnic groups portrayed through popular culture and media. Culturally responsive teachers create instructional activities to analyze critically how ethnic groups are stereotyped, and how these misrepresentations can be counteracted through the education system (Ladson-Billings, 2005). Finally, when working with the formal curriculum (i.e., government mandated curriculum), educators are called to focus on social justice topics, outcomes, and frameworks (Egbo, 2009). While these forms of curriculum are distinct, Gay (2002) inspires educators to view rights, voice, participation, and freedom as central aims of a social justice curriculum.

As faculty committed to teaching social justice education as a central aim of our TEP, we had been using these curriculum forms to guide our course planning and instructional delivery; however, despite our efforts, microaggressions continued to persist. Thus, we sought an alternative strategy to designing our TEP. We selected the Stanford Design Thinking Model because of its emphasis on attending to the needs of the various stakeholders at different steps in the process. In the case of our TEP, the stakeholders include our TCs, faculty, and the local community.

Stanford Design Thinking Model

Design thinking can be broadly described as a process to inspire innovative problem-solving with a human-centered core (IDEO.org, 2015). Similarly to project-based learning, in this process people are charged with developing a prototype to resolve issues that negatively impact people's lives. Design thinking inspires a culture of work where people are "united by a design thinking mindset of cooperation" (von Thienen et al., 2017, p. 307). In recent years, design thinking has made its way into higher education (Henriksen et al., 2020). There are a number of different design thinking models available for use by educators and we chose the Standard Design Model that includes the five steps of Empathizing, Defining, Ideating, Prototyping, and Testing.

Design Steps

To develop the prototype of our curriculum innovation, we moved through the five stages of the Stanford Design Thinking model.

Empathizing required us to consider the needs of the K-12 students with whom our graduates would eventually work. In doing so, priority was placed on experiences related to the local Indigenous communities and the large Sikh community in the districts where our TCs would be completing practicum teaching. Additional focus was placed on working with students with diverse learning needs and LGBTQ+ students.

Defining required us to consider the problem from multiple perspectives. In doing so, our key focus took into account our largely homogenous group of TCs (white, middle-class, Christian, female), including some TCs who had never experienced public schooling. Our desire was to introduce a vision of education that valued difference and inclusion, that challenged the dominant Eurocentric narrative regarding what and how education and schooling should be

experienced, and recognized that teachers play a significant role in making the world a more socially just environment for everyone.

Ideating, for us, began with discussing with our faculty colleagues the persistent challenges we faced in preparing socially just teachers. This required us to brainstorm on the qualities that make up a socially just educator. Faculty (ten in total in our department) focused on teachers as agents of change who seek to advocate for marginalized populations and raise awareness of the inequities these populations face. It was important to include knowledge about all local ethic groups, especially those occupying minority positions. Several faculty members referenced socially just educators as having self-knowledge: an awareness of their own biases and assumptions. Faculty also recognized the need for educators to demonstrate a commitment to equity and fairness that was noticeable or "visible" to their students. Program experiences had to be multiple, wide ranging, and field based.

The next step in our ideation involved recalling our past experiences with TCs—both positive and negative. We considered the markedly homogenous demographics of our TCs in terms of age, gender, ability, culture, and race, as compared to the social and cultural diversities of the students our TCs would be teaching to. We noted that current approaches within courses seemed ineffective for some TCs in reinforcing the value of social justice education as a central and necessary aim of becoming a teacher. As such, we sought to devise a series of experiences in our program, both inside and outside of scheduled course time, that would disrupt the narratives of a mainstream curriculum; however, instead of inserting activities or experiences in an ad hoc manner, we aimed for a comprehensive, program-wide approach. In this sense, experiences were not just additions, but part of an overall progression.

Prototyping, for us, involved creating curriculum and revising program designs. The prototype was a continuous thread of social justice education that ran through the entire 10-

month program. This thread involved both in-class activities during courses and experiences/events that did not occur within a course, but were still contained within the program structure of Monday to Friday, 9am to 4pm. All faculty were involved in the curriculum innovation (prototype) to ensure that all activities and experiences were referenced in multiple ways and in all courses throughout the program. To decide on the activities and experiences themselves, we reflected on the TCs as stakeholders in the program. We referenced previously shared program reflections (gathered through round table feedback sessions at the end of every program year) about what had impacted their thinking (e.g., St. Mary's Indian Residential School Visit, the examination of culturally inclusive resources, the community ethnography). We then determined gaps and possibilities in our programming, eventually resulting in a final prototype (Figure 1). We took time at monthly department meetings to update each other on course and program activities; as well, faculty collaborated on activities (e.g., multiple instructors led activities on place-based learning and culturally inclusive resources) to impress upon TCs both the value of the collaborative nature of this work and the collective vision and goal that were shared among all faculty.

The *testing* phase, for us, was research-driven. After the implementation of our 10-month prototype, we analyzed TC responses to three questions regarding their perceptions of a socially just educator, and how their experiences in the TEP influenced those perceptions. Their responses were used to evaluate the prototype.

Figure 1

#Sociallyjustteacher Prototype

Method

August – October
- Explicit intent for social justice in orientation (including lanyard #sociallyjustteacher)
- Visit to St. Mary's Residential School
- Visit to Gur Sikh Temple
- Place based education activities
- EDUC 410: Diversity in schools
  - What is an ethical space?
  - Placemat (focus on diversity)
  - Identity bags
  - "Danger of a single story"
  - Hidden curriculum
  - Take a stand (purpose of education)
  - Four corners (religion in schools)
  - Community ethnography
  - Culturally inclusive resources (with EDUC 445)
  - Guest speaker: Residential schools/History of FN Education in Canada
  - Privilege article stations
  - Privilege line
  - "Ism" group teach
  - "Ism" conflict scenario role play
  - "Ism" Inquiry paper
- EDUC 445: Planning and assessment
  - Inequity in assessment
  - Differentiation in planning
- EDUC 495: Reflective practice
  - Heart Journal
  - Reflection on "What does it mean to be a SJ educator?"

5-week School Experience

November - December
- Guest Speakers (FASD/Autism)
- Visit Virtual School
- EDUC 447: Indigenous youth and schooling
  - Granular focus on First Peoples' Principles of Learning
  - Jigsaw reading of Truth and Reconciliation (TRC) Report; cultural appropriation
  - Mini-teach on residential schools
  - Evaluating Indigenous resources
  - Aboriginal worldview frameworks
  - "Reel Injun" (2009); "Colonization Road" (2016)
  - Guest speakers: Missing and Murdered Indigenous Women and Girls (MMIWG); role of allies; storytelling
  - Practicing protocols
  - Visit Coqualeetza Residential School
  - Rewriting TRC as poetry
- EDUC 412-413: Special learning needs
- EDUC 495: Reflective practice
  - KDP Grid/Reflections on Social Justice
  - Weaving Activity – align philosophy

January - February
- Guest Speakers: LGBTQ+
- Role Simulation: Stó:lō pre-contact to present day
- EDUC 421: Elementary social studies methods
  - Voices of the Valley at The Reach
- EDUC 450: Second language learners
  - Lesson in Punjabi
  - Reading and assessment strategies
  - Working with refugee students
  - Multimodal technologies
  - EDUC 422/498: Fine Arts Methods
    - WWII/Japan Role Drama
  - EDUC 495: Reflective Practice
    - "Where I'm From" poem creation

May - June
- Indigenous Place names tour through the Valley with Stó:lō Cultural Advisor
- EDUC 454: Mental health and special learning needs in schools
  - Supporting students with mental health and trauma informed practices
- EDUC 495: Reflective Practice
  - Reflection on "What does it mean to be a socially just educator?"
  - E-portfolio with social justice evidence included
- Finish with TC-led conference: "What does it mean to be a socially just teacher in the Fraser Valley?"

12-week Certifying Practicum

This is a qualitative, non-experimental evaluation study (Payne & Payne, 2004) bound by participation in a small post-degree TEP program in the 2018–2019 cohort year (81 of 86 TCs gave permission for us to use their reflections). Evaluation studies, at their core, aim to determine whether a program, or aspect of a program, achieves its intended purpose. We sought to evaluate the ability of our curriculum map (prototype) to support the social justice dispositions and actions of our TCs. TCs gave permission for us to access one of their pre-portfolio assignments, a set of non-graded written reflections on their experiences of the 2018–2019 cohort year. This assignment posed the following three questions: What does it mean to be a socially just educator in the Fraser Valley?; what program experiences have led to this understanding?; and, how do you see implementing this vision into your future practice?

Data analysis was completed in accordance with Saldana's (2009) recommendations for qualitative coding. The three questions were posed to three different cohorts of TCs (two elementary, 26 and 28 respondents; one secondary, 27 respondents); among the 81 respondents, there were four or five who only answered two of the questions. Independently, we used structural coding for responses, analyzing each question and cohort separately. This represented the first cycle of coding and involved two steps: Identifying each unique key point per question (decoding); and, giving those key points a title or code (encoding). For example, "In my teaching practice, I will stand up for my students, stand by my students, and stand behind my students wherever they need it" (E2, C24; for transparent referencing, E1 = first elementary cohort; E2 = second elementary cohort; S = secondary; C = candidate; # = position of candidate, 24 of 81) was identified as a unique key point and was given the code: advocating for students. During the second cycle of coding, each researcher independently used pattern coding to organize their codes into categories. At this point in the analyses, the researchers shared their categories and

codes to reach "consensus" (Harry et al., 2005, p. 6), and this represented our third cycle of coding.

We had a great deal of consensus in our codes and categories, and we engaged in many in-depth discussions regarding the final names of our categories. Using the example above, we had referred to this as advocacy, standing up for students, and advocating for students. Through our discussions we decided on the code: being an advocate for others. Once we agreed upon categories and codes, all researchers worked together to finalize possible themes (fourth and final cycle of coding). On recommendations from Saldana (2009), we used a form of "codeweaving" (p.187) to elicit potential themes. For example, we took the categories from the three questions and looked for themes that crossed multiple questions, then created a series of narratives that compared and contrasted them. Finally, we identified key themes that are found in our discussion.

Results

For each question, categories were established with a subset of codes. We used TC written responses to support these code titles. In some categories there were differences noted between elementary and secondary TCs. Those differences are described and explored within each question where relevant. We recognize that TC responses may have been influenced by the fact that it was their own instructors, who had been focusing on social justice throughout the year, asking these questions. To try and limit this influence, the questions were administered by someone other than their instructors, no marks were assigned to the task, and responses were not viewed until after program completion. When the questions were posed to the TCs, emphasis was placed on seeking to improve the program, and participation was introduced as a way for TCs to alter and inform the program design. Despite these measures, caution needs to be taken when interpreting the data.

Q1: What is a Socially Just Educator in the Fraser Valley?

There were three categories of responses for this question: teacher as person, the act of teaching, and classroom design.

Teacher as person

This category speaks to TCs' visions of themselves as educators and how this vision aligns with their personal values. It was the largest category with the most codes attached to it, indicating the importance TCs placed upon acknowledging their identity as socially just educators. The first code was the importance of *respecting students*. "For myself, being a socially just educator is being respectful of diversity and difference within the school and community. It is our role to embrace, celebrate, and encourage individuality, and to view these differences as an asset" (E2, C9). This required TCs to *connect with students.* "An educator who cares about their students' well-being will check-in with students regularly and make connections with them" (E2, C12). It was also important for TCs to be *lifelong learners.* "I believe being a socially just educator is a journey that I will continue to work towards as I walk the road of a teacher" (S, C6). TCs recognized that being a socially just educator required them to go beyond respecting and caring for students, to being an *advocate and role model."*I recognize that although I may only be one person, my goal is to demonstrate an attitude of advocacy, respect and compassion for others. My hope being that students will mimic my behaviour" (E1, C11). In order to be an advocate, TCs recognized that they needed to be *aware of their own bias.* "Teachers must be willing to put aside their biases or previous understandings and be willing to educate themselves about, and advocate for, the needs of their students" (S, C19).

The act of teaching

The second category moves away from focusing on the identity and values of a socially just educator, to exploring the actions of a socially just educator. TCs repeatedly commented on the importance of *confronting and teaching about stereotypes and racism.* This means that "you are aware of the advantages of cultural, racial, religious, spiritual, and physical diversity and to utilize those differences to expand the community in their school" (E1, C17). You are "educating about stereotypes and the truths and myths behind them" (E1, C2). Critical to this active stance against stereotypes and racism is the importance and value of *including multiple perspectives.* "They foster an inclusive environment in their classes through modelling respectful behaviour and exposing students to multiple perspectives when discussing content and learning itself" (S, C2). To support this kind of teaching, TCs referenced the importance of *differentiated instruction.* "For me, being a socially just educator also means that I use differentiated instruction and assessment in my classroom so that all students are given as many opportunities as possible to be successful in their learning" (E2, C27).

Classroom design

In order to enact these visions of teaching, TCs described classrooms that needed to be *inclusive* and *equitable.* "They treat their students with respect and compassion, and work toward creating an environment where all students feel safe and appreciated, no matter what their background or where they are in their journey currently" (S, C20). A classroom designed to demonstrate equity meant that TCs "understand that they need to recognize the diversity in their classroom, to adjust or adapt the learning environment or lesson to ensure that they are equitable or equally accessible to all students in their care" (E1, C12).

TC responses demonstrated a robust understanding of the dimensions that characterize what it means to be a socially just educator. Not only did they speak to teacher as person, they included references to teaching practice and classroom design.

Q2: What Experiences in the BEd Contributed to this Vision?

There were two categories of responses for this question: program-wide and specific experiences.

Program-wide

TCs commented on the value of having social justice permeate all aspects of the program. Rather than relegating teaching social justice to one or two courses, TCs noted that social justice was touched upon by all instructors in all courses. As such, the first code for the program-wide category focuses on TC comments that social justice was an *explicit and consistent theme throughout the entire program*. "The BEd set the ground work of theory behind being a socially just educator by weaving the theme through the courses in the program. To follow up, the program provided many opportunities to see these theories put into practice through field trips" (E1, C15). It was exciting for us as teacher educators to see that some TCs incorporated similar opportunities during their practica (see the categories from question three).

The second program-wide code discussed the value of having *the incorporation of Indigenous content and First Peoples' Principles of Learning (FPPL)*:

> Our BEd's many activities and field trips to educate us about the Stó:lō
> Peoples and their history equipped me to bring that knowledge into the
> classroom, and inspired me to continue to learn and seek opportunities to be
> part of truth-telling and reconciliation in my classroom. … Learning the
> FPPL showed me a way of teaching that resonates strongly with me, and gave
> me permission to use it. (E1, C6)

It was affirming to have TCs comment upon the incorporation of Indigenous content and pedagogy as that focus was a key part of our empathizing stage.

Specific experiences

Beyond referencing the significance of this program-wide social justice focus, there were specific experiences that TCs noted as critical in their developing understanding. Three codes were discussed in relation to specific experiences: field trips, guest speakers, and courses. The key *field trips* commented on by all TCs were visits to St. Mary's Indian Residential School, Coqualeetza Indian Residential School, the Indigenous Place Names Tour, and the tour of the heritage Gur Sikh temple. TCs considered the experiential nature of being in various places to be very powerful.

> I felt it was much easier to connect with the culture and the history of local
> First Nations by being able to hold historical artifacts in my hands, to see the
> walls that closed in students within residential schools, to look over the rivers
> they fish in, and to stand at the base of mountains we heard the Creation
> stories about. (E1, C7)

TCs also commented on the *guest speakers* that were invited to classes. Individual TCs referenced the Punjabi language lessons, the Q-mmunity workshop on LGBTQ+ people, and the workshop on supporting students with FASD (Fatal alcohol spectrum disorders). However, the most referenced event was the "Gladys we never knew" (British Columbia Teachers' Federation, n.d.) blanket exercise[1] that enabled TCs to experience the history of colonization through the eyes of Indigenous Peoples.

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[1] In this participatory simulation, participants place blankets on the floor to represent Turtle Island. Participants move about the blankets as Indigenous Peoples. People and blankets are removed as Indigenous Peoples were displaced and killed through specific acts of legislation and colonization.

Growing up, I had never learned much about the true history of Canada; of

residential schools and the stealing of the land; of broken promises and

betrayal. That exercise made me realize how much was lost and how hard we

have to work as educators to make First Nations people feel welcome and

safe, if we even can in my lifetime. (S, C6)

In addition to field trips and guest speakers, TCs commented on specific *courses* that

impacted their understanding of what it means to be a socially just educator. While a number of

courses were referenced, the majority of TCs commented on a few courses:

- Schooling in a Diverse Society

- Introduction to Development and Special Learning Needs (Elem) or Adolescent

  Development and Special Education (Sec), and

- Indigenous Youth and Schooling.

The Schooling in a Diverse Society course was one of the first in the program, and it was

designed to challenge TCs' experiences and expectations regarding what it means to be a

teacher.

It began with our course, "Schooling in a Diverse Society," which talked

about the importance of welcoming diversity in our classroom. … It also

made me aware of our own prejudices or privileges that we may have without

even knowing it, and just being aware of that. (E2, C10)

TCs realized that we were encouraging them to "challenge my current (then) thinking and evolve

my ways of doing" (S, C24). The Indigenous Youth and Schooling course similarly opened their

eyes to a different worldview and set of experiences. Finally, the courses designed specifically to

address development and special learning needs,

provided me with an impactful reality and history of children with

differences. … Discussing topics of equity rather than equality, and inclusion

of differences in classroom environments … encouraged us all to think of the

world from different lenses and to use differences as opportunities for

inspiration and learning. (E1, 11)

In summary, the programmatic experiences and courses worked symbiotically. TCs

would learn *about* social justice education within their courses, and then *experience* social justice

education through field trips, from guest speakers' lived experiences, or by participating in

emotionally-charged activities. Comments reinforced for us the imperative of approaching social

justice education in a multi-faceted manner.

Q3: How will you bring (did you bring) your social justice vision into your classroom?

This question encouraged TCs to become designers of their own (hopefully) socially just

classroom by moving from vision to design. Interestingly, TC responses to this question were all

in first person leading us to identify the three categories as: I will be/am, I will implement, and I

will design a classroom that.

I will be/am …

Many TCs responded to this question similarly to the first question that asked them to

define a socially just educator; TCs' definitions of a socially just educator directly informed who

they were and what they would do as educators. The three codes that were the most prevalent

across the data for elementary and secondary TCs were *being an advocate for others, being a*

role model for others, and *continuing to learn.* For example: "In my teaching practice, I will

stand up for my students, stand by my students, and stand behind my students wherever they

need it" (E2, C24). Or, "I want to make sure to stay on top of current events to be able to act as

an advocate as necessary inside and outside the classroom" (S, C21). In terms of being a role

model, TCs wanted to "build cultural bridges into the community and model, teach, equip, and shape students to be socially just and socially just advocates" (E2, C26). To enable effective modelling and advocacy, TCs also recognized the importance of ongoing and continuous education. "As an educator I will look for opportunities to continue my growth in, and understanding of, social justice issues" (S, C21).

I will implement

TCs consistently referenced three activities for implementation. They focused on applying *Indigenous content* and the *First People Principles of Learning (FPPL), differentiated instruction,* and *lessons about and for social justice* into their practicum and in future classrooms. TCs gave explicit examples of how they incorporated Indigenous content directly into their practicum experiences:

> I was able to incorporate the FPPL into my Health Unit explicitly, by tying in
>
> the idea of consequences and wellness, and having an in-depth discussion on
>
> these with the class. In English, I added Indigenous content to the poetry unit,
>
> carrying this over from Socials. (S, C1)

TCs' references to differentiated instruction were varied. At times they referenced modifications for specific students, while others focused on varying their instructional practices or assessment. "I provided adaptations to tests and assignments when necessary in order to allow all students to accurately demonstrate their learning and growth" (E2, C11).

What is interesting about the third category, lessons about and for social justice, is that each group of TCs approached the topic a little differently. The first elementary cohort focused on what teaching about social justice is. "It is removing the concept of 'normal' and highlighting the power that comes from individuals working together to understand each other" (E1, C17). In contrast, the second elementary group went beyond defining and, instead, focused on ensuring

that students were empowered to enact social justice. "I believe that being a socially just educator means not only helping students to recognize the problems of today, but also to take active steps towards addressing those issues" (E2, C11). Finally, the secondary TCs approached social justice as an opportunity to address misconceptions and surface diverse perspectives. "I will also ensure that I bring in multiple perspectives to the classroom so my students are able to learn about many world views that may look different than their own" (S, C3); "I will bring this vision to life in my practice by addressing misconceptions and issues facing marginalized peoples" (S, C10). They even made subject-specific connections. For example, "I will speak about ethics with regards to science, and the different ways of knowing" (S, C14); or, "During my English class we deconstructed the view of Canadian history through the lens of Saul in the novel *Indian Horse* written by Indigenous author Richard Wagamese" (S, C15).

I will design a classroom that …

Within this category, three codes emerged that represent TCs' ideal visions for their classroom. They want their classrooms to be *safe*: "I emphasized on numerous occasions the importance of allowing every student in the class the right to have a voice and the ability to feel comfortable and safe using it" (E1, C22). TCs also shared the importance of making sure that their classrooms *represented student diversity*. "Throughout my practicum, I tried my best to include a variety of cultural material within my lessons. I asked individuals where they were from in order to explore together those regions in the world during my Social Studies unit" (E1, C8). Finally, TCs envisioned a socially just classroom as being inclusive. "I plan on teaching with inclusion at the forefront of my mind at all times. I will not have students sitting to the side but instead have them taking part in all class activities" (E1, C21).

Our data strongly suggests that TCs value and want to design their lessons and classrooms based on their experiences in the program. It was promising to read TCs' intentions

to implement socially just content and pedagogies into their future classrooms. We were particularly pleased that a number of TCs were also able to provide specific examples of social justice education from their own practica experiences.

Discussion

In reviewing our results, we believe we have substantial data to respond to the questions driving this inquiry.

Looking for Relationships

The first question asked of the TCs focused on exploring the relationships between vision, experience, and enactment in relation to teaching social justice. When comparing the categories and codes from question one (vision of a socially just educator) and question three (enactment), we observed significant overlap. For example, being an advocate and role model, differentiating instruction, and being inclusive were codes in response to both questions. Similarly, the three categories in both questions overlapped: looking at self, action, and classroom design. This result supports the assertion that there is a relationship between teacher values and designing a socially just education; it is insufficient to simply teach about social justice as a set of classroom practices without spending significant time and attention interrogating one's identity, beliefs, and values in relation to social justice (Egbo, 2009, Palmer, 1997). The development of a vision as a socially just educator is something the TCs felt was integral to the design of a socially just classroom.

In addition, we assert that a relationship between programmatic experiences (question two) and the enactment of a social justice vision (question three) is evident in our data. Actual community-based experiences created opportunities for TCs to participate and reflect on their own learning in relation to social justice activities. This enabled them to envision themselves replicating these activities with their own students. "I plan on continuing to involve inclusive

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perspectives as foundations for my content and pedagogy. I will also try to do some of the same activities we've done in the BEd to help bring the students' learning to life" (S, C10). We viewed the relationship between program and vision as one that illustrated the importance of TCs developing their own authority of experience (Munby & Russell, 1994): through experience, knowledge of practice about teaching for social justice was generated.

The Value of Design Thinking

When we asked TCs about which experiences in the BEd contributed to their vision, an overwhelming number of them commented on the importance of a program-wide approach. In place of ad hoc attempts and learning silos, we sought to model social justice education as a continuous thread through the program. Social justice was the first concept we shared with TCs in the three-day orientation and it was the topic for the last program-wide activity in June. This consistent thread represents, models, and reinforces the faculty vision of social justice education in preparing teachers. This was beautifully summarized by one of our TCs:

> I truly believe that my education and understanding surrounding social justice
>
> has been formed through the BEd. … By having all courses grounded in the
>
> theme of social justice, I was able to understand it through many angles and
>
> subjects. The guests that we had come in and demonstrate gave the topic
>
> meaning and impact … I feel like I am leaving this program with a much
>
> deeper knowledge and higher level of understanding about social justice. In
>
> addition to this, I also feel much more curious and have a desire to
>
> continuously learn about social justice in my future practice. This is all
>
> because of the effective ways that the program implemented and taught the
>
> theme of social justice. (E1, C2)

We believe that the TCs' valuing of a program-wide approach supports our vision for this design and, ultimately, our prototype. In order to finalize this prototype, two factors were critical: The will of all faculty to take on the challenge of re-imagining the program; and, all faculty understanding and adhering to the design thinking model. We knew that we needed a different approach for our TEP in order to address the microaggressions we continued to face in relation to social justice. Design thinking provided a framework to develop a re-imagined curriculum that was more fulsome and rigorous, ensuring that a multitude of perspectives were included. Empathizing and defining enabled us to be more broadly inclusive and responsive to the community. The ideating stage provided us with the opportunity to clarify our vision and create a common language. This was critical for the cohesion of the faculty: Everyone saw a way forward for their own involvement, while opportunities for collaborations and co-teaching emerged. These seeds were necessary for cultivating a robust prototype that addressed our concerns.

It was exciting to use the testing phase as our research project; it provided an opportunity to gather evidence from TCs that appeared to validate our own perceptions of the effectiveness of the prototype. This prototype enabled us not only see the gaps "in-between," but to connect them effectively so that our value of social justice education became more consistent throughout the program as a whole; we went beyond course requirements to a programmatic approach in order to truly engage in a purposeful enactment of a social justice-focused curriculum. Our prototype seemed to create a heightened imperative for our TCs: They experienced the activities of a socially just educator (their instructors) and saw themselves in that role. As a result, we acknowledge and appreciate the value of using the design thinking model to support the redesign of a TEP. We continue to use the prototype today, and faculty have reported that the number of microaggressions decreased over the course of the program.

Implications for TEPs

We assert that there is value in using design thinking for reworking the structure of a TEP and we believe that we have data for a strong connection between program-wide initiatives (e.g., course collaboration, field experiences, guest speakers) and the likelihood of TCs implementing social justice education in their own classrooms. However, we also recognize that there are specific elements that previously existed in our program that helped us to enact and achieve this vision.

Aspects of our TEP That Made These Results Possible

To develop this prototype and implement it with evidence of success, it is important to have faculty that are committed to teacher education as a scholarly endeavour. All faculty are actively involved in research and scholarship in the field of teacher education. We found it was imperative that faculty had a common or cohesive vision regarding what they conceived for a TEP. Thus, opportunities to talk together, to collaborate and co-teach, and to regularly share reflections on the program, including discussing struggles and successes with courses and individual TCs, were critical; our experience, and our TC responses, revealed that spending time together as a faculty was vital.

It is possible that this type of redesign had a greater chance of succeeding because we are a small program. Our department consists of ten faculty members and less than 100 TCs every year. Faculty teach the same TCs in multiple courses, making it easy to come to consensus about TC issues and programmatic design decisions. Engaging a larger faculty to develop a cohesive vision which inspires everyone equally may prove a challenge. As such, program size may be a consideration when looking at what may be transferable from our design and study.

Finally, and critically, our faculty and program work with a common timetable that differs from the rest of the university. All classes occur between 9am and 4pm, Monday to

Friday. We have a lunch break at the same time, our classrooms are located in the same area of the university, and our yearly schedule matches the K–12 calendar year (in schools for 10 months a year, with two weeks off in December and for Spring Break). While this may make it challenging at times for our faculty to connect with faculty outside of our program, it does create an insular, "we are in it together," feel to the program. In many ways, our uniqueness within the university and our program's common timetable enhance the closeness between our faculty and our TCs. These features—small faculty and program, common timetable, cohesive faculty vision, and commitment to teacher education as a scholarly endeavour—made it possible for design thinking to be implemented with what we measure to be success. It is important that this is considered when applying what we have learned to other programs.

Progressing Towards a Social Justice Vision Through Design Thinking

Having utilized the Stanford Design Thinking Model to reimagine our TEP, our reflections point to a few key aspects that we believe are important to consider if attempting something similar in your own program. At the forefront of our reflection is the importance of involving faculty within the design thinking process itself: Faculty cohesion is supported when all faculty can work together and share ideas at each stage of the design, especially in the defining stage. Second, it is imperative to consider the experiences (both personal and curricular) of teacher educators working towards social justice. While there is some variety with regards to age, gender, and ethnicity, our faculty are predominantly white, middle-aged educators. As such, much of our personal preparation for working in a socially just program was to educate ourselves on multiple perspectives and experiences, to connect with a variety of colleagues with different academic and lived experiences from our own, to examine our own privilege, and to challenge our personal understandings of what social justice could actually look like. Similarly to the focus of Childs et al., (2011), while we might not have much equity *in* our faculty, we sought to

achieve equity *through* our faculty, and that our work increased opportunities for equity in our local schools. Third, we encourage teacher educators to think broadly about program redesign. Social justice education, for us, is not an add-on or an adjustment, but the glue that connects all parts together. We encourage teacher educators to consider how social justice is reflected in admission decisions, program orientation, department meetings and retreats, and scheduling. Fourth, reflecting back we realize how important it was for the program to provide opportunities for TCs to gain an authority of experience (Munby & Russell, 1994). It is vital that TCs learn through *doing* (heart and hand), not just *thinking* (the mind) (Feiman-Nemser, 2001). TC responses to our third question give hope that this authority of experience will support them in becoming socially just curriculum designers in their own classrooms. Additional research will follow former TCs into the field to see if this hope is realized. Fifth, and finally, our program already had a three-phase "curriculum map," which overviewed our courses, and included a focus for each of the three terms of the program. Having this as a starting point enabled us to build a more robust prototype; our design thinking journey had a launching point that we found to be very helpful.

In conclusion, we were excited to use the design thinking model to create a working prototype to address microaggressions and challenges to social justice education. We were initially frustrated not knowing how to address these instances in our program; however, by designing together as a team, we felt empowered to meet the programmatic needs of our faculty and our local communities. While social justice is a journey that requires continual adjustment and learning, we see a way forward for ourselves that situates a social justice curriculum at the centre of our TEP. With hearts and minds open, we walk forward together.

References

Allen, J., & Hermann-Wilmarth, J. (2004). Cultural construction zones. *Journal of Teacher Education, 55,* 214–225.

Bassey, M.O. (2016). Culturally responsive teaching: Implications for educational justice. *Educational Sciences, 6(4)*, 35–48.

British Columbia Teachers' Federation. (n.d.). *Gladys we never knew.* Retrieved February 2, 2020, from https://bctf.ca/GladysWeNeverKnew.

Childs, R.A., Braod, K., Gallagher-Mackay, K., Sher, Y., Escayg, K. et al. (2011). Pursuing equity in and through teacher education program admissions. *Education Policy Analysis Archives, 19*(4), 1–22.

Cochran-Smith, M. (2004). The problem of teacher education. *Journal of Teacher Education, 55(4)*, 295–299.

Darling-Hammond, L. & Adamson, F. (2014). *Beyond the bubble test: How performance assessments support 21ˢᵗ century learning.* Jossey-Bass.

Dworkin, R. (1978). *Taking rights seriously.* Duckworth.

Egbo, B. (2009). *Teaching for diversity in Canadian schools.* Pearson.

Egbo, B. (2019). *Teaching for diversity in Canadian schools* (2nd ed.). Pearson.

Foster, B., Walker, M., & Song, K. (2006). *A beginning teaching portfolio: Documenting and reflecting on your professional growth and abilities.* Pearson.

Garmon, M.A. (2004). Changing preservice teachers' attitudes/beliefs about diversity: What are the critical factors? *Journal of Teacher Education, 55*(3), 201–213.

Gay, G. (2002). Preparing for culturally responsive teaching. *Journal of Teacher Education, 53(3)*, 106–116.

Gewirtz, S. (2001). Rethinking social justice: A conceptual analysis. In J. Demain (Ed.), *Sociology of Education Today* (pp.180–195). Palgrave Publishers

Harry, B., Sturges, K.M., & Klingner, J.K. (2005). Mapping the process: An exemplar of process and challenge in grounded theory analysis. *Educational Researcher, 34*(2), 3–13.

Henriksen, D., Gretter, S., & Richardson, C. (2020). Design thinking and the practicing teacher: Addressing problems of practice in teacher education. *Teaching Education 31*(2), 209–229. DOI: 10.1080/10476210.2018.1531841.

IDEO.org (2015). *The field guide to human-centred design.* New York, NY: Author.

James, C. (2010). *Seeing ourselves: Exploring race, ethnicity, and culture.* Toronto, ON: Thompson Educational Publishing.

Ladson-Billings, G. (1995). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal, 32,* 465–491. https://doi.org/10.3102/00028312032003465

Ladson-Billings, G. J. (2005). Is the team all right? Diversity and teacher education. *Journal of Teacher Education, 56*(3), 229–234.

Mills, C., & Ballantyne, J. (2016). Social justice and teacher education: A systematic review of empirical work in the field. *Journal of Teacher Education, 67*(4), 263–276. https://doi.org/10.1177/0022487116660152

Munby, H., & Russell, T. (1994). The authority of experience in learning to teach: Messages from a physics methods class. *Journal of Teacher Education, 45*(2), 86–94.

North, C. (2006). More than words? Delving into the substantive meaning(s) of "social justice" in education. *Review of Educational Research, 76*, 507–535. http://www.jstor.org/stable/4124413.

Palmer, P. (1997). *The courage to teach: Exploring the inner landscape of a teacher's life.* Jossey-Bass.

Payne, G., & Payne, J. (2004). *Key concepts in social research.* SAGE Publications.

Saldana, J. (2009). *The coding manual for qualitative researchers.* SAGE Publications.

Sleeter, C. (2001). Preparing teachers for culturally diverse school: Research and the overwhelming presence of Whiteness. *Journal of Teacher Education, 52*(2), 94–106.

Sturman, A. (1997). Social justice in education. *The Australian Council of Educational Research, 40,* 153–338.

Sue, D. W. (2010). *Microaggressions in everyday life: Race, gender, and sexual orientation.* John Wiley & Sons.

Villegas, A. M. (2007). Dispositions in teacher education: A look at social justice. *Journal of Teacher Education, 58*(5), 370–380.

Villegas, A. M., & Lucas, T. (2002). Preparing culturally responsive teachers: Rethinking the curriculum. *Journal of Teacher Education, 53*(1), 22–31.

Von Thiene, J., Royalty, A., & Meinel, C. (2017). Design thinking in higher education: How students become dedicated creative problem solvers. In C. Zhou (Ed.), *Handbook of research on creative problem-solving skill development in higher education* (pp. 306–328). IGI Global.

A Micropracticum Learning Design: Bridging Content Knowledge and Participatory Field Experiences in Teacher Education

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Abstract

A teaching practice is developed, in part, from practicing teaching and reflection on practice. Student teachers are required to engage in practice teaching and reflection as part of their teacher education programs. However, practice teaching experiences and opportunities to learn "in the field" often range in quality and may not adequately prepare every teacher candidate for the complex learning needs and contexts in diverse classrooms. Practice teaching opportunities need to be well designed and scaffolded to address both theory and practice, and provide student teachers with meaningful opportunities to develop the competencies and dispositions needed for teaching well as a beginning teacher. This design-based research focused on three student teachers' experiences in a micropracticum in a high school. The micropracticum occurs between teaching practice in a campus classroom and prior to embarking on full practicum experiences in K-12 classrooms. Observations by the field advisor, along with narrative reflections by student teachers and a high school teacher who engaged in a micropracticum, serve as the primary sources of data that informed the analysis of student teacher experience in this evaluation of the impact and effectiveness of the micropracticum approach to practice teaching. Researchers drew upon observations and reflections to create narrative accounts, consolidate key themes across

participant experiences, inform subsequent cycles of the micropracticum, as well as to offer

recommendations and insights on future practice.

Résumé

L'exercice pédagogique se développe, en partie, par la pratique de l'enseignement et la réflexion

sur cette pratique. Dans le cadre de leur programme de formation, les futurs enseignants sont

tenus de s'engager dans cette pratique. Celle-ci, appuyée sur les stages de formation « sur le

terrain », varie cependant en qualité et suivant la diversité des classes, et n'arrive pas toujours à

préparer adéquatement tous les candidats aux besoins et aux contextes d'apprentissage

complexes. Le stage pédagogique doit être solidement conçu et échafaudé pour combler l'écart

entre la théorie et la pratique; de même, il doit fournir aux futurs enseignants un cadre pratique

favorisant le développement des compétences et des attitudes requises pour équiper tout

enseignant débutant à bien exécuter ses tâches. Ainsi conceptualisée, la présente recherche porte

sur les expériences de la micropratique de trois élèves-enseignants dans une école secondaire. La

micropratique s'effectue au terme du stage préparatoire de l'enseignement dans une salle de

classe du campus et avant le début du stage complet entrepris dans une école, de la maternelle à

la 12e année. Les observations de la conseillère académique sur le terrain, ainsi que les

réflexions par écrit de trois stagiaires et d'une enseignante du secondaire qui se sont engagés dans

la micropratique, constituent les principales sources d'analyse de l'expérience des futurs

enseignants dans cette évaluation de l'impact et de l'efficacité de l'approche micropratique dans

la formation de ces derniers. S'appuyant sur leurs observations et réflexions, les chercheures en

ont produit des récits afin de tirer les thèmes-clés de leur expérience et, par conséquent, de

renseigner les cycles ultérieurs sur la micropratique et offrir des recommandations sur sa mise en

pratique future.

Introduction

Originally designed to serve needs of a largely agrarian and emerging industrial society, early approaches to teacher education in 19th and 20th century normal schools were hierarchical, bureaucratic, and highly segmented (Friesen, 2018). Standardized mass education of new teachers may have been appropriate given prior contexts and the needs of earlier social systems. However, contemporary youth both expect and "need to be engaged in technology-enabled learning environments and intellectually demanding school experiences that prepare them to move into ever-changing and complex social, economic, political, and cultural contexts" (Jacobsen & Friesen, 2011, para. 1), and thus need highly trained and agile teachers who can reflexively respond and adapt in complex and changing school systems. To address effectively the present and future needs of Canadian learners and new teachers, contemporary Faculties of Education are called upon to design and provide responsive and flexible preservice teacher education that shifts from the long-term focus on teaching, towards an intentional focus on teachers becoming experts in learning (Friesen, 2018).

In each province, the ministries of education prescribe the minimum number of weeks that student teachers must fulfill in their practicum in order to comply with certification standards. The standardized approach to teacher preparation that involves student teachers enrolling in a predetermined number of theoretical and specialized content courses on campus, followed by a prescribed number of weeks of practice teaching under the supervision of a certified teacher in the field—commonly known as field experience or practicum—needs to shift. The combination of the successful completion of the required courses and number of weeks of practicum experiences in schools may qualify a BEd graduate for a teaching certificate, and grant them rights and privileges to teach in that province's schools; however, standard campus coursework and field practicum siloes may not ensure that newly certified teachers are prepared

to address the diverse and complex learning needs of contemporary learners in dynamic and changing classroom and school contexts.

Research suggests that teacher education programs are challenged in providing adequate hands-on teaching and learning experiences with contemporary learning technologies on campus before student teachers enter their practicum (Mor & Mogilvesky, 2013). Providing student teachers with authentic practice in designing for, and leading learning with technology as part of their campus coursework can help to build student teachers' confidence and self-efficacy before they start practicum. Student teachers can benefit from mentors on campus who support them as learners and designers as they come to understand what it means to teach and how to design for learning, before they start their block or extended practicum. The micropracticum model examined in this study offers an authentic teaching experience student teachers can engage in, as it emerges from intentionally designed coursework on campus as part of building the confidence and self-efficacy student teachers need to design for learning during their practicum. A micropracticum is defined here as a short-term, scaffolded practice teaching experience in a real classroom with real students for which student teachers design and teach lessons, reflect on these experiences and receive feedback from the classroom teacher and faculty supervisor. A micropracticum experience is managed through a campus course and occurs prior to embarking on full practicum blocks in K-12 classrooms. As teacher educators, we anticipate that our research on the micropracticum can provide useful insights and evidence from local practice and contexts that can inform the changes that are called for in teacher education.

The design of the micropracticum, a bridge between microteaching on campus and a practicum in schools, can provide student teachers with scaffolded design and teaching practice with peers and mentors. Distinct from microteaching, which tends to occur in the teacher education classroom as laboratory with each student teacher designing and delivering a practice

lesson to peers in the same course, the micropracticum focuses on K-12 students' learning. In microteaching, the student teachers have all learned similar content, pedagogical approaches, and learning technologies—if any—that they are required to infuse into their practice lesson for their peers. This type of controlled microteaching environment is removed from, and is not as authentic as, practice teaching in a real classroom with real K-12 students during practicum. In microteaching, the student teacher's peers are not the intended K-12 learners and as such may have difficulty asking helpful questions or providing authentic critiques and feedback to help the student teacher develop their practice. Practicum, in contrast to microteaching with peers on campus, occurs in authentic, dynamic, and complex classroom contexts with K-12 students who need to be engaged in learning—for real! Given that many student teachers experience anxiety and lack confidence as they prepare to undertake the high-stakes practicum, the micropracticum can be an important bridge that addresses all these concerns.

Teacher educators, cooperating teachers, and student teachers identified the disconnect between the theory and content student teachers learned in courses on campus and the actual practice of student teaching in the practicum (Brown, 2017). In reflecting upon this disconnect, and how much and what types of practice student teachers have on their journey to becoming certified teachers, the idea for the micropracticum was born. With an intentional focus on designing for learning, we describe a micropracticum framework that was designed to engage student teachers in authentic design, teaching and learning experiences within the boundaries of an on campus course that serves as a bridge to practicum. Thus, the micropracticum is distinct from the microteaching found in some teacher education programs.

Our research approach is design-based with an emphasis on iterative design in response to an identified problem, nested cycles of implementation, and ongoing reflection to evaluate the impact of the micropracticum on student teacher learning as part of our own ongoing teacher

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education practice. In this chapter, we describe the first iteration of the micropracticum and design-based research that involved a field advisor, three student teachers, and a high school teacher who opened her classroom to the initiative. The three student teachers and the teacher consented to be participants in the study, and have each shared their reflections on the micropracticum experience for analysis and discussion. A second iteration of the micropracticum design, using the principles and findings described here, was carried out in a subsequent semester. The analysis of data and recommended changes that emerged from the first iteration of the design-based research on the micropracticum, which we describe in the sections that follow, both informed and were applied in the design and enactment of the micropracticum in the second iteration.

Design-based research (DBR) was considered a good fit for this cyclical evaluation of iterations of micropracticum since the goal was to produce usable knowledge that could inform and influence teacher education, as well as yield design principles that could reflexively inform ongoing practice and research (McKenney & Reeves, 2019). In addition, it was important that shareable knowledge from the micropracticum experiences be informed by student teachers themselves, along with interpretations by the cooperating teacher and teacher educators, such that the iterative designs and study of local practices would inform principles upon which future designs might be considered in other teacher education contexts.

Literature Review

Knowing what to do and actually doing what we know in teaching are sometimes two very different things (Hirschkorn & Mueller, 2016). There are variables and local factors that can enable or prevent teachers from doing what they know, which include support for such enactment, culture, protocol, beliefs, perspectives, timelines, access to resources, among other factors. Teacher education has often not kept pace with the many changes that technology brings

to the classroom (Brown & Jacobsen, 2016; Jacobsen & Lock, 2004) and therefore may not provide opportunities for every student teacher to develop the techno-pedagogical-content knowledge they will need for their classroom (Brown, 2017). Mor & Mogilvesky (2013) report that student teachers went through the motions of teacher preparation during their courses on campus, but then reported the real learning happened during practicum and in authentic teaching experiences with students in schools, even when these situations did not include the partner teacher or student teacher using contemporary learning technologies with the learners. Student teachers did not see the link between content and theory courses on campus and practice teaching in classrooms, and as a result, they simply endured and got through coursework before they could engage in practicum and obtain their teaching certificate (Mor & Mogilevsky, 2013). Student teachers questioned the validity of the courses taken on campus and described the campus component of their teacher education programs as detached and ineffective for putting theory into practice (Mor & Mogilevsky, 2013). While "student teachers consider cooperating teachers to be one of the most important contributors to their teacher preparation program" (Clarke et al., 2014, p. 163), studies also indicate that many student teachers do not get enough or any practice in authentic learning environments on campus prior to starting practicum (Broad & Muhling, 2017; Brown, 2017; Mor & Mogilevsky, 2013).

Given this context, our design-based research focuses on the design and evaluation of student teacher learning experiences that can enable new teachers to develop techno-pedagogical content knowledge that helps them design technology-rich collaborative learning environments, and enact these designs with the type of students they will eventually teach (Brown, 2017). Using a micropracticum approach to design and enact lessons for learning, student teachers are given opportunities to develop knowledge of what to do and to practice what they know from on-campus experiences as a scaffold or bridge to their practicum placements in

schools (putting theory into practice). Many would agree that acquiring knowledge on campus is insufficient on its own for the development of new teachers who can independently translate that learning into practice; student teachers also benefit from mentorship, practice and reflection opportunities as they translate the acquisition of relevant knowledge into the design of participatory experiences in authentic learning environments. There are many variables or aspects involved in activating these metaphors of acquisition of knowledge and participatory experiences (Sfard, 1998). We argue that scaffolded lesson design and mentored practice teaching experiences help student teachers to actively develop the techno-pedagogical content knowledge needed to design and enact contemporary learning experiences during the block practicum.

Knowledge Acquisition Metaphor

Tondeur et al. (2012) argued there are insufficient opportunities for student teachers to experience the complexities involved in teaching and learning with technology required to develop self-efficacy, or the proficiency required to translate that learning into use during practicum. Teacher education programs may provide student teachers with opportunities to create a lesson plan that blends some topic with technology (knowledge) and to microteach the lesson they have created on campus with peers (practice). While student teachers are required to practice teach the designed or mock lesson with their peers in the college or university classroom, such lab type practice rarely equals the authentic, dynamic, and complex classroom environments in which student teachers will learn and teach during practicum. While practice lessons with peers on campus have value, the teacher education classroom is removed from the reality of K-12 classrooms in schools. Micropracticum provides student teachers with scaffolded experiences in authentic and dynamic K-12 environments in which to practice leading lessons. These mentored opportunities help student teachers to develop skills and dispositions that may

be difficult to develop in microteaching on campus. For the micropracticum to be feasible, field advisors need access to teachers and schools that are willing to open their doors for student teachers to work with real students. Experienced teachers who are willing to "lend" their students and classrooms to student teachers, and provide feedback on emerging practice, open up opportunities for developing the techno-pedagogical content knowledge needed for responsive teaching in diverse classrooms. The micropracticum is a knowledge acquisition scaffold and pedagogical practice bridge that can help prepare student teachers for their practicum experiences.

Participatory Experiences Metaphor

Practicum is due for redesign, both in format and process. These can be highly variable teaching and school-based experiences that do not provide every student teacher with the type of learning opportunities that prepare them well for their own practices. Practicum mentors, sites, contexts, and experiences are diverse. All student teachers should have the opportunity to acquire consistently effective experiences in their practicum placements (Brenner & Brill, 2016; Kale, 2014; Mor & Mogilevsky, 2013). A review of the research on the practicum indicates that there is a need for change in teacher education (Brown, 2017) and that re-considering our approaches to field experience is timely for all education stakeholders. Jacobsen, Friesen and Clifford (2004) argued that as teacher educators on campus, we must resist the urge to replicate ourselves by teaching in the ways we were taught; instead, we must be intentional in designing technology-rich collaborative learning environments in which student teachers are immersed, and learn first-hand how to design and enact discipline-rich lessons and inquiries with technology for learners in today's classrooms.

Brown (2017) outlined a micropracticum model for the intentional design of student teacher learning and practice experiences that departs from teaching the way we were taught on

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campus. Brown's micropracticum model includes faculty, experienced teachers in classrooms, and curriculum specialists working collaboratively to design and support authentic learning experiences for student teachers, so they can practice and experience the knowledge developed on campus in authentic learning environments. In this paper, we explore questions such as:

- What needs to happen on campus to provide student teachers with the knowledge that they require in their practicum?

- What opportunities do student teachers have to design learning and to practice their lesson designs in authentic environments?

- How is teaching and learning modelled in teacher education programs? and

- How might practicum be redesigned to provide student teachers with the knowledge and practice that they need for their future learning environments?

This design-based research builds upon Brown's (2017) recommendation that a "revised practicum model needs to provide opportunities for all student teachers to experience consistent and effective teaching and learning with technology in every practicum placement" (p. 262). Through our inquiry, we aim to provide useful insights from local practice and student teachers' experiences designing for learning based on relevant curriculum to inform teacher education more broadly.

Student Participant Narratives

Three student teachers and a cooperating teacher who engaged in a micropracticum, along with a field advisor from campus, agreed to contribute to the research by writing reflections on their learning for analysis. The micropracticum in the high school classroom replaced the microteaching experience that these student teachers would typically have acquired in a course on campus. The three students were in their final year of teacher education and enrolled in a curriculum and instruction course. The students collaborated on the design of a

learning unit to span one month, and coordinated the topics to be taught and the sequence and number of lessons needed for each topic. The students were responsible to teach three lessons each in addition to designing and teaching two collaborative lessons: the all-period day (where one subject spanned all periods in a day) and the final day as a culmination of all of the lessons. Each student taught their lessons consecutively with some non-school days interrupting this sequence. Planning for the vagaries of school timetables is not part of microteaching in the college or university classroom. Student teachers were required to design lessons that brought all students into the lesson, even if that meant reviewing content that was presented in the previous lesson several days prior. Regular class periods were eighty-five minutes; however, on Wednesdays the periods were shortened to fifty minutes. Student teachers had to design their lessons according to the days for which they were responsible. School timetables, mixed periods, and continuity of lessons for students are elements of an authentic classroom that student teachers would not experience in on-campus microteaching. The month included non-school days, a spring break week, a registration day, and a professional development day. The researchers invited the student teachers to write about their micropracticum experiences in response to some guiding topics, and to provide open-ended reflections on what elements, actions, or experiences had helped them to *become* a new teacher. The guiding topics used to frame student teacher post-micropracticum reflections were based on Technology, Pedagogy, and Content Knowledge themes (Koehler al., 2012). TPACK themes were a foundation for cyclical designs for learning that included lesson planning, teaching the lessons, building relationships with students and explicitly valuing diversity, practicing classroom management, and reflections on how one is learning and how and who one is *becoming* as an educator. In the four sections that follow, the student teachers' and cooperating teacher's reflections on the

microbracticum experience in a high school have been edited and condensed into representative narrative accounts by the researchers, as part of the analysis and synthesis of data.

Student One Narrative

Student One is a student teacher with a degree in film studies and is studying major teachable subjects in business and technology. In the second of a three-year after degree teacher education program, Student One hopes to teach students about creating film and video as well as teach commerce courses in senior high school. The following composite narratives were synthesized and condensed by the researchers from the verbatim student teacher reflections.

Student One. I was given the opportunity to apply my learning in a business class at a local high school. I leveraged my interest and passion for economics into the design of a lesson to teach over three days during the micropracticum. Infusing technology into learning is very important to me, so I used Google Slides and incorporated the Stock Market Challenge online activity to engage students in the introduction to economics.

I believe developing effective classroom management skills can only be accomplished in authentic learning environments with real students. I have been taught about different techniques and methods of classroom management in my courses; however, the best way for me to learn how to manage a class was with real students in a high school. Through this micropracticum experience, I found that classroom management is about who I am as an educator. My emerging pedagogical knowledge is based on what I learned in my teacher education program and reflecting upon how I applied it in a classroom. There was an emphasis on differentiated instruction and infusion of technology in my courses on campus. What I learned about these approaches was brought into the micropracticum when I used the Stock Market Challenge to gamify

the lesson, and I used collaboration and group work in an activity to help students to explore and understand how economics is used in decision-making.

Developing my toolkit to face discipline problems is best learned in an environment such as this real high school classroom. In practicum, we (student teachers) want everything to go perfectly to impress our cooperating teachers and to be memorable. As student teachers, we talk amongst ourselves and in courses about all the different ways to manage a classroom in our courses on campus, but it really doesn't mean much if we aren't given the opportunity to try it out. It's important to find what works for YOU as a teacher; during micropracticum, I was able to be myself and react when faced with different situations, such as when I had to be stern and bring the class under control, and also in seeking ways to engage the students. There were problems with cell phones and the easy answer is to just take them away, but I wasn't going to do that. I challenged myself to find a way to get students to recognize that cell phones are a tool and not a toy, and that we use them for learning in the classroom by doing calculations, online research, and in gamifying the classroom.

Working with socially and academically diverse children is something that we did not get a lot of instruction on prior to entering a classroom. However, we had to learn very quickly how to work with, and respond to diverse learners in the high school classroom. Pre-planning only goes so far; it is our ability to adapt in the situation that provides us with the richest learning. Belief in a student's ability can only be created by building relationships. In a micropracticum situation, there is a mutual respect between student teacher and cooperating teacher. I didn't just teach a lesson for the sake of getting a passing grade for myself; I really wanted the students to learn about economics and how it applies to their daily lives. I wanted them to be successful in those three days in

learning economics. I wanted to find ways to make it applicable to their lives and to show them that even though they may not recognize it, they use economics every day.

My growing ability to recognize that I do not have all the answers, and my growing comfort with my partial knowledge, is important for me to acknowledge as a new teacher because my uncertainty is similar to that of my learners, and is both human and authentic. As a lifelong learner, I may never have all the answers, and that excites me because it means there is more to discover. Student teachers should not see their own lack of knowledge as a weakness, but as an opportunity to dig deeper, and as a teacher we can design learning experiences that can empower students by having them seek out and discover the answer and share it with the class. They too can teach the class!

The three lessons I designed changed over the course of the micropracticum experience because of conversations I had with the classroom teacher and my faculty instructor, who both encouraged me to try new things. This application of my campus learning in a real classroom went well beyond doing mock lessons with my peers. Micropracticum helped me develop the confidence to adapt, to challenge myself, and to take risks in a mentored environment as preparation for my practicum. I was able to apply what I learned in the campus classroom, to try new ideas and activities with real students, to reflect and adapt and build confidence, engage in lesson and unit planning, as well as design learning for a variety of students, all before going into practicum.

Student Two Narrative

Student Two holds a degree in business and is studying major teachable subjects in business, technology, and history. Student Two is in the second of a three-year after degree teacher education program and hopes to teach students in business and history courses at the junior and senior high school levels.

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Student Two. The time we spent in a micropracticum at the local high school was a great learning experience for the three of us as part of our Advanced Methods course. We had been asking to do more of this type of teaching instead of one-off lessons with each other, and we were given the opportunity to teach a combined unit in high school with two other classmates. A few times in my other Methods classes, we were asked to do one-off lessons and were given a topic that we knew nothing about. We were even told that we could not teach certain lessons because the professor wanted to do those with the class herself. Designing for random topics was a difficult experience and it was challenging to design one-off lessons. In contrast, the lessons we designed for high school students in our micropracticum experience gave us the freedom to try out different things in the classroom. We received immediate feedback after our lessons from the classroom teacher and the faculty instructor, who both have a wealth of teaching experience. We had access to enough technology in the classroom so that we could design almost anything we wanted to do with students. Designing on campus and then teaching in the high school classroom was a great way to practice infusing technology in the classroom. We had a good foundation from several of the other technology content courses on campus, so it was nice to have an opportunity to test our ideas with real students in a real high school environment.

Classroom management was a bit nerve wracking for me. Walking into someone else's class to teach grade twelve students caused me anxiety. I thought it might be a tough experience since I had not practiced my lessons in an authentic environment. However, with my knowledge of classroom management and support from my faculty instructor, I felt that I was able to execute my lesson well and did not have any classroom management issues. This real teaching experience was a great way to practice my

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classroom management skills, and to confront my anxiety. I believe my pedagogical knowledge and curriculum planning was not very good because I just didn't have enough teaching experience. By this point, I only had experienced eight weeks of practicum in my teacher education program. In preparation for the micropracticum, I believe we spent ample time with our faculty instructor going over our lessons and curriculum outcomes to make sure that we addressed the outcomes and planned a great, meaningful lesson for students. We were given helpful feedback before our lessons and then again afterwards about how our lessons were structured. The micropracticum gave me a great opportunity to develop practical knowledge. In most education classes, we just talk about doing things in a classroom and don't get the chance to practice them until practicum.

My experience with authentic practice teaching in high school is a great way to practice classroom management because all situations are authentic. This micropracticum gave me insight into how the school system works. The cooperating teacher answered all of my questions about the school system and had great examples to share for things that had happened in her school and across the division. In terms of personal growth and professional development, I can't say enough good things about this experience. The micropracticum opportunity gives student teachers a peek into the educational system and some experience on which to develop their own opinions. Designing and teaching a lesson was a great experience for me to work on how to get students to ask questions and have good discussions. In one of my lessons, I moved quickly through my material and had a lot of time left in the class. We decided to have a good discussion on the subject and the students started to ask a lot of questions. This gave me an opportunity to work on my skills at creating discussion questions with, and from my students. Experiencing this micropracticum in the high school classroom also showed me that while I do not have all

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the answers, I can handle not having an answer for a student. The micropracticum was a great opportunity and I would recommend this approach for student teachers in other teacher education programs, as it was a very rewarding experience and helped me to become a better teacher heading into practicum.

Student Three Narrative

Student Three holds a kinesthetics degree and is studying major teachable subjects in business and technology. Student three is in the second of a three-year after degree teacher education program and aims to teach at the junior and senior high school levels upon graduation.

Student Three. I was so excited by the opportunity to get real world experience with high school students in my field of study. The high school micropracticum provided me with an opportunity to plan and teach lessons in a real environment, with real policies and procedures, and with real high school students. My lesson plan was based on the Marketing and Digital Commerce course and specifically focused on the topic of the marketing mix. I have always tried to incorporate technology into my teaching, but it's not just about using technology in the classroom, but rather using technology as a tool to make learning meaningful. In this practice teaching in high school, the students and I used a variety of technologies to enhance our learning on the topic.

One of the biggest benefits of the micropracticum was that we were no longer in the sterile campus environment. We were meeting the students for the first time on day one and we had to develop a management style very quickly. We also had to manage behaviour such as students coming in late, leaving class for extended periods of time, and packing up early. These were all behaviours we wouldn't encounter on campus in our teacher education classroom while practice teaching with our peers. The planning process for the high school students was something that we had a lot of experience with over the

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two years in our teacher education program. However, the tough part was planning for three lessons, not knowing where each lesson will finish at the end of each day. We were teaching to real students—it wasn't just about providing the content. We really had to have the "wherewithal" and make sure that the students understood what we were hoping they would learn. We had to make decisions on how to deal with classroom management issues and on how long to spend on each topic.

The students in this class were well behaved, but the thing I learned the most about was that I can't pre-plan for every problem. I needed to develop problem solving skills. What am I going to do if the situation changes? Sterile teaching (microteaching on campus) in our first Methods classes and our practicum experience provided benefits, but I truly felt that this micropracticum in a high school helped to better prepare me for my final practicum block. I was able to see the purpose in what we were doing. I gained insight on things we don't learn about in our campus classroom, such as taking attendance, understanding what to do when the bell rings and the kids are leaving, etc. This microteaching was so REAL. It really solidified for me that I should be a teacher. I found myself building strong relationships with the students, developing engaging and innovative lessons, as well as developing an overall sense of happiness, success, and enjoyment with what I was doing.

Knowing which tools to use when facing discipline problems is something that I struggle with as a new teacher. It was great to talk and listen to the high school classroom teacher who shared some of her techniques that have worked and not worked over the years. The more time I spend in the classroom, the more I feel confident to question the education system as a teacher. I have always had the mindset that I want to prepare my students for the future. Although some of our institutions are not forward thinking,

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getting an opportunity to do a micropracticum gave me the chance to try things I might not have tried on campus with peers. This opportunity just solidified that my professional, fun demeanour is okay within a high school learning environment. When I first became an educator, I felt that I needed to have all the answers to every question or I was not a good teacher. Through this experience, I learned about ways to be confident in my ability to teach and respond to the questions that my students asked.

Learning about content and lesson design is great, but learning how to get your students engaged with the content in a way that is meaningful and purposeful helps to make the learning real for me. I have learned about how confidence can command a room, and how connecting with students on a personal level can truly engage the learner. Although it is great to know how to build lesson plans, unit plans, assessment pieces …, it is more important to be able to relate the designs to my students' learning. That is one thing that I will never forget …. PURPOSE!! It has changed the way I look at developing my lessons.

Cooperating Teacher Reflection

The following narrative was edited and condensed by the researchers from the teacher's written reflection.

Cooperating Teacher. As a former student in the teacher education program, I remember how difficult it was when I first started practicum. The fear of the unknown, simply walking into a school again, having to jump in with another teacher's schedule, are all parts of what new colleagues must do and learn as a student teacher on practicum. Student teachers are expected to survey, learn, and apply content knowledge in a short amount of time. Before you know it, you are being evaluated and heading back to campus for more courses, or if it is your last year, then it is time to find employment. Many

teachers have gone through the present system and have "figured it out." However, with the opportunity of a micropracticum, this bridge to practicum can relieve some of the uncertainty and alleviate some of the stresses. Additionally, the practice teaching experience can also give student teachers the opportunity to grow from being good to being great. A micropracticum experience can make a student teacher stand out and empower them as a new educator, and help them become better prepared for what is to come during practicum.

Initially, I met with the three student teachers via a Google Hangout where we briefly discussed the topics they could teach in the upcoming month. About one month before beginning the micropracticum, the student teachers, along with the faculty instructor, came for a field visit to my classroom to meet my students. During the pre-planning phase, the student teachers had time to plan and prepare lessons and to ask me any questions before teaching their lessons in my classroom. When the students presented their lessons, I realized that they were still nervous; however, they had the proper time to set up their lessons to be successful. Just like our high school students, we mentors want to set our student teachers up for success by providing the right coaching and tools to guide them as they start their new teaching practice on their own.

Using a Google Doc, the faculty instructor and I recorded specific feedback throughout the lesson for each of the student teachers on each of the lessons (Table 1). Together, the faculty instructor and I met with each student teacher after each lesson to share and discuss the feedback. Each feedback session typically began with a question inviting the student teacher to give their impression of student learning that occurred in that lesson. There were approaches that the student teacher realized could and perhaps should have been changed, but were not possible mid-stream in the lesson. One student

teacher commented that he knew that he needed to change several approaches for the next lesson the instant that he delivered it in the first lesson, because of the way the students responded. The student teacher's ability to reflect on action and consider his next steps was an indication that this teaching and learning experience was rich and meaningful. Feedback was meant to inform the student teacher's reflection and redesign of the subsequent lessons. The faculty instructor and my reflective and reflexive practice of providing formative feedback to the student teacher were focused on continual improvement. This form of intentional scaffolding and mentoring was guided by our expectation that our new teaching colleagues would reflect carefully on each lesson, and then design and redesign their approach based on the responses and needs of their students.

Table 1

Excerpts From the Cooperating Teacher Feedback

Review question to ensure everyone heard the questions—student asking layering questions—ensure everyone understood the question to have the same response.

Stocks—students want to dive into a topic—sometimes you have to deviate from your lesson to go deeper into a topic which you didn't expect to do. This is a more structured environment, but keep this in mind when you have your own classroom situation.

Two students came in late—be sure to greet the students to ensure you recognize they are in class.

Presentation tools such as PowerPoint—try not to read exactly what is on the slide, but use it as an aid to elaborate what you want to articulate to your students.

Pros & Cons—this would have been a great group activity—utilizing brainstorming to see what each individual student would have come up with … Mentimeter would have been great for this situation.

Got the students' attention with playing a game—good way to start—good to have some type of recording for or against it. Have students go to the front of the class—this is a great way to have students practice their presentation skills—multi area to learning opportunity. Be sure everyone votes and is included. Easy to lose students in this area.

Be conscious of the time, also not using the laptop cart in class is problematic since other classes could have utilized them in the school. Be conscious of this when booking as there is only one cart for this side of the school.

The formative feedback provided to each student teacher (excerpts in Table 1) documented what I saw and my advice on how it might be done differently. Recorded observations and my comments were meant to help the student teacher reflect on the reality and intensity of teaching and learning they experienced, and to analyze the many details a teacher must be aware of throughout each day. Eventually a teacher builds habits and routines that they carry out fluently. Having a peer comment and offer advice on pragmatics can be so helpful, as a new teacher is building their own practice.

It was evident that these student teachers invested a lot of time in designing meaningful learning opportunities and soaked up every bit of feedback that I provided. This micropracticum in my classroom has provided the student teachers with the opportunity to apply the theory they have learned on campus with real students in a classroom, and to get feedback from an experienced teacher and also from their methods course instructor. The student teachers had to plan according to real scenarios that teachers face, such as working with IEPs (independent education plans) and modifications. Another big aspect they had to consider was how to build rapport with students from the start. I am confident these student teachers will be successful in their practicum because they were passionate about their learning which was infectious for me and the students. The student teachers made lessons fun and engaging for my students; they were engaged with making learning happen and in making the retention of learning easier for students. If we continue to break down the traditional campus classroom as a separate from the field, and move away from non-authentic, sterile learning environments into complex and dynamic real classrooms, then maybe we can help to develop new teachers in better and more authentic ways.

Discussion

Key ideas emerged from the student teacher and cooperating teacher reflections on the micropracticum experiences in a high school, and the type of bridge this mentored learning opportunity provided between coursework on campus and the block practicum. The researchers reviewed the four reflections in order to extract the commonalities and differences, and the benefits and challenges, the student teachers and cooperating teacher wrote about regarding their experience of the micropracticum. Five themes are used to organize key insights that emerged from the student teacher and cooperating teacher reflections: (a) classroom management

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approaches; (b) using learning technologies; (c) moving from theory to practice; (d) becoming teacher; and (e) experiencing the complexities of practice.

Classroom Management Approaches

Classroom management is a topic that all three of the student teachers identified as vital for a successful lesson in which learning can occur. Each of the student teachers experienced different situations that involved student behaviours, engagement, relationships, and actions that required individualized responses to ensure that the needs of all learners in the classroom were met. All three preservice teachers appreciated the opportunity to experience teaching lessons they designed in an authentic environment, with the faculty instructor and classroom teacher providing them with immediate feedback on their implementation of classroom management strategies.

Using Learning Technology

All three of the student teachers incorporated learning technologies in their lesson designs and infused technology into their teaching. The pedagogical emphasis for the lessons was inquiry along with student-centered approaches to interaction. The primary technologies used were mobile devices and apps. However, to ensure equitable access to technology, the student teachers were required to reserve the school's Chromebook cart. Two of the mobile apps used for learning were Kahoot and Mentimeter. These apps also enabled formative assessment for learning which, in turn, provided the student teachers with opportunities to reflect on student learning and revise their next lessons to ensure all students were meeting the learning outcomes. The economics lessons were supported with a Chromebook application. However, some high school students preferred to use their mobile devices and discovered they were able to access features not available on the desktop version of the program. The student teacher did not realize this feature prior to the lesson and was able to incorporate flexibility and responsive teaching into the lesson.

Student teachers learned in real time the value of contingency plans, how to draw upon their students' ideas and expertise with technology, and what they might do when technology or the lesson did not work as planned. Student teachers valued the opportunity to design for, and lead high school students' learning with technology as part of their micropracticum experience, which increased their confidence and self-efficacy before they started the practicum block.

Moving from Theory into Practice

The micropracticum experience provided student teachers with opportunities to put theory into practice and to learn from practice by specifically applying their on-campus learning experiences to design for learning in the classroom. Student teachers often do design plans for learning and practice teaching the lessons that they have designed on campus with peers. However, mock teaching experiences are rarely immersed in the ecological complexity of a high school or elementary classroom, and may not provide student teachers with the authentic, real-time practice and feedback, which they need to become flexible and adapt their lessons to meet their own learners' needs when they are in their classrooms. Student teachers identified that the authenticity of their learning designs for real students required them to practice responsiveness and flexibility to adapt their lesson plans to meet their students' needs and, in turn, they had to practice scaffolding. The micropracticum experience helped student teachers to bridge the theory practice gap by developing techno-pedagogical content knowledge and deepening their understanding of the importance of theory through hands-on practice.

Becoming *Teacher*

In a continuous practice-reflect-learning cycle, student teachers enacted their designs for student learning, received feedback and questions about practice for reflection, and engaged in continuous learning about practice through design, practice, and reflection. The journey of a teacher is *becoming (*Britzman, 2012). This micropracticum experience required student teachers

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to invest time in collaborative lesson design, preparing for, engaging in, discussing, and reflecting on their practice teaching; the micropraticum experience also engaged students, even at this very early stage in their careers, to invest time in living and reflecting on the experience of continually striving to improve teaching practice, with mentoring from the cooperating teacher and faculty field advisor. In micropracticum, student teachers gained deeper insight into the ongoing journey of becoming teacher by teaching and learning with real students prior to the extended practicum.

Experiencing the Complexities of Practice

The cooperating teacher identified teaching as a complex practice that considers many variables and elements to provide rich opportunities for student learning. Student teachers are expected to hit the ground running in practicum, to consider all variables about each individual learner, and to include appropriate content and assessment components, even though oftentimes they may have not yet had the opportunity to put into practice that which is expected of them as new teachers. The cooperating teacher provided immediate feedback to each of the student teachers, which gave them insights and new awareness of the many aspects of teaching. Student teachers were exposed to specific contextual strategies for consideration and reflection. The documented feedback from the micropracticum was theirs to retain, which they can review and reflect upon as they design learning on a daily basis during practicum. The continuous practice-reflect-learning cycle during micropracticum was found to help the student teachers gain confidence through practice, form relationships with students, and reduced their anxiety about practicum.

Next Steps

The design and enactment of this micropracticum was informed by design-based research on how designs for technology enabled learning experiences in teacher education get translated

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into classroom practice (Brown, 2017). Engaging with contemporary educational learning theories, as part of their campus courses, is an essential component for student teachers to become pedagogically fluent; however, the opportunity to translate learning into designs for learning and practice teaching is also important in order to ensure that student teachers are able to draw upon these theories—such as techno-pedagogical content knowledge—when they enter their classrooms. The practicum experience, when approached by all stakeholders with the genuine interest and intent to mentor student teachers (i.e., student teachers, cooperating teachers, faculty supervisors, administrators, and institutions), can be an invaluable learning experience for student teachers. An opportunity for a micropracticum within an advanced methods course, or some other design, can act as an important bridge between theory learned on campus and practice as developed in practicum. Student teachers benefit from the scaffolding and formative feedback from the cooperating teacher and faculty advisor, which also contributes to their greater confidence and efficacy in translating the learning theory they have acquired on campus during their high-stakes practicum (Brown, 2017). During micropracticum, student teachers are offered an opportunity for authentic practice in design and planning through collaboration with a cooperating teacher, building relationships with students, and leading learning in a lower stakes, high learning context.

Program designs, timetables, relationships with partner schools and a set number of student teachers are key elements to consider for implementing the micropracticum in a teacher education program. Student teacher timetables can be complex and demanding, and may be one of the biggest challenges of the micropracticum. For example, as part of this ongoing, design-based research, a second cycle of micropracticum has been implemented using insights gained from the first cycle. Reflections on practice and learning informed the analysis and redesign of the micropracticum for a second cycle with eight student teachers, an increase in number that

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multiplied the complexities of implementation. Managing the student teachers' timetables and logistics on campus and in the school increased the impact and demands on the cooperating teacher and field advisor for feedback and mentoring. Thus, we realize that developing a robust process and system for coordinated implementation across the program becomes necessary for further expansion of the micropracticum.

Growth and sustainability of the micropracticum experience beyond one or two faculty champions, and beyond one or two cooperating teachers in schools, is also a consideration if this approach to a practice teaching bridge between campus and practicum is feasible for program-wide adoption. Conversations and collaboration with colleagues across the teacher education program based on these promising findings from the initial implementation cycle bodes well for this micropracticum experience to spread. However, negotiating access to teachers and schools on a larger scale can become a challenge if it is not coordinated well and in combination with other program elements. Our findings about the impact on student teacher learning and the outcomes of the micropracticum experience from this design-based research can be useful in significant ways: It can inform other teacher educators and education stakeholders on how the micropracticum framework may be implemented and scalable for a practice teaching bridge between coursework and practicum in other teacher education programs.

References

Brenner, A. M., & Brill, J. M. (2016). Investigating practices in teacher education that promote
and inhibit technology integration transfer in early career teachers. *TechTrends*, *60*(2),
136–144.

Britzman, D. P. (2012). *Practice makes practice: A critical study of learning to teach*. SUNY
Press.

Broad, K., & Muhling, S. (2017). Voices of hope: Sustaining learning and optimism through a
protracted and jagged entry to the teaching profession in Ontario. In B. Kutsyuruba & K.
D. Walker (Eds.), *The bliss and blisters of early career teaching: A pan-Canadian
perspective* (pp. 139–153). Word & Deed Publishing.

Brown, E. (2017). *Exploring the design of technology enabled learning experiences in teacher
education that translate into classroom practice* [Doctoral dissertation, University of
Calgary]. http://dx.doi.org/10.11575/PRISM/26108

Brown, E., & Jacobsen, M. (2016). Developing technological fluency in and through teacher
education: An applied research project in teachers' college. In O. Dreon & D. Polly
(Eds.), *Teacher education for ethical professional practice in the 21st Century* (pp. 1–
23). IGI Global.

Clarke, A., Triggs, V., & Nielsen, W. (2014). Cooperating teacher participation in teacher
education: A review of the literature. *Review of Educational Research*, *84*(2), 163–202.

Friesen, S. (2018). A future wanting to emerge: Challenging assumptions about teacher
education. *Education Canada, 58*(3), 14–17. https://www.edcan.ca/articles/a-future-
wanting-to-emerge/

Hirschkorn, M., & Mueller, J. (2016). Introduction. In M. Hirschkorn & J. Mueller (Eds.), *What should Canada's teachers know? Teacher capacities: Knowledge, beliefs and skills* (pp. 5–10). Canadian Association for Teacher Education.

Jacobsen, D. M., and Friesen, S. (2011). Web exclusive: Hands on vs. hands up: Technology-enabled knowledge building in high school. *Education Canada, 51*(3). https://www.edcan.ca/articles/web-exclusive-hands-on-vs-hands-up-technology-enabled-knowledge-building-in-high-school/

Jacobsen, D. M., Friesen, S., & Clifford, P. (2004). Mentoring student teachers into the profession: Intentionally creating a culture of inquiry in the context of practice. In M. Simonson & M. Crawford (Eds.), *Annual proceedings of the National Association for Educational Communications and Technology (AECT) Convention* (pp. 308–315). AECT.

Jacobsen, D. M., & Lock, J. V. (2004). Technology and teacher education for a knowledge era: Mentoring for student futures, not our past. *Journal of Technology and Teacher Education, 12*(1), 75–100. https://drive.google.com/file/d/0B-36OcipMmoPbTdia2hrN1F5RjQ/view

Kale, U. (2014). Can they plan to teach with Web 2.0? Future teachers' potential use of the emerging web. *Technology, Pedagogy and Education*, *23*(4), 471–489.

Koehler, M. J., Shin, T. S., & Mishra, P. (2012). How do we measure TPACK? Let me count the ways. In R. N. Ronau, C. R., Rakes & M. L. Niess (Eds.), *Educational technology, teacher knowledge, and classroom impact: A research handbook on frameworks and approaches* (pp. 16–31). IGI Global. http://doi:10.4018/978-1-60960-750-0

McKenney, S., & Reeves, T. C. (2019). *Conducting educational design research* (2nd ed.). Routledge.

Mor, Y., & Mogilevsky, O. (2013). The learning design studio: Collaborative design inquiry as teachers' professional development. *Research in Learning Technology*, 21.

Meyer, J.H.F. (2010). Helping our students: Learning, metalearning, and threshold concepts. In Hughes J. Christensen and J. Mighty (Eds.), *Taking stock: Research on teaching and learning in higher education* (pp. 191–213). McGill-Queen's University Press. http://dro.dur.ac.uk/6849/1/6849.pdf

Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher*, *27*(2), 4–13.

Tondeur, J., Van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2012). Preparing student teachers to integrate technology in education: A synthesis of qualitative evidence. *Computers & Education*, *59*(1), 134–144.

Part 2: Collaborative Professional Learning for Teacher Designers

Engaging Teacher Candidates in Collaborative Curriculum Design: Education for Innovation (E4I)

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Abstract

In this chapter, we elaborate on a multi-year collaborative curriculum design initiative in which teacher candidates (TCs), inservice teachers, faculty of education instructors, and representatives from a number of national partner organizations worked together towards the creation and implementation of an *Education for Innovation (E4I)* curriculum resource for Canadian teachers. With a specific focus on the TC collaborative curriculum development experience, we describe the perceived benefits (informed design process, authentic audience, shared synergy, direct connection to teaching practice) and challenges (inadequate time, lack of full implementation, need to develop community partnerships) related to the process. Further, a number of recommendations for future practice and research are provided: the inclusion of TCs in collaborative curriculum design projects; the need for action research projects in teacher education courses pertaining to curriculum development; and an increased emphasis on related innovation research and knowledge mobilization.

Résumé

Nous présentons dans ce chapitre une initiative de collaboration pluriannuelle ayant rassemblé des étudiants en éducation, des enseignants, des spécialistes universitaires en éducation, ainsi que des représentants issus de diverses organisations partenaires autour de la création d'une trousse de ressources pédagogique, l'« *Innovation pour l'Éducation (E41)* », destinée aux enseignants canadiens. Portant une attention particulière sur l'expérience collaborative dans l'élaboration des programmes scolaires, nous examinons les avantages (processus de conception éclairé, public réel, énergie partagée, expérience pratique de l'enseignement) et les contraintes d'une telle approche (manque de temps, mise en œuvre incomplète, nécessité de développer les partenariats communautaires). Nous offrons en outre plusieurs recommandations sur la recherche et la pratique à venir, à savoir : l'intégration des enseignants en formation dans les projets de programmes scolaires collaboratifs; la nécessité d'incorporer des projets de recherche-action dans les cours de formation des enseignants; enfin, une plus grande emphase sur la recherche favorisant l'innovation et la diffusion des savoirs dans ce domaine.

Background

This curriculum development project involved collaboration from university faculty, principals, teachers, students, teacher candidates (TCs), and national community partners in the creation, implementation, and ongoing revisions of a set of resources entitled *Education for Innovation* (E4I). The Rideau Hall Foundation[2] (RHF) in Ottawa selected the Schulich School of Education at Nipissing University to create educational resources to support the two following publications co-authored by The Right Honourable David Johnston, 28th Governor General of Canada, and Tom Jenkins that were released as part of the *Canada 150* (sesquicentennial) celebration: *Innovation Nation: How Canadian Innovators Made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier, and Happier* (2017), written for emergent readers, and *Ingenious: How Canadian Innovators Made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier, and Happier* (2017), written for older/adult readers. The faculty researchers involved in the *Innovation* (E4I) project (Jarvis et al., 2018) have reported on the overall experience of this curriculum development initiative, with fuller background context and details.

In this chapter, we will focus specifically on the engagement of TCs during their teacher education program, and how this innovation curriculum writing opportunity enhanced their capacity to design deep learning experiences for their own students in the future. The following section provides information on the various groups that collaborated through the different stages of the E4I curriculum development process and resources.

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[2] The Rideau Hall Foundation (RHF) is an independent and non-political charitable organization established to mobilize ideas, people, and resources across the country to tap into our national spirit and help realize our shared aspirations. The RHF works closely with the Office of the Governor General and our many partners to connect, honour, and inspire Canadians. RHF initiatives and resources can be found on the RHF website: https://www.rhf-frh.ca/

Collaborations

A number of different collaborative structures were part of this larger project. In what follows, we provide an overview of the various stakeholder groupings who collaborated on the E4I project.

Faculty members

In the spring of 2016, an invitation circulated within the faculty of education at Nipissing University to participate in the RHF's "innovation education" project. Seven faculty members across two Nipissing campuses (i.e., North Bay and Brantford) answered the invitation. The object of the invitation was to form an Innovation Education Committee to determine the development process for the resources that the Schulich School of Education was asked to create. The Project Lead/Innovation Committee Chair was a faculty member who was teaching a curriculum methods course. Other faculty members were teaching similar courses or more subject-specific courses such as Mathematics or Physical Education/Health, and agreed to serve on the committee and to involve, to some extent, the TCs in their courses in the design and development of the resources, which ultimately became referred to as the *Education for Innovation* (E4I) documents. After the grade- and curriculum-specific units were developed, the faculty team realized that an Innovation Cycle with certain phases pertained to all of the units, and that there was clearly a common set of learning experiences that were related to innovation skills and mindsets. The Innovation Cycle featuring five key components (Inquire, Ideate, Incubate, Implement, and overall Impact) was created with accompanying questions within each component. The faculty writing team, with input from TCs, decided to further develop three generic (i.e., similar in structure and main components) cross-curricular teaching resources (Early Learning/Kindergarten; Grades 1–8; Grades 7–12) that were based on the Innovation Cycle framework. The Innovation Cycle units were then revised by faculty, school teachers, and

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TCs in the summer of 2017, and posted for public access on the then titled "Canadian Innovation Culture" website. The generic teaching resources and the grade-specific innovation units all featured a newly-developed Innovation Cycle model, sample activities, and suggested culminating projects/events. From this point, the three cross-curricular resources were referred to as "generic" *Education for Innovation* (E4I) resources.

Teacher candidates

In the 2016–2017 academic year, Bachelor of Education TCs from the participating faculty classes (i.e., Mathematics Education, Curriculum Design, and Inquiry) completed a unit planning assignment that aligned with *Ontario Curriculum* expectations and was based on course learning outcomes. TCs were asked to read and familiarize themselves with the two Rideau Hall Foundation books, *Ingenious* and *Innovation Nation,* and further asked to incorporate Canadian innovation(s) from the books into their unit plan development (e.g., a unit focusing on medical innovations such as prosthetic limbs, insulin, electric wheelchair, etc.). The challenge for TCs was to develop a curriculum unit using a project-based approach. The culminating activity of each unit was to develop a group innovation. The Innovation Education Committee subsequently used these curriculum units as a guide to develop innovation resources. Some TC teams developed a unit that could be used across subjects. The units were first implemented informally by TCs for feedback; they were then piloted by teachers from northern and southern Ontario, and from a variety of public, Catholic, and home-schooling contexts; and finally, they were presented at Rideau Hall in Ottawa. These units were internally adjudicated and a shortened list of the most comprehensive innovation units were revised for pilot implementation in Ontario schools. TCs were involved in many stages of the curriculum development initiative including class trips to initiate the resources; they also participated in presentations of resources to various audiences and ongoing revisions to the resources.

Eight National Partner Organizations

The Rideau Hall Foundation invited significant partner organizations across sectors with a common interest in innovation education to work informally with faculty members. The partners were asked in 2017 to begin meeting together, sharing ideas, and strategizing about future events and resources to promote innovation. This RHF partnership included the following seven organizations: the faculty of education at Nipissing University; the Perimeter Institute (an independent research centre in foundational theoretical physics); Junior Achievement Canada (youth business education organization); PowerPlay Strategies (program that helps students develop an entrepreneurial toolkit by creating and running their own real business ventures); Skills Canada (non-profit organization dedicated to the promotion of careers in technology and skilled trades); the Young Entrepreneur Leadership Launchpad (YELL) (high school Entrepreneurship course that is eligible for university credit); and Ingenium (a central organization which features links to the Canada Agriculture and Food Museum, Canada Aviation and Space Museum, and Canada Science and Technology Museum). These partner organizations provided guidance and early feedback to the Rideau Hall Foundation in terms of the E4I resource development, and some of the partners, such as the Perimeter Institute and Junior Achievement Canada, invited members of the research team to participate in extra meetings and events.

Inservice teachers

Associate teachers, other practicing classroom teachers, home-school teachers and, in one case, an entire school community, implemented and provided specific feedback on the Innovation Curriculum Units draft developed by TCs. The feedback was collected informally, and also through an online questionnaire, and provided direction for the ongoing revisions of *Education for Innovation* (E4I) resources. Additionally, a number of these participants also agreed to complete a second questionnaire in which they shared their perspectives on the

curriculum development process. In the summer of 2017, a team of inservice teachers also worked on the development of the secondary school level resources and the revisions of the elementary school level resources, with input from TCs.

E4I Curriculum Resources

In 2018, a new *Canadian Innovation Space* (CIS) website (https://canadianinnovationspace.ca/) was designed by RHF, along with a new logo, to house various innovation resources and initiatives. Three generic education resources represented in Figure 1 (i.e., Early Learning/Kindergarten, Grades 1–8 and Grades 7–12) were made available in both official languages (English and French). Common to all the *Education for Innovation* resources were: (a) an inquiry of specific Canadian innovations and innovators from our history; (b) the presentation of the Innovation Cycle with its five components—Inquire, Ideate, Incubate, Implement, and the central or overall component of Impact; (c) student engagement with the innovation process and projects; and (d) sharing these innovation projects via an Innovation Celebration.

Figure 1

Final 2018 Versions of the Education for Innovation (E4I) Resource Covers

Although innovation as a concept has been variously defined in different countries and project initiatives (see, for example, Couros, 2015; Crossecombe, 2018; Gabriel, 2016; Kelly, 2016; and Perimeter Institute for Theoretical Physics, 2017), the E4I project opted for the following definition: "Innovation is the creation or improvement of a product (thing) or action (process) to make a positive impact." The Innovation Cycle, essential to the E4I innovation resources, evolved from sketches and notes on paper to a graphic using four colours to reflect the four key components and the central component of Impact (Figure 2). Figure 3 represents the partners' final version of the Innovation Cycle.

Figure 2

Early Graphic Design Treatment of the Innovation Cycle

INQUIRE
1. What is Innovation?
2. What is the impact of Innovations?
3. What is an Innovation Centre?
4. What are the qualities of Canadian Innovators?

IDEATE
5. What is an Innovation Cycle?
6. What is an Innovation Project?
7. How is an Innovation Idea developed?

INCUBATE
8. How is an Innovation tested and improved?

IMPLEMENT
9. How is an Innovation implemented?
10. What is an Innovation Celebration?

INNOVATION CYCLE

INQUIRE

IDEATE

INCUBATE

IMPLEMENT

IMPACT

Figure 3

Final Graphic Design of the Innovation Cycle Model

INQUIRE
Inspiration
Imagination
Investigation

IMPLEMENT
Intellectual property
Investments
Incorporation

IMPACT

IDEATE
Initiative
Interactions
Integrations

INCUBATE
Impediments
Improvements
Iterations
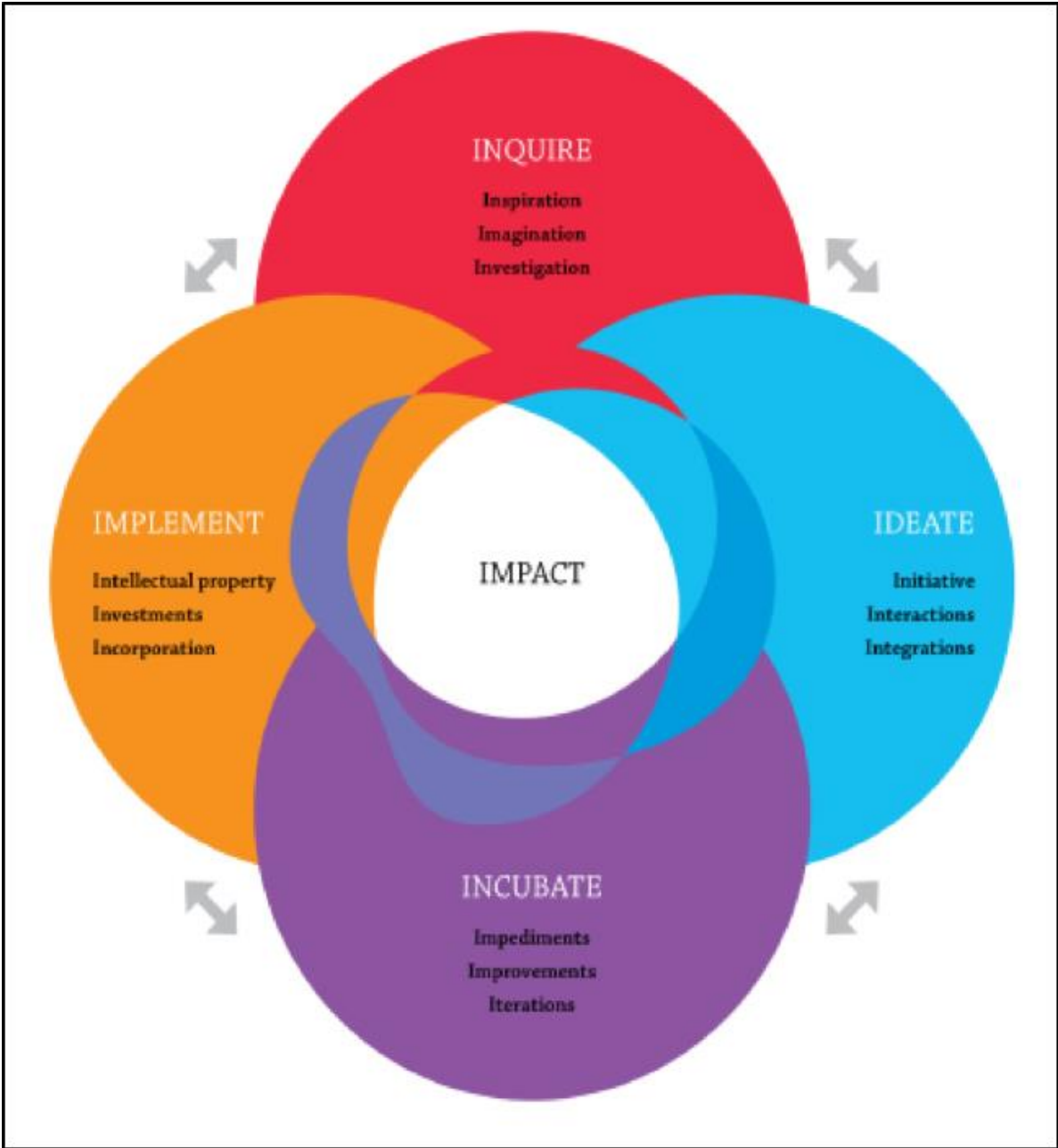
Literature Review

A review of the literature related to curriculum development yielded a range of studies that explored the collaborative design process from various stakeholder groups, including TCs and inservice teachers. The curriculum development process has been studied extensively, yet there are few findings related to the inclusion of TCs and, especially, the inclusion of TCs in the development of innovation education resources. The following studies provide an overview of the relevant findings in the literature, while highlighting some of its gaps.

Curriculum Development/Design

Designing and revising educational experiences for students is often referred to as curriculum development. Effective curriculum development requires supportive educational philosophies (Buell Hart, 1986; Lillevang et al., 2009; McFadden, & Roehrig, 2017; Robertson, 2007; Rosy, 2015) and knowledgeable and supportive leadership (Bordage & Harris, 2011; Bryman, 2007; Hurlimann et al., 2013). In Myers and Schenkman's (2017) study, leadership was found to have an impact on positive group dynamics. Other factors related to a curriculum development success, as identified by Myers and Schenkman (2017), were the development of strong partnerships and collaboration throughout its process.

Carse (2015) reported that teachers' engagement with professional development was a contributing factor to their efforts and agency in facilitating and activating curriculum change. To foster ownership and to counter teachers' resistance, the latter were included in the curriculum development process, which moved away from a top-down approach (Bakah et al., 2012; Fullan & Hargreaves, 1992). McFadden and Roehrig (2017) suggest that leaders in curriculum design must ensure the involvement of teachers who are able to commit to developing curricular resources that will be used by other teachers, adding that this should be considered "a responsibility not to be taken lightly" (p. 20). In her Theory of Generative Change,

Ball (2009) maintains that teachers appreciate professional development when it is part of the change that they value and desire to see happen in their classrooms.

Teachers, as curriculum designers, need to learn alternative skills beyond the brainstorming stage of development to understand the broader goals and context (Davis et al., 2015; Dorst, 2011; Jardine et al., 2006; McFadden & Roehrig, 2017). A significant and consistent inhibitor to curriculum development process is the lack of adequate *time* (Bhat et al., 2017; Hurlimann, et al., 2013)—the time it takes to research, develop, review, and revise the curriculum resources. In reviewing the literature, budget was also a factor that either facilitated curriculum development (Bhat et al., 2017; Buell Hart, 1986) when sufficient, or hindered it when inadequate (Mok, 2005). According to Myers and Schenkman (2017), implementation is critical to the ultimate success of a curriculum development program.

Collaborative Curriculum Design

Collaborative Curriculum Design is defined as "one way in which a professional learning community of educators can interact with other professionals, such as science content experts, to utilize their diversity of knowledge, beliefs and experiences to accomplish a common goal" (Tammen et al., 2018, para. 5). Sidebotham et al., (2017) evaluated a participatory curriculum development framework to determine its applicability to promote engagement and ownership during the elaboration of a Bachelor of Midwifery curriculum at an Australian university. Using qualitative methods, they found that two main themes emerged in their work, namely, that it was "a transformative journey," and that it featured a positive "partnership in action." Their results confirmed that the participatory curriculum development process provides symbiotic benefits to participants, leading to individual and organizational growth and the perception of a shared curriculum.

Collaborative Curriculum Design with Inservice Teachers

According to Voogt et al. (2016), "collaborative design positively affects both professional development and the implementation of curriculum change, because teachers develop competencies and practice and develop ownership of the change" (p. 121). Voogt et al. (2016) conducted a meta-synthesis of 14 PhD studies that utilized some form of Collaborative Curriculum Design to examine its impact on teacher learning and curriculum change. Overall, their findings suggest that there were a number of positive and significant characteristics highlighted by these different doctoral studies. Specifically, they found that curriculum design teams advanced teachers' pedagogical content knowledge and skills, leading to stronger student outcomes and stakeholder appreciation (p. 121).

Huizinga et al., (2013) noted that "teachers encounter various problems while designing related to conditions set for the design process, and lack the knowledge and skills needed to enact collaborative design processes" (p. 33). In their study, six teachers and six facilitators offering support to these teachers reflected on an implemented curriculum design process, the problems they experienced, and the support offered. Their findings indicated three gaps in teachers' design expertise pertaining to three domains: curriculum design expertise, pedagogical content knowledge, and curricular consistency expertise. Further, they highlighted the importance to support teacher designers during the design process, and to enhance teachers' design expertise by offering tailored assistance to teachers (p. 33).

Collaborative Curriculum Design with Teacher Candidates

Although literature related to curriculum design *for* TCs is extensive, there are fewer studies reporting TCs' own engagement *with* curriculum design. Lambert and Biddulph (2015) describe curriculum making as "a sophisticated process that requires creative boundary work from teachers … to make a curriculum that is worthwhile, engaging and relevant" for students

(p. 216). In other words, teachers need to use their professional knowledge and understanding of the subject, students, and pedagogy to cultivate meaning making in the classroom. The foundation of curriculum making is a "progressive conception of subject knowledge" (p. 216). The authors propose that "curriculum making provides a framework that can deepen and strengthen the initial training … of teachers" (p. 210). To meet the ever-changing social, cultural, environmental, and economic influences on students, Lambert and Biddulph recommend that bachelor of education programs assist TCs in understanding that curriculum development has three interrelated components: student readiness (previous knowledge and experience), the nature of the subject, and understanding of pedagogy.

Curriculum theorists Jardine et al., (2006) propose the idea of a "*Curriculum of Abundance.*" Using the philosophical underpinnings of constructivism, Jardine et al. (2006) break from the structured, flat, static, and "ordinariness" of curriculum and teaching to a curriculum of abundance, which "requires thinking and experiencing that is substantive, material, bodily, earthly, located specific" (p. xxiv). "Abundance is a practice" (2006, p. 10) cannot be put into use in a pragmatic sense, as it is not a learning style or pedagogical tool; rather, curriculum in abundance is a mode of being. In developing their own units of study, TCs in our program were encouraged to tie historical innovation data (e.g., famous Canadian innovations) to contemporary developments and related socio-political issues, thus engaging in such forms of progressive, expanded content knowledge and aspects of an "abundant curriculum."

Hume and Berry (2013) studied the use of collaborative CoRe (Content Representation) design in schools with preservice chemistry teachers, along with their associate teachers (or teacher mentors), in an effort to enhance the practicum experience. The researchers found that some of the associate teachers were very curious about the process of CoRe design, and they

interpreted this as a strong indication of the associate teachers' openness to innovation in professional learning. They noted that,

> Planned and purposeful involvement of associate teachers with student teachers in collaborative inquiry could prompt and facilitate teacher change within the profession. Thus, there is promise in CoRe design for enriching the PCK of student teacher and experienced teacher alike, so strengthening the practicum experience for all concerned. (p. 2124)

Likewise, our E4I project involved large groups of TCs designing curriculum, which they then implemented themselves or by inservice teachers with students in multiple school contexts. The E4I project also brought together a team of university faculty members with a smaller group of TCs who were thoroughly involved in writing and revising the innovation curriculum. Faculty members were interested to see how their own perceptions of the curriculum design process might compare with the perceptions of other participants, especially those of TCs who participated in various stages of the development and implementation processes.

Innovation in Educational Research

Much has been written about innovating the curriculum (Ediger, 2019; Saravanan, 2012; Weipeng, 2018), classrooms (Avallone, 2020; Shulman, 2018), teaching (Davis, 2017; Walter, 2019), or education at large (Freeland Fisher, 2019; Hofman et al., 2013). These areas of focus usually refer to the adoption of certain educational or pedagogical reforms in hopes of updating or breathing new life into school curriculum. Much less, however, has been written that specifically focuses on the process of innovation itself as the basis of curriculum (Jarvis et al., 2020; Shavinina, 2013b). When it has been documented, it usually focuses exclusively on product design, such as described in Fixson's work (2009):

If innovation is understood as a process of inventing and commercializing new products and services, as a process that incorporates activities from multiple disciplines, and as a process that follows more heuristic than algorithmic rules, then perhaps this process can be taught in an interdisciplinary setting with a strong experiential emphasis, such as product design and development. In this paper, I compare and contrast 14 courses and three programmes in interdisciplinary product development at 16 leading US schools. (para. 1)

Shavinina (2013a), in her edited collection entitled *The Routledge International Handbook of Innovation Education*, makes the case that innovation education involves a wide range of educational interventions and social actions. She recommends for consideration 11 key elements, such as adopting ideas from gifted/talented children programs for all learners; a focus on the development of entrepreneurial giftedness, metacognitive abilities, managerial talent, and deadline management; and a familiarization with polymaths, applied wisdom and moral responsibility, and innovation science (p. 30).

While Shavinina's work is clearly envisioning a broader scope for innovation education at all levels of schooling and in the workplace, there are a few notable connections with our E4I project. For example, our Innovation curriculum encompasses the ideas of meta-cognition (innovator self-assessment) and innovation implementation (element #4); we emphasize an awareness of Canadian innovations and innovators (element #6); we include social innovations which habitually involve a shared moral impetus for action (element #7); and we present a specific method for group innovation creation, implementation, and celebration (element #10).

The *Education for Innovation* (E4I) project was therefore unique in several different ways, insofar as it represented a collaborative curriculum design initiative that: (a) involved a diverse group of TCs, inservice teachers, and university faculty; (b) focused on the actual

teaching and learning of the innovation process; and (c) expanded the definition and scope of innovation education not only to include entrepreneurial product design (e.g., snowmobile, Robertson screwdriver), but also social process innovations (e.g., Breakfast for Learning, Homeless Hub). The defining feature of the *Education for Innovation* development process for the present study was the inclusion of TCs as co-designers and co-pilots of the curriculum resources. This feature has not been examined extensively in previous research, thus, the present study addresses this gap in the literature.

Purpose of the Study

The purpose of this study was to describe and explore how faculty in a teacher education program engaged TCs in a collaborative curriculum design initiative with multiple stakeholders. More specifically, the research was guided by the following question: What are the perceived benefits and challenges to engaging TCs in the design and implementation of an external curriculum development initiative?

Methodology and Methods

A qualitative case study (Coles, 1993; Merriam, 2009; Stake, 2005) was used to develop a picture of an emerging culture within the E4I innovation project. The research was divided into two main components: curriculum development (the process) and the E4I resources (the products). For the purpose of this chapter, the focus of the discussion is on the curriculum development—or process—component of the E4I project.

Data collection

To explore the experiences of the participants and provide an in-depth analysis, multiple sources of data were used (Merriam, 2009; Stake, 2005). Participants completed an online questionnaire, which was developed using *Qualtrics* software for both the process and product studies. Approximately 140 practicing teachers, 8 school administrators, 320 TCs, and 7 teacher

educators were involved in the E4I curriculum design and review process, which lasted several years. From this larger group, 24 individuals (mostly TCs, with some homeschool and private school educators by invitation) responded to the Product Questionnaire. The subsequent Process Questionnaire invitation was sent out to those who were more involved in the overall E4I process, and this led to six individuals (five teacher educators and one TC/research assistant) consenting to participate. Qualitative data also included E4I resource artifacts (e.g., development of innovation cycle model, related graphics, and unit drafts), direct observation of curriculum design development meetings and TC unit presentations, interviews, and archival records. The main source of data for this chapter are the Product Survey Questionnaire responses and the observations of faculty members in working directly with TCs throughout the process.

Data analysis

Data were entered into *Atlas.ti* qualitative software for the purpose of inductive thematic analysis. The researchers analyzed the data which included the three streams of activity identified by Miles and Huberman (1994): data reduction (review data, develop codes, code data to summarize, sort and organize); data display (organize and compress data into matrix); and conclusion drawing/verification (make meaning of the data by noting patterns, interpretations, and triangulation of sources). Using data from the various sources, constant comparative analysis of data (Glaser & Strauss, 1967; Handsfield, 2006) was conducted to derive categories and themes. Subsequently, conclusions were drawn from results in various data displays, while verification involved triangulation of data from the multiple sources across all three sites. In accordance with our approved Research Ethics Board protocol, pseudonyms were used in cited quotations to protect the individual identity of all research participants.

Results and Discussion

Based on participant survey data, artifacts, documents, video interviews, and direct observations, researchers identified the perceived benefits and challenges related to the TCs' participation in an external curriculum development process. Future recommendations are discussed separately in the following sections.

Perceived Benefits

By taking part in the *Education for Innovation* (E4I) curriculum writing process, TCs were given the opportunity to design engaging learning experiences for students. TCs indicated that a number of benefits were characteristic of this approach to curriculum design, namely, an informed design process, an authentic audience, shared synergy, and a direct connection to teaching practice.

Informed Design Process

First, faculty were invited to develop educational resources to support the *Ingenious* book (Johnston & Jenkins, 2017). The participating faculty invited TCs in their classes to complete grade-, subject-, and topic-specific units that aligned with the *Ontario Curriculum* expectations and that were based on course learning outcomes. Initially, approximately 120 curriculum innovation units were developed across grades and subject areas by the TCs in courses taught by the Innovation Committee faculty members. The TCs focused their unit planning on a specific set of innovations in the *Ingenious* book for Grades K-12. The faculty team met to review the submitted units. One or two units for each grade were selected for further review and revision, and were then piloted with students and evaluated by teachers and TCs.

It was in the process of developing educational resources that TCs and faculty collaboratively contributed to iterative drafts of the Innovation Cycle. Units ranged widely in terms of selected topics, with each unit focusing on either one or more Canadian innovations as a

starting point for student learning (e.g., aviation related innovations, healthcare innovations, and winter/cold weather innovations). One TC team developed a unit specific to the *Ingenious* book's sub-categories as mentioned in its title (*How Canadian Innovators Made the World Smarter, Smaller, Kinder, Safer, Healthier, Wealthier, and Happier*) that could be used across subjects for Grades 1–8. Further, questions from the TCs emerged about how they could integrate the innovator's creative process in the learning experience. During the selection of the grade-specific units, discussion about the book category specific unit and the question regarding the innovator's process led to an exchange among the faculty and a TC present at the meeting, on how to enhance the units to reflect both the innovator's process and the qualities/attributes of innovators.

The initial draft of the Innovation Cycle was sketched on a chart paper showing the cycle in steps/stages/phases (terms yet to be developed). With input from TCs, the faculty team placed the impact component in the center intersecting or overlapping with each stage of the cycle. The faculty and TC team assigned colours to each of the phases of the cycle: Inquire (red for *Questioning*), Ideate (blue for *Blue Sky Thinking*), Incubate (yellow for *Testing, Adapting, Growing*), and Implement (green for *Go; Putting It into Action*). With the development of the Innovation Cycle, writing teams were organized in the summer of 2017, which included faculty, teachers, and TCs. Three generic educational resources (Early Learning/Kindergarten, Grades 1– 8, and Grades 7–12), each featuring the Innovation Cycle, were developed by these writing teams. During this time, TCs took the initiative to develop video resources, using Powtoon software, which further explained the innovation cycle. These videos were the catalyst for the videos that were later developed using a professional production company.

Two TCs, who were pivotal to the success of the *Education for Innovation* resources, had organized a class trip for the students in their practicum placements to the faculty of education campus. The class trip was focused on Communications Innovations and was an exciting "field

test" for the innovation units. Both TCs who were involved in this experience extolled the benefits of the immersion in all phases of curriculum development. Their reflections on their E4I participation follow:

> The opportunity to try out the innovation curriculum units with real students in Grades 3–4 was enlightening, as I was able to see how the activities engaged children and made them excited to learn about innovation. The video that I created to explain innovation made the concept come to life.

> We were thankful for the experience of developing learning activities in a communications innovation unit, resulting in many interesting ideas for new innovations. One group of children thought of a new kind of smartphone with removable parts, including camera pieces that are replaceable. The young students called this innovation a RELENS. We saw the results of our innovation units in action.

In alignment with Sidebotham et al., (2017), our collaborative curriculum development process could be described as "focused on partnership in action" (p. 9). To move away from the top-down approach, researchers highlighted the need for teachers to have ownership of the curriculum development process (Bakah et al., 2012; Fullan & Hargreaves, 1992). As suggested by Huizinga et al. (2014), teachers were engaged in, and supported at all stages, the E4I curriculum development process. Similarly, TCs were involved in the curriculum making process. We concur with Lambert and Biddulph (2015) that engaging TCs in participatory curriculum development can and does enhance their learning experience.

Authentic Audience

Second, TCs were highly motivated by the idea that the innovation curriculum was being created for an authentic audience, and that it would be potentially implemented by teachers in a variety of educational contexts. As one TC who participated in the E4I curriculum writing

project noted, "I like that I am creating this unit for a purpose and not just for an assignment mark." Another noted that the curriculum design process was perceived as "real work in the real world." In most instances, the grade-specific innovation units were completed as part of course assignments in the Bachelor of Education (BEd) program. However, those TCs agreeing to participate in the E4I project understood that their creative work would be among those units potentially selected for use in the further development of the E4I learning modules. One faculty instructor reflected:

> Working directly with TCs on the units provided me the opportunity to provide specific feedback and coach them through the curriculum development process. The TCs expressed their gratitude to be able to work so closely with faculty on a curriculum development. They also appreciated the task was not for a mark, but for a long-term purpose.

Beyond knowing that the innovation curriculum units would be used in classrooms, some TCs also participated in public events beyond the BEd regular programming. For example, several participants took part in a special day that was hosted on-campus and that included the attendance of one of the *Ingenious* book co-authors. Other special events included an Innovation celebration with The Right Honourable David Johnson, 28th Governor General of Canada in attendance, and several dedicated writing and reviewing sessions wherein the curriculum was further developed and revised. These special events provided an authentic audience for the work completed by the TCs and afforded the opportunity for feedback and celebration.

Shared Synergy

Third, the TCs' participation created a shared synergy (i.e., the interaction or cooperation of two or more organizations or individuals to produce a combined effect greater than the sum of their separate effects) in the E4I curriculum design process. The familiar saying, "the whole is

greater than its parts," reflects the role TCs had in the E4I project. Similar to Bhat et al. (2017) and Sidebotham et al. (2017), the collaboration created a synergy among participants and created better outcomes for curriculum development compared to a compartmentalized approach. The value that TCs added to the project was clearly demonstrated through their enthusiasm and their contributions to the E4I project. For example, in a video interview two TCs shared their thoughts about their involvement in the E4I resources. Jesse described the opportunity to develop a unit plan as "awesome … [and] we are really inspired to put these lessons together." (Personal communication, November 23, 2016). Similarly, Kendall shared that she was, "Really excited about getting the experience of creating a piece of work that contributes to the work of educating young Canadians." She went on to explain:

> We believe that every human is creative and every community is inventive. We wanted students to be able to create new ways of meeting, problem solving, and designing, and delivering what people need and want—demonstrating fresh ways of thinking and collaborating. Throughout our unit plan, we want students to learn and discover about the people who are just like them, harnessing curiosity and creativity to improve what they see around them with astounding impact. (Personal communication, November 23, 2016)

Pat, a TC who contributed throughout all stages of the resource development process, shared her commitment to the creation of a culture of innovation in the classroom:

> Through my experiences as a TC, I strongly believe that the *Education for Innovation* resources are an essential component to cultivating a culture of innovation in our schools. … As teachers, we need to provide students with innovative opportunities that foster learning and support their passions and interests. Through the *Education for Innovation* resources, I have seen first-hand how one idea for an innovation project can improve

students' confidence and skills, and also inspire them to take their learning beyond the classroom walls. (Personal Communication, September 2019)

In some participating schools, Innovation Celebration activities were planned for public sharing of the student work. Many of the participating TCs took part in such events. What follows are three comments from participating inservice teachers, each reflecting on the culminating event:

Teachers showcased an Innovation Celebration for the community in May of this year which highlighted some of the culminating tasks for the units and the graphic organizers from the E4I resource. Teachers worked in grade level teams and planned innovation culminating tasks over a 4–5 week period. Students had an opportunity to showcase seasonal innovations, space innovations, social innovations, and much more. A brochure was created for the community.

The Innovation Celebration took place throughout the school, including: the learning commons, gymnasium, hallways, and classrooms. Teachers, also, connected with secondary schools via Google Hangouts. We wanted the locations to reflect the best setting for students to share their work comfortably with staff and parents.

The students were proud of their own innovations and used researchers' weekly visits to the Learning Commons as another opportunity to showcase their work. Each student was represented and the school community had the chance to also see their innovation. Our final activity occurred at our Celebration of Learning at year end. Each student selected an item from our Canadian ABC collection and showed it to the parent community. At the end of the celebration, we had all 26 letters of the alphabet on the stage in the Learning Commons.

A very exciting result of the innovation project was receiving an authentic signed letter from the Office of the Governor General of Canada! Every participant in the *Education for Innovation* project received a letter of thanks in the mail from the Governor General which was treasured as an artifact for professional teaching portfolios. These different forms of Innovation Celebrations and acknowledgements allowed TCs, inservice teachers, students, administrators, and invited parents/guardians to all share in the results of shared synergy.

Direct Connection to Teaching Practice

Finally, TCs revealed that the E4I curriculum design process provided them with a direct connection to their teaching practice, because lessons and units were implemented within their practicum placements and related special events. For example, some TCs participated in a faculty of education innovation event with their practicum placement classes. Two TCs also organized an innovation-focused field trip with their STEM club students while on practicum placement. In participating in the E4I curriculum, TCs were also able to develop their own understanding of the language of innovation, which further supported them in their own lesson/unit preparations and planned learning experiences.

One inservice teacher highlighted the creativity aspect of the curriculum, noting, "I believe that allowing students to think creatively is key. A student might think, 'Someone just like me invented peanut butter. I could have thought of that! What could I invent?' Having a unit on innovation of Canadians in a Canadian school system will certainly get some students thinking outside of the box."

In one particular case, an entire volunteer school staff became involved in implementing the *Education for Innovation* (E4I) curriculum. Through the positive involvement of a dedicated school administration, ongoing faculty support, and teacher enthusiasm, this particular school

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provided an excellent example of how such an initiative could be implemented in a school-wide

context. As noted by the project leader, "Another benefit has been the opportunity to work with a

school … [which] has provided excellent feedback and input to the revisions, along with

testimonials that have been very useful." This school implementation experience has been

reported on in detail both in print (Cantalini-Williams et al., 2018) and via video documentation

(Rideau Hall Foundation, 2018).

As noted earlier, research literature on TCs' engagement with curriculum development is

limited. Lambert and Biddulph (2015) propose that "curriculum making provides a framework

that can deepen and strengthen the initial training … of teachers" (p. 210). As reflected in the

above teacher and TC comments, their participation in the E4I project has been highly engaging

for them, and has helped them to develop an enhanced understanding of the concept of

innovation, as well as the curriculum development process.

Perceived Challenges

A number of perceived challenges, or barriers, were also shared by the participants, or

were noted by the project planning team when reflecting on the *Education for Innovation* (E4I)

curriculum writing process: the lack of adequate time to complete complicated tasks; the lack of

full implementation across BEd courses; and the limited collaboration with the national

innovation partnerships that were established early on in the process.

Adequate Time

Consistent with the literature (Bhat et al., 2017; Hurlimann et al., 2013), the lack of

adequate *time* was an inhibitor to the developmental process. Throughout the various

developmental stages for the E4I project, time was made to include face-to-face meetings and

curriculum writing and revision sessions, as well as many virtual planning meetings that were

hosted throughout the years, as needed. Curriculum development is a time-consuming process

and TCs' time in the teacher education program is limited. Engaging TCs in a curriculum initiative from beginning to the end of the process can be challenging.

Faculty members were heavily invested in TC feedback and support throughout the collaborative curriculum development process. "During the summer, we worked together with a team of teachers, TCs, and faculty developing E4I resources. The opportunity to collaborate with different perspectives was enlightening and positive." Were such experiences to become required components of teacher education programs, then faculty investment of time and energy in these areas could become part of the actual courses offered and regular workload. We acknowledge that the large number of TCs, who were initially involved in the curriculum development process, dwindled with only about 10 TCs involved in the final stages of revisions and implementation. Time was a factor in limiting ongoing involvement by large groups of TCs who had conflicting priorities and responsibilities.

Lack of Full Implementation

Since different faculty members teach various sections of the same required courses, this can lead to an inconsistent implementation of any given initiative. Not all faculty members of the same faculty of education had a shared experience. Only faculty members who responded to the open call for participation in the project were more inclined to ask their TCs to develop innovation units for potential consideration in the E4I curriculum. What follows is a survey response from one of the faculty of education instructors describing the investment of time and energy that was committed to this curriculum writing process:

> I recruited three more TCs to develop grade-specific secondary unit plans related to Indigenous visual arts and music. I met with the five TCs frequently in their unit development. After the candidates developed their initial draft I continued to work with the candidates in the unit development. … These units went through multiple reviews and

drafts to ensure the content was appropriate and the unit was consistent. I was consistently involved in this process of review and revisions (e.g., most especially assessment, evaluation, consistency in the delivery of the lessons, and formatting).

Such an opportunity could be extended to all TCs, if it were to become a standard and required part of the 2-year program in Ontario. Collaborative curriculum design assignments would allow future teachers to experience the benefits of co-creating engaging curriculum, while seeing curriculum implemented on practicum and/or by other inservice teachers.

Developing Community Partners

The eight national community partners who were invited to send representatives to an original meeting in Ottawa were enthusiastic about the project. Each partner organization was selected due to their ongoing involvement in innovation-related activities in Canada. Travel from across the country is obviously an expensive undertaking. While local and national events involving these various partner groups were indeed planned throughout the years, it would have been beneficial to have continued meetings with partner representatives, even if just by virtual connection (e.g., Zoom). As one faculty member noted, "the greater the number of people at the table from differing perspectives, the more difficult it is to move things along. Also, it was not clear the role of the other organizations attending the meeting." Continued communication would have made this particular aspect of the project more fruitful and productive. Notwithstanding these reservations, more recent developments with another organizational partner, *Desire to Learn* (D2L), has taken the E4I initiative to a new level as they have worked with faculty and project organizers to develop a new suite of online, interactive learning experiences to further enhance the E4I modules. Hence, the development of community partners is a key factor in strengthening such curriculum writing processes, whether through project funding, collaborative curriculum design of resources, field trips, or presentations. TCs involved in curriculum

development projects with diverse community partners benefit from exposure to the mandates and roles of each of these groups in education.

Recommendations

Here are three recommendations that the researchers present for future consideration: allocation of increased time for collaborative curriculum design projects; action research project initiatives related to curriculum design; and future research and knowledge mobilization in this particular area.

Increased Time Focusing on Curriculum Design

We would highly recommend that an increased amount of time be allotted for collaborative curriculum design experiences, preferably including inservice teachers wherein curriculum could be created, implemented, and reviewed as a team effort. The advent of the 2-year Bachelor of Education program in Ontario, along with the structure of the 4-year Concurrent Education programs, allows for the kind of programming flexibility that could easily include initiatives such as action research and collaborative curriculum design.

Action Research Projects

Engaging TCs in action research to systematically reflect and explore personal and professional experiences in curriculum design, beyond a course assignment, has the potential to enhance their professional development. Described as an approach to provide TCs with an authentic assessment, action research allows TCs to act as professionals by determining and solving issues within their own classrooms (Clarke & Fournillier, 2012; Clayton & Meadows, 2013; Cochran-Smith et al., 2009). Researchers point to the important role action research plays in the preparation of TCs' professional development (Holter & Frabutt, 2012; Perrett, 2003). The cycle of inquiry allows TCs to connect theory learned during coursework on campus to their practical experiences during their field placements within classrooms, resulting in a meaningful

experience (Ulvik & Riese, 2016). Thus, we strongly recommend that teacher education programs consider having their TCs experience some form of action research project, within one or more required courses, to define the area of curriculum design that is important to address within their context (e.g., student interest in understanding the geo-political and mathematical issues surrounding a global pandemic spread may lead to the creation, implementation, and revision of a new unit of study).

Further Research and Knowledge Mobilization

Additional research in the area of collaborative curriculum design involving TCs, teachers, and university faculty members is encouraged. By further documenting and sharing results via publications (print/online) and presentations (onsite/virtual), projects such as *Education for Innovation* (E4I) can potentially become more popular. TCs can be involved not only in the development of curriculum, but they can also participate in ongoing revisions, implementation, and evaluation through research studies. TCs can be included as equal partners and designers of curriculum. They can assume the teacher-researcher role as they implement and assess curriculum that they have co-developed with faculty and inservice teachers.

In Summary

The *Education for Innovation* (E4I) curriculum project is an example of a national collaboration between teacher education programs, area school districts, and national partners to endorse a broader vision of how such an innovation curriculum may align with, and support pre-existing innovation-related initiatives across the country. Input gained from the face-to-face meetings with various stakeholder groups encouraged an enlarged awareness of contemporary innovation-related events, resources, and connections. Participating faculty and inservice teachers were grateful for the experience and immersion in a project with a tangible goal. TCs especially benefited from authentic experiences in visioning, developing, revising, and

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implementing curriculum resources. TCs were considered valuable assets in every stage of the design process and, conversely, they were excited to derive benefits from assignments related to real-life challenges. Ultimately, TCs themselves experienced the innovation cycle as they made a positive impact through inquiring, ideating, iterating, and implementing the Education for Innovation resources.

The multi-year innovation curriculum design and implementation process provided ample opportunity for the researchers to collect formal (surveys) and informal (observations) data on all aspects of the overall process. The perceived benefits outweighed the challenges and included: informed design process, authentic audience, shared synergy, and direct connection to teaching practice. The few challenges encountered were: an inadequate amount of time, a lack of full implementation and a difficulty to develop community partners. The list of related recommendations articulated a need for action research projects in teacher education courses to define curriculum focus areas, TCs' involvement in collaborative curriculum design, and increased emphasis on related research and knowledge mobilization. We would concur that diverse and purposeful forms of collaborative curriculum design hold much promise for teacher education programs.

References

Avallone, A. (2020). Nurturing creativity and innovation in the classroom. *Teaching Music, 27*(3), 40–45.

Bakah, M. A. B., Voogt, J. M., & Pieters, J. M. (2012). Advancing perspectives of sustainability and large-scale implementation of design teams in Ghana's polytechnics: Issues and opportunities. *International Journal of Educational Development, 32*(6), 787–796.

Ball, A. F. (2009). Toward a theory of generative change in culturally and linguistically complex classrooms. *American Educational Research Journal*, *46*(1), 45–72. https://doi.org/10.3102/0002831208323277

Bordage, G., & Harris, I. (2011). Making a difference in curriculum reform and decision-making processes. *Medical Education, 45*(1), 87–94.

Bryman, A. (2007). Effective leadership in higher education: A literature review. *Studies in Higher Education, 32*(6), 693–710.

Buell Hart, D. (1986, 10–12 July). Curricular decision making with an educological perspective: Theory into practice 'Educology 86'. In J. E. Christensen (Ed.), *Educology 86: Proceedings of a conference on educational research, inquiry and development with an educological perspective. Canberra, July 1–12, 1986* (pp. 101–111). Educology Research Associates.

Cantalini-Williams, M., Black, G., Jarvis, D., & Guibert, J. (2018, Fall). Leading-edge administrators using technology to promote innovation. *CAP Journal,* 21–23.

Carse, N. (2015). Primary teachers as physical education curriculum change agents. *European Physical Education Review, 21*(3), 309–324.

Clarke, P. A., & Fournillier, J. B. (2012). Action research, pedagogy, and activity theory: Tools facilitating two instructors' interpretations of the professional development of four

preservice teachers. *Teaching and Teacher Education: An International Journal of Research and Studies*, *28*(5), 649–660.

Clayton, C., & Meadows, G. (2013). Action research projects in pre-service teacher education. *Teacher Educators' Journal*, *20*, 5–18.

Cochran-Smith, M., Barnatt, J., Friedman, A., & Pine, G. (2009). Inquiry on inquiry: Practitioner research and student learning. *Action in Teacher Education, 31*(2), 17–32.

Davis, J. (2017). Innovative teaching strategies that improve student engagement. *Association for Middle Level Education.* https://www.amle.org/BrowsebyTopic/WhatsNew/WNDet/TabId/270/ArtMID/888/ArticleID/876/Innovative-Teaching-Strategies-that-Improve-Student-Engagement.aspx

Davis, B., Sumara, D., & Luce-Kapler, R. (2015). *Engaging minds: Cultures of education and practices of teaching* (3rd ed.). Routledge.

Ediger, M. (2019). Innovation in a technological age. *Reading Improvement, 56*(2), 67–69.

Fixson, S. K. (2009). Teaching innovation through interdisciplinary courses and programmes in product design and development: An analysis at 16 US schools. *Creativity and Innovation Management*. Wiley Online Library. https://doi.org/10.1111/j.1467-8691.2009.00523.x

Freeland Fisher, J. (2019, January). 5 big ideas for education innovation in 2019. *eSchool News*. https://www.eschoolnews.com/2019/01/28/5-big-ideas-for-education-innovation-in-2019/

Fullan, M., & Hargreaves, A. (Eds.). (1992). *Teacher development and educational change*. Falmer.

Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory: Strategies for qualitative research.* Aldine.

Handsfield, L. (2006). Being and becoming American: Triangulating habitus, field, and literacy instruction in a multilingual classroom. *Language & Literacy, 8*(2)*,* 1–26.

Hofman, R. H., de Boom, J., Meeuwisse, M., & Hofman, W. H. A. (2013). Educational innovation, quality, and effects: An exploration of innovations and their effects in secondary education. *Educational Policy, 27*(6), 843–866.

Holter, A. C., & Frabutt, J. M. (2012). *Action research in Catholic schools: A step-by-step guide for practitioners* (2nd ed.) Alliance for Catholic Education Press.

Huizinga, T., Handelzalts, A., Nieveen, N., & Voogt, J. M. (2013). Teacher involvement in curriculum design: Need for support to enhance teachers' design expertise. *Journal of Curriculum Studies, 46*(1), 33–57. https://doi.org/10.1080/00220272.2013.834077

Hume, A., & Berry, A. (2013). Enhancing the practicum experience for pre-service chemistry teachers through collaborative CoRe design with mentor teachers. *Research in Science Education, 43*, 2107–2136. https://doi.org/10.1007/s11165-012-9346-6

Hurlimann, A., March, A. & Robins, J. (2013). University curriculum development-stuck in a process of how to break free. *Journal of Higher Education Policy and Management, 35*(6), 639–651.

Jardine, D. W., Friesen, S., & Clifford, P. (2006). *Curriculum in abundance*. Lawrence Erlbaum Associates.

Jarvis, D. H., Black, G. L., & Cantalini-Williams, M. T. (2020, Spring). Education for Innovation (E4I): Exploring the developmental process of a Canadian curriculum resource. *Alberta Journal of Educational Research, 66*(1), 72–99. https://journalhosting.ucalgary.ca/index.php/ajer

Jarvis, D. H., Cantalini-Williams, M. T., & Black, G. L. (2018, May). *Education for Innovation (E4I): A national initiative promoting innovation in Canadian schools*. Athens Institute for Education and Research Conference Paper Series.

Johnston, D., & Jenkins, T. (2017). *Ingenious: How Canadian innovators made the world smarter, smaller, kinder, safer, healthier, wealthier, and happier.* McClelland & Stewart.

Johnston, D., & Jenkins, T. (2017). *Innovation nation: How Canadian innovators made the world smarter, smaller, kinder, safer, healthier, wealthier, and happier.* McClelland & Stewart.

Lambert, D., & Biddulph, M. (2015). The dialogic space offered by curriculum-making in the process of learning to teach, and the creation of a progressive knowledge-led curriculum. *Asia-Pacific Journal of Teacher Education, 43*(3), 210–224.

Leathwood, C., & Phillips, D. (2000). Developing curriculum evaluation research in higher education: Process, politics and practicalities. *Higher Education, 40*(3), 313–330.

Lillevang, G., Bugge, L., Beck, H., Joose-Rethans, J., & Ringsted, C. (2009). Evaluation of a national process of reforming curricula in postgraduate medical education. *Medical Teacher, 31*(6), 260–266.

McFadden, J. R., & Roehrig, G. H. (2017). Exploring teacher design team endeavors while creating an elementary-focused STEM-integrated curriculum. *International Journal of STEM Education, 4*(21). https://doi.org/10.1186/s40594-017-0084-1

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation* (2nd ed.). Jossey-Bass.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). SAGE Publications.

Myers, K., & Schenkman, M. (2017). Utilizing a curriculum development process to design and implement a new integrated clinical education experience. *Journal of Physical Therapy Education, 31*(3), 71–82.

Perrett, G. (2003). Teacher development through action research: A case study in focused action research. *Australian Journal of Teacher Education, 27*(2), 1–10.

Rideau Hall Foundation. (2018). *Education for innovation.* [Video] https://canadianinnovationspace.ca/resources/education-for-innovation/

Robertson, J. (2007). Beyond the 'research/teaching nexus': Exploring the complexity of academic experience. *Studies in Higher Education, 32*(5), 541–556.

Rosy, M. M. (2015). Research in curriculum development. *Asian Journal of Nursing Education and Research, 5*(3), 431–436. https://doi.org/10.5958/2349-2996.2015.00086.5

Saravanan, V. (2012). Curriculum design, development, innovation and change. *Procedia: Social and Behavioral Sciences, 47*, 1276–1280. https://doi.org/10.1016/j.sbspro.2012.06.811

Shavinina, L. V. (2013a). The fundamentals of innovation education. In L. V. Shavinina (Ed.), *The Routledge international handbook of innovation education* (pp. 29–51). London, UK: Routledge. https://doi.org/10.4324/9780203387146

Shavinina, L. V. (Ed.). (2013b). *The Routledge international handbook of innovation education*. London, UK: Routledge. https://doi.org/10.4324/9780203387146

Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57*(1), 1–22.

Shulman, R. D. (2018). 10 ways educators can make classrooms more innovative. *Forbes*. https://www.forbes.com/sites/robynshulman/2018/11/19/10-ways-educators-can-make-classrooms-more-innovative/#75340b157f87

Sidebotham, M., Walters, C., Chipperfield, J., & Gamble, J. (2017). Midwifery participatory curriculum development: Transformation through active partnership. *Nurse Education in Practice, 25*, 5–13.

Stake, R. E. (2005). *Qualitative case studies*. In N. K. Denzin & Y. S. Lincoln (Eds.), The Sage handbook of qualitative research (pp. 443–466). SAGE Publications.

Tammen, S., Faux, R., Meiri, K., & Jacque, B. (2018). Collaborative curriculum design as a framework for designing teacher professional development that produces the content knowledge for teaching the life sciences. *Journal of STEM Outreach, 1*(1). https://doi.org/10.15695/jstem/v1i1.2

Ulvik, M., & Riese, H. (2016). Action research in pre-service teacher education: A never-ending story promoting professional development, *Professional Development in Education*, *42*(3), 441–457.

Voogt, J. M., Pieters, J. M., & Handelzalts, A. (2016). Teacher collaboration in curriculum design teams: Effects, mechanisms, and conditions. *Educational Research and Evaluation, 22*(3-4), 121–140. https://doi.org/10.1080/13803611.2016.1247725

Walter, P. (2019). Innovations in teaching adult education: Living history museums and transformative learning in the university classroom. *Adult Learning, 30*(3), 121–127.

Weipeng, Y. (2018). A school-based fusion of East and West: A case study of modern curriculum innovations in a Chinese kindergarten. *Journal of Curriculum Studies, 50*(1), 17–37.

Genuine Collaboration and Partnership:
Creating a University- and Board-led PLC for Instructional Design

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Abstract

For the past three years, the University of Calgary's Werklund School of Education and Rocky View School Division (RVS) have worked alongside one another to design a Professional Learning Community (PLC) for preservice teachers to develop their skills as designers in authentic professional and classroom settings. This paper examines this ongoing collaboration, drawing on the perspectives of university faculty and staff, on the one hand, and the school division learning leaders and a senior executive, on the other. Through our collaborative self-study, we examine the problems and possibilities of this work, as well as its implications for our practice. Specifically, we ask: What is the experience of university and board stakeholders in designing, leading, and participating in a PLC for instructional design? How can stakeholders create a program that reflects the complexity and creativity of teaching and learning? This work will be of interest to teacher educators across Canada working in university and school contexts to enhance student learning.

Résumé

La Werklund School of Education de l'Université de Calgary et le Conseil scolaire Rockyview (Rocky View School Division ou RVS) ont travaillé de concert au cours des trois dernières années pour la mise sur pied d'une communauté professionnelle d'apprentissage (CaP). Cette initiative a pour but de développer les compétences professionnelles des futurs enseignants et d'autres acteurs clés dans un environnement scolaire véritablement professionnel. Le présent chapitre fait l'examen de cette collaboration, s'appuyant sur les observations de professeurs et du personnel de l'université d'une part, et des leaders de l'apprentissage et d'un cadre supérieur du conseil scolaire, de l'autre. Grâce à une auto-évaluation collaborative, nous nous penchons sur les défis et les possibilités d'une telle approche, et ses incidences sur la pratique. Nous cherchons particulièrement à comprendre : (a) l'expérience des intervenants universitaires et du conseil d'administration dans la conception, la direction et la participation à une PLC investie dans la conception pédagogique; (b) de quelle façon les intervenants peuvent créer un programme reflétant la complexité et la créativité de l'enseignement et de l'apprentissage. Cette étude suscitera l'intérêt des formateurs d'enseignants à travers le Canada, tant dans le cadre universitaire que scolaire, et dont l'objectif est d'enrichir l'expérience pédagogique des élèves.

Introduction

Canadian teacher education programs are called on to equip beginning teachers with the knowledge, skills, and dispositions to transform student learning in their classrooms (ACDE, 2017). The Council of Ministers of Education Canada (CMEC, 2019), for example, articulates a "pan-Canadian effort to prepare students for a complex and unpredictable future," emphasizing the need for deep learning, adaptability, and innovation in Canada's classrooms (para. 1). In Alberta, provincial curricula seek to develop students' abilities to inquire, collaborate, solve problems, communicate ideas, and make informed decisions (Alberta Education, 2006). To foster these skills, preservice teachers in our Bachelor of Education program participate in a mandatory final-semester course on design-based thinking, where they take on the role of "teacher as designer," exploring how to "draw on their creative and imaginative capacities to develop viable solutions … to context-specific challenges and issues in education" (Werklund School of Education, WSE, 2019, p. 1). In the context of these local and national objectives, we began to wonder: How could we make this work authentic for beginning teachers? What would happen if the University of Calgary's Werklund School of Education and Rocky View School Division (RVS) collaborated to enrich the practice of teachers and focus on designing student learning?

The Werklund School of Education and RVS, both located in Southern Alberta, have a history of collaboration, including university-board research partnerships and practicum opportunities for preservice teachers (who often move on to become inservice teachers with the board). Yet, we recognized that we could be doing more to develop our in- and preservice teachers as designers of learning. As Willms et al. (2009) note, beginning teachers improve such skills when they have the opportunity to practice and revise their work alongside their peers. Further, Barron and Darling-Hammond (2008) identify that students "learn more deeply and

perform better on complex tasks if they have the opportunity to engage in more authentic learning" (p. 3). In other words, to better prepare our students as teachers, we needed to create an authentic, professional, and collaborative learning space where Werklund preservice teachers and RVS inservice teachers could work together in a meaningful way. Such an approach must be rooted in student learning. As Timperley (2015) argues, effective professional learning engages teachers "in cycles of inquiry that [ask] them to identify what students [need] to know and do to meet curricular and other goals valued by the communities in which students live and are educated" (p. 797).

Thus, for the past three years the Werklund School of Education and RVS have collaborated to design a Professional Learning Community (PLC) for preservice teachers to develop their skills as designers in authentic professional and classroom settings. This chapter, which is part of a broader study, describes this ongoing collaboration, drawing on the perspectives of university faculty and staff, as well as learning leaders and a senior executive in the school division. This work will be of interest to teacher educators across Canada working in university and school contexts to enhance student learning.

Literature Review

As a PLC for instructional design, our partnership has been rooted in work examining professional learning for preservice and inservice teachers, as well as human-centered approaches to design and student learning. A central goal of this project was to create an authentic professional learning opportunity for preservice and inservice teachers. As Timperley (2015) contends, this requires an explicit focus on professional *learning*, rather than professional *development*. Specifically, "professional learning implies an internal process in which individuals create professional knowledge through interaction with this information in a way that challenges previous assumptions and creates new meanings" (Timperley, 2015, p. 797). That is,

in order to move beyond the realm of professional development and into a context of professional learning, participating teachers must do more than attend a series of workshops. They must have specific opportunities to challenge their assumptions about teaching and create new meanings about student engagement, learning, and wellbeing. As Oddone et al. (2019) note, "the increasing complexity of professional practice calls for sophisticated, ongoing professional learning," so that teachers are prepared to "meet the needs of students and expectations of external stakeholders" (p. 103). This sophistication must necessarily include how such opportunities are designed, and how designers account for changes in teachers' learning needs over time (Keay et al., 2019). Board and university stakeholders must consider: If professional learning extends beyond a series of discrete events, how are teachers challenged to learn and grow, or to take up this work with their students in new ways? Kennedy (2014) contends that such opportunities are only truly professional learning if teachers develop agency to enact that learning. She notes, "[the learning] must be enacted in some way to make a positive change to practice" (p. 693). Put another way, teachers must be able to see the effects of the learning they are doing in their classroom and with their students (Timperley, 2015).

One approach to this kind of professional learning is the PLC. Stoll (2011) describes PLCs as "an inclusive and mutually supportive group of people with a collaborative, reflective, and growth-oriented approach towards investigating and learning more about their practice in order to improve pupils' learning" (p. 104). PLCs are characterized by reflective practice, collaborative approaches, assessment for learning throughout the process, and interdependence between members of the PLC (Kelly, 2013; Mitchell & Sackney, 2009). Importantly, the learning that takes place in a PLC moves beyond individual teachers' learning to include "a collaborative community context—collective learning in a community of practice" (Stoll, 2011, p. 104). PLC members work together and learn from one another to create a group of educators

developing their practice together. For Timperley (2015), such learning must focus on student outcomes. PLC teachers ask, for example, "How have we contributed to existing student outcomes? … What do we already know that we can use to promote better outcomes? What do we need to learn and do to promote better outcomes?" (Timperley, 2015, p. 799). Asking these questions within the context of a PLC enables participating teachers to focus their professional learning on their enacted practice (Stoll, 2011). Further, by examining common problems of practice, PLC participants are able to share vulnerabilities and uncertainties with trusted colleagues (Kelly, 2013). This reinforces the notions of interdependence and agency: "When all members of the PLC are showing vulnerability and supporting one another, no hierarchy is evident. Each member is equal to the other members, allowing the inter-weaving of dependence to flow through the group unhindered by proficiency and power" (Kelly, 2013, p. 864). Put simply, effective PLCs create spaces for teachers to engage in deep professional learning with one another.

The focus of this particular PLC is on instructional design through design-based thinking. Within the context of RVS, instructional design "incorporates the evidence-based practices of Understanding by Design® … and is used to structure authentic inquiry-based studies or project-based learning experiences" (RVS, 2020c, para. 1). In our context, Alberta teachers are challenged to design learning experiences that develop their students as engaged thinkers (Government of Alberta, 2013). As Wiggins and McTighe (2005) describe in their seminal text, "teachers are designers. An essential act of our profession is the crafting of curriculum and learning experiences to meet specified purposes" (p. 13). Wiggins and McTighe continue by contending that good design "is not so much about gaining a few new technical skills as it is about learning to be more thoughtful and specific about our purposes and what they imply" (2005, p. 14). That is, as with professional learning, effective instructional design

intentionally considers what students need to know and do, and how teachers will work to support that learning (Timperley, 2015).

Design-based thinking takes up these notions of intentional instructional design by starting "from a user-centered approach of gaining empathy and of designing a product that meets a need" (Quinn et al., 2018, p. 7). Drawing on business and educational contexts, this approach enables teachers and students to reframe how they see the world and examine problems real people face in real situations (IDEO, 2020). In particular, designers are challenged to ask questions and build empathy to better understand stakeholders' needs (Kolko, 2015). In an educational context, having a better understanding of teacher and student needs provides a framework for responding to the complex challenges arising in our classrooms (Christensen et al., 2016). The approach is also explicitly human-centered, allowing designers to conceptualize, implement, and iterate their solutions based on their users' problems, needs, and preferences (Brown, 2008; Friesen & Jacobsen, 2015). Such approaches to instructional design necessarily align with approaches to professional learning. As Timperley (2015) describes, rich professional learning is "an active process of systematic inquiry" focused on understanding and responding to specific student needs (p. 798). These concepts are central to our theoretical perspective, which we describe in the following section.

Theoretical Perspective

This chapter draws on the perspective that, as Willms and colleagues (2009) describe, "effective teaching practice begins with thoughtful, intentional designs for learning—designs that deepen understanding and open the disciplines to genuine inquiry" (p. 33). To solve complex human problems, teachers and learners must engage in intentional, human-centered work that richly engages students with issues they face in their world (Barron & Darling-Hammond, 2008; Brown, 2008; Willms et al., 2009). This perspective aligns with the RVS instructional design

framework (RVS, 2020c), which calls on teachers to engage students in authentic tasks, scaffold student learning, and make learning visible. The RVS instructional design framework is further informed by Understanding by Design® (McTighe & Wiggins, 2012). Perhaps most importantly, this framework "reflects a continual improvement approach to student achievement and teacher craft. The results of our designs—student performance—inform adjustments in curriculum as well as instruction so that student learning is maximized" (McTighe & Wiggins, 2012, p. 2). Importantly, approaching design as a task of continual improvement happens at two levels. First, as teacher educators, we design learning for preservice and inservice teachers. As Timperley (2011) contends, we cannot leave teachers to do this work on their own, or rely on didactic methods to tell teachers what they ought to do with their students. Instead, we must engage in a cycle of professional inquiry to understand what preservice and inservice teachers need, and how we can engage them in authentic learning opportunities to address those needs. Only then can teachers incorporate design processes into their own teaching (Timperley, 2011). In this way, our project features two concentric circles of designing, assessing, and questioning. We (Werklund and RVS) design professional learning for our in- and preservice teachers. They, in turn, design learning for the students in their classroom. Both levels reflect Timperley's (2015) contention that "student learners must be the touchstone" (p. 798) for teachers and other stakeholders involved in PLCs.

As a PLC, this work is also explicitly collaborative. Barron and Darling-Hammond (2008) observe that "teachers need time—and a community—to support their capacity to organize sustained project work" (p. 12). To that end, preservice teachers participating in the PLC work with one another, their partner teachers, the school board, and the university to guide our conversations and introduce new iterations into the experience. This also provides teachers with the know-how and the know-why of doing design-based work with their students and as

part of their professional learning (Friesen & Jacobsen, 2015). As they see growth in their students' achievement, teachers become increasingly motivated in the work of their PLC (Timperley, 2011). Because of the collaborative nature of this undertaking, we believe this is best achieved if universities "expand the innovation ecosystem" (Brown, 2008, p. 8)—working in partnership with school divisions and preservice teachers to co-create opportunities and engage both preservice and inservice teachers in substantive conversations about the work of instructional design (Brown et al., 2013).

Methodology

This chapter is part of a broader study examining an instructional design PLC we have run for our preservice teachers over the past three years. The purpose of this chapter is to examine the authors' experiences collaborating in this work. Specifically, we ask: What is the experience of university and board stakeholders in designing, leading, and participating in a PLC for instructional design? How can stakeholders create a program that reflects the complexity and creativity of teaching and learning? In this chapter, we examine these questions through the lens of collaborative self-study (Bragg & Lang, 2018; Hamilton & Pinnegar, 2013). As Bullough and Pinnegar (2001) contend, "if researchers in colleges of education are to study the development of teachers, they should publicly declare their own role in that development" (p. 14). Self-study research enables teacher educators to scrutinize their knowledge "as it is understood and lived within the immediate context of practice and within the wider educational, organizational, and structural contexts of their work" (Berry & Forgasz, 2018, p. 237). We particularly draw on Samaras' (2010) foci of self-study, which call for personally situated inquiry, critical collaboration in that inquiry, a goal to improved learning, transparent and systematic research processes, and the generation and presentation of knowledge.

As Bullough and Pinnegar (2001) elaborate, "self-studies in teacher education are about the problems and issues that make someone an educator," and each researcher "has an ineluctable obligation to seek to improve the learning situation not only for the self but for the other" (p. 17). The issues that we discuss in this chapter are central to our work as teacher educators. Shirley, one of the authors of this paper, describes the purpose of this PLC as a way to engage preservice teachers in real work, with real students, in real classrooms. As teacher educators doing this work, our challenges are also real and affect both our preservice teachers' success and the success of the students they work with. This chapter therefore serves as a space to examine "our own reflections and conversations before, during, and after the project, [to] understand more deeply the complexities of teacher education" (Kitchen & Stevens, 2003, p. 2).

Each member of the research team also brings their own perspective to this work. Reflecting O'Dwyer et al., (2019), our collaborative self-study has allowed us to serve as critical friends for one another, mitigating risks of being "overly individualistic and introspective" (p. 140; see also Bambino, 2002). Michael Holden is the Werklund School of Education's Youth Leadership Facilitator and served as students' main administrative contact each year. Shirley Pepper is a Sessional Instructor and has been a leading voice in designing and revising the PLC. Amy Burns is the Associate Dean of Undergraduate Programs in Education, and in this capacity serves as an advisor and advocate for experiential learning and school-university partnerships. Dave Morris is the Associate Superintendent of Learning with Rocky View School Division, and is the leader of the board's Learning Design Team. Adam Turner and Sara Martin are RVS teachers and Learning Design Specialists who ran the PLC sessions in 2019–2020. Jason Ness is an RVS teacher and former Learning Design Specialist who helped to initiate the project and who ran the PLC sessions in 2017–2019. We recognize that our learning, while localized, is relevant in other contexts: Werklund and RVS are not the only school-university partners in

Canada, nor the only professional learning opportunity for preservice teachers. Enhancing our specific approach to this school-university PLC may support similar initiatives being taken up elsewhere.

Data from this chapter are drawn from cycles of research and design conversations we have held since March 2017. These conversations include full meetings of our team, smaller group meetings, email exchanges, as well as minutes and transcription notes, taken up in cycles of critical reflection (see O'Dwyer et al., 2019) where subsequent conversations were informed by, and took a critical lens to, previous dialogues. Group compositions in each conversation varied, but in most cases included team members from both the university and school division. These conversations served to "encourage and solicit respective questioning and divergent views" so that we could better understand one another's perspectives and "work to help validate the quality and legitimacy of each other's claims" (Samaras, 2010, pp. 10–11). This validation process was twofold. First, these conversations served as touchpoints to ensure that the partnership was meeting university and school board needs, the needs of our preservice teachers, and the needs of students in classrooms. As Jason described, we wanted to make sure we "walked the walk" as we designed this professional learning (see Willms et al., 2009). Second, from a research standpoint, these conversations examined our ongoing process from multiple, critically reflective perspectives (Bragg & Lang, 2018). In particular, we explicitly asked ourselves what our experience in engaging in this work had been, and what elements had been essential to our collaboration and learning as teacher educators. Throughout this self-study process, we have learnt on our diverging and converging perspectives, and we have done so through "genuine rather than contrived" processes of examining where we are, where we have been, and where we are going (Bragg & Lang, 2018, p. 81).

The remainder of this chapter documents our context, processes, challenges, and learning experience. We begin the following section with a description of how the PLC started, and the basic structure we have employed with three cohorts of preservice and inservice teachers. Then, we examine our respective goals for the collaboration, how we implemented those goals, and how we have iterated our work to reflect feedback from each other and the participating teachers. We conclude by considering where we go from here, and how universities and school divisions might take up this work in other contexts.

The Context of our Professional Learning Community

As we described at the beginning of the chapter, this PLC exists within a context that calls on teachers to design rich, authentic learning experiences for their students. Alberta's Ministerial Order on Student Learning (Government of Alberta, 2013), for example, states that "education in Alberta will be shaped by a greater emphasis on education than on the school … on inquiry, discovery and the application of knowledge," where students are seen as engaged thinkers who know "how to think critically and creatively and make discoveries through inquiry, reflection, exploration, [and] experimentation" (p. 1). These expectations align with IDEO's (2020) notion of a designer's mindset, where students and teachers are encouraged to "embrace empathy, optimism, iteration, creativity, and ambiguity" (para. 10). While all preservice teachers at the Werklund School of Education participate in a mandatory final-semester course on design-based thinking, we recognize that taking a course in design does not necessarily give new teachers everything they need to succeed. Indeed, as Timperley (2015) notes, the most impactful opportunities are often the ones that allow teachers to "solve puzzling teaching and learning problems related to individuals or groups of learners in the teachers' classes" (p. 799). In other words, we saw a need to support our teachers' ability to take these mindsets and apply them in specific, real-world contexts as part of their teaching practice.

Our collaboration began with a conversation between Shirley and Jason in March 2017. Shirley had just taken on the role of Course Coordinator for the university's Professional Development and Lifelong Learning course, which focuses on introducing preservice teachers to "an iterative, knowledge-building cycle that considers how student need informs teacher professional learning, builds teacher knowledge and skill, and improves student outcomes" (WSE, 2020a, p. 1). Shirley reflected that she wanted to make the course as authentic as possible, and so asked to meet with Jason, who at the time was serving as a Learning Specialist with RVS, to generate ideas. Their conversation evolved to ask: How do we make this work truly authentic—not just in our university courses or in our board Professional Development sessions, but in working together across those spaces? What would happen if we brought preservice and inservice teachers together, helped them have an experience as real teachers, and go deeper in how we design learning in these spaces? This conversation sparked what has now become our PLC for instructional design. As Jason later commented in an email to the Associate Dean,

> Hopefully it goes without saying that providing preservice teachers an opportunity to interact with, and get feedback from, more practicing teachers is of value. We see the value for our practicing teachers in having [this] opportunity …; for many of our cohort teachers, our framework will be as new for them as it will be for the university students.

Reviewing her emails from these early stages, Shirley noted recurring concepts: "an opportunity for preservice teachers to learn and collaborate"; "authentic and relevant, as well as building capacity." For both the university and the board, collaborating together represented an opportunity to learn alongside one another. These initial conversations, and those that followed, form the basis of the framework for our collaborative research.

Since April 2017, we have organized three PLCs for preservice and inservice teachers as part of this project. While each PLC iterates to reflect lessons learned from the previous year, several features remain consistent:

- Preservice teachers apply for this opportunity before participating in the PLC for the length of their final year in the program. A description of the 2020–2021 PLC can be viewed [on the University of Calgary website](#) (WSE, 2020b). The application includes three criteria: Do preservice teachers articulate an interest in this teaching approach; Have they successfully completed their other practica; Are we able to find a partner teacher to match them with?

- Participating preservice teachers are matched with a partner teacher from RVS who has interest or experience in student-centered design. These matches are done in collaboration with RVS Learning Design Specialists, individual schools, and the university's practicum team.

- Once matched, preservice and inservice teachers attend a variety of workshops and sessions together, learning alongside one another and alongside the university and board teams. These workshops include an orientation to the PLC, an examination of design-thinking as an approach to teaching, an experience of what design looks like in the RVS context, and opportunities to design learning for their classroom students. [Examples](#) of the 2019–2020 workshops are available [on the RVS website](#) (RVS, 2019a; 2020a). We describe these sessions in further detail later in this chapter.

- Preservice teachers complete two of their practicum experiences—14 weeks in total—with their partner teacher as part of their formal program requirements. While PLC participants are evaluated according to the same criteria as all preservice teachers in the

program, this focused placement gives participants a specific context for the learning they design.

- Preservice teachers reflect on their experiences throughout their time in the PLC. Reflections include regular conversations with their partner teachers, structured discussions during PLC workshops, as well as a formal debrief with RVS and university stakeholders at the end of their final practicum placement.

- Participants make their students' learning visible. The medium for this learning is flexible and has included community initiatives, school-based events, as well as presentations at local and regional teaching conferences (see Chapin et al., 2019; Yuen et al., 2020). An example of one participant's work is publicly available on Youtube (RVS, 2019b).

Understanding our Experience as Collaborators for Learning

As we began examining our journey together, Shirley offered a central observation: "At no time did I feel someone blocking me. Not from Amy, not from Jason. I felt invited in. I felt, 'How do we make this possible? How can we support you?' At no point did anyone say, 'Well that's a good idea, but …'." Mike found this openness especially important. Creating this PLC each year requires buy-in from across our communities: The undergraduate program must account for a more complex practicum placement process; the university must allocate instructor and support staff time to facilitate the PLC; preservice teachers, inservice teachers, and learning designers must agree to take up this work; and the board must pay for teacher release time so that PLC partner teachers can attend professional learning sessions that also benefit teachers not yet employed by the board. For Mike, this reflects a goal we have articulated to all three cohorts: Everyone involved in the work must feel that they are in this together, that we are really trying to solve problems and advance pedagogy.

For Adam and Sara at the board, this experience meant creating a space for teachers to work as professionals with Learning Designers who are specialized in elevating teachers' skills. In particular, they sought to develop all participants' capacity to do this work and to speak a common language of design. As Jason described, preservice teachers "bring excitement [and] value when you come into RVS as new hires and you already have built some capacity." This strengthened capacity aligns with Fullan and Hargreaves' (2016) notion of professional capital. They explain,

> If you want good return on investment in teachers and teaching, you have to attract, select, and develop teachers with high levels of human capital in terms of knowledge, skill, and talent; you have to deliberately improve these qualities over time through the decisional capital of structured experience and feedback that continuously supports and challenges all educators as professionals. (p. 1)

This investment from the board, while beneficial for recruitment purposes, was mostly focused on increasing the number of teachers with confidence and experience to engage in design and rich professional learning. As Jason quipped to our first PLC group in the Fall of 2017, "We don't want the same old, same old. We want transformative teachers. That's what we need." Recognizing the prevalence of teacher resistance to traditional professional development (Musanti & Pence, 2010), RVS sought instead to engage teachers at the beginning of their careers and introduce them to the RVS culture of "engag[ing] students as co-designers of their learning, empowering them to follow their passions and challenging them to new heights" (RVS, 2020b, p. 4).

We also sought to create a space where preservice and inservice teachers could authentically design learning for the students they actually work with. Just as student learning is improved when teachers engage them in authentic tasks (Barron & Darling-Hammond, 2008),

teacher practice improves when they are able to enact the ideas that they learn about through pre-and inservice education (Willms et al., 2009). To that end, each workshop PLC participants attend supports Stoll's (2011) phases of PLCs. These include:

1. Starting out: acquiring information and beginning to use ideas.

2. Developing: experimenting with strategies and building on initial commitment.

3. Deepening: well on the way, having achieved a degree of mastery and feeling the benefits.

4. Sustaining: introducing new developments and re-evaluating quality— professional learning community as "a way of life" (Stoll, 2011, p. 112).

The timeline for this process, which we describe in detail below, is also visualized in Figure 1.

Figure 1

Professional Learning Timeline for Participating Preservice Teachers

Starting Out

March-April: Interested preservice teachers attend information sessions and apply.

September: Preservice teachers attend a workshop for orientation, goal setting, and to establish ongoing reflection.

Developing

October: Preservice teachers attend a design thinking workshop hosted by the faculty.

November-December: Fall practicum. Preservice and partner teachers attend a series of workshops hosted by the board.

Deepening

January: Preservice teachers attend a reconnecting workshop co-hosted by the faculty and board.

January-February: Preservice teachers complete a course in design-based thinking as part of their BEd.

Sustaining

February-April: Final practicum. Preservice and partner teachers receive at-the-elbow support from the board.

May: Preservice teachers attend a group reflection session and all participants provide feedback. The board and faculty consider how to iterate for the following year.

In "starting out," participating preservice teachers attend an orientation in September introducing them to the ideas of PLCs, design-based thinking, and the learning goals for the coming year. Preservice teachers also articulate their goals and aspirations, and begin co-creating a Google Document that they reflect in as a group. Each year, we notice that PLC participants are reluctant in these initial meetings to name themselves as "design-thinkers"; like many of our preservice teachers, they worry they are imposters who aren't "cut out for teaching" (see ATA, 2018). As Timperley (2015) notes,

> One of the strongest social norms in schools is that everyone is expected to pretend that
>
> they are equally effective in what they do even when they feel they are unable to do it.
>
> Having to pretend is antithetical to professional learning. (p. 800)

Pushing against this norm, we explicitly invite participating teachers to adopt a beginner's mindset. This increases the likelihood that participants will take risks, fail forward, and open themselves up to learning rather than take on a defensive stance (Stoll et al., 2003). While this beginner mindset does mean that teachers (including inservice teachers) may need to be introduced to what design-thinking is and how it has evolved, Mike and Shirley learned from this year's cohort that *doing* these ideas has greater effect than *hearing about* them. As one participant observed: "You had me at design-thinking."

As preservice teachers begin developing their knowledge with the PLC, they attend workshops hosted by RVS alongside their partner teachers. Jason has consistently described these workshops as "alternating between your student hat and your teacher hat—first do, then design." In these sessions, such as the ones described on the RVS website (RVS, 2019a), preservice and inservice teachers participate in design-thinking protocols, discuss what learning looks like in RVS, and begin to design learning that they will take into their classrooms after each session. Preservice teachers, partner teachers, and the Learning Specialists draw on critical

friend protocols to enhance their designs (Bambino, 2002; Özek et al., 2012). Because these workshops take place during preservice teachers' practica, participants are able to design that learning with specific students in mind, and adjust future designs based on feedback from each iteration.

The specific structure of these workshops has also evolved over time as we, the organizers, iterate to better serve these teachers. For example, in planning for the 2019 PLC, Shirley shared that some of the 2018 partner teachers felt "voluntold"—and so were not active partners in the learning and in some cases worked against the goals of the PLC and their preservice teacher. Broaching this issue helped RVS to redesign one of the workshops, as well as how we approached partner teachers to be involved in this work. Adam and Sara reflected on this conversation from the lens of new team members for that year:

> We wanted to make it more meaningful and authentic in designing learning, for both mentor and preservice teachers. Experiencing RVS design elements through a pre-established design our Design Team was already using didn't connect with everyone. So, we shifted our focus to grounding their experiences in solid relationships and empathetic understandings of what instructional coaches do. We needed to emphasize mentor teachers as instructional coaches who work alongside preservice teachers to provide mentorship and coaching as a collaborative duo in designing learning. That supported learning away from an educational hierarchy of a master teacher imparting all of their knowledge to be replicated by a preservice teacher. The analogy that struck a chord was approaching learning as a "collaborative duo," not a "cover band." Starting their relationship as co-designers meant they could experience and implement elements of RVS's instructional design process as a team.

Adam and Sara's comments echo Özek et al. (2012) who emphasize that critical friends and peers in professional learning must work *alongside* one another: Hierarchies cannot come into play. Adam and Sara also highlight the importance of creating a space that resonates with all participants, including inservice teachers. Sara elaborated,

> This is not a hierarchy, but two professionals coming together. We honoured the design process by considering where the participants were coming from, what mindsets they may have had coming into the process, and worked to create an environment where teachers and preservice teachers could establish a true collaboration.

Meeting participants "where they are" is most effective when this process begins at the start of each cohort. As Shirley reflected, "How the partner teacher is brought into the process is really important. If they suspect that they're not really in it, they will work to sabotage it." Amy, similarly, noted that: "The teacher really has to want to do it. … If they're forced, it's almost worse than the student not getting the opportunity at all." Mike added:

> It's good that our students buy in and that we inculcate them—but we also need to do this for partner teachers. We need to show them that they are equal partners in this process and can also benefit from this work. Being a partner teacher is too often seen as a mechanical necessity. We need to find the sweet spot where this PLC isn't just for preservice teachers or for the board, but for the teachers, too.

This again reflects Timperley's (2011; 2015) contention that teachers are most likely to engage in professional learning when they see the impact that learning has on student achievement, engagement, and wellbeing: Being able to see how that work matters to them and their classroom after the preservice teacher leaves.

Participating preservice teachers deepen their skills after they complete their Fall practicum and return to the university before their final practicum. In addition to attending a

reconnecting workshop where participants unpack their experiences and share successes and challenges, the preservice teachers also complete a course in design-based thinking and a course that further examines PLCs and critical friend protocols. These courses seek to "develop capacities working with key design principles and mindsets" (WSE, 2019, p. 2) and "build and sustain a practice of integrity and personal satisfaction" (WSE, 2020a, p. 2). Amy believes this opportunity extends the value of the existing coursework:

> It allows a teacher to move further along that continuum toward masterful understanding of something. One course will not do that for you. It will give you the vocabulary, and it will give you ideas, but a course doesn't let you *do* anything. This opportunity transfers that knowledge out into the world and gives the teacher a chance to do something with it in a relatively safe environment.

Later in this final semester, preservice teachers return to their practicum placement and work with their partner teachers and the RVS Learning Specialists to arrange "at the elbow" connections. These sessions provide individualized support based on the needs and challenges the preservice and inservice teacher identify for the work they are doing. Simply put, these connections are unique for every teacher and every classroom.

Sustaining this work has been an essential part of our teachers' journey, and our own. The preservice teachers circle back to the Google Document they created in September to examine how their thoughts have shifted, and if they are meeting their goals (individually and as a group). We challenge them (though this does not always happen) to make their students' learning visible: to create a space within the school or the community where students can showcase the products of their design for a real audience. Finally, after their practicum is over and they are ready to graduate, they attend a final debrief and celebration to reflect on the preceding year and offer feedback to improve the PLC for future years. Our broader study

examines these reflections in more detail, as well as how past participants are sustaining this work in their practice now that they have classrooms of their own.

As teacher educators, we have also taken up these iterative conversations to improve our understanding. We find ourselves particularly drawn to critical friend protocols to examine what's working, what isn't, and how we can better serve our students and our teachers (Bambino, 2002; Özek et al., 2012). Importantly, as critical friends, our work is non-hierarchical: Most of the authors have no power over one another, and RVS and Werklund are equal partners in this work. This creates opportunities for relational work together. Shirley and Amy, for example, have both taught in RVS and worked with Dave and Jason in other contexts. Mike, meanwhile, did not know Adam and Sara before the 2019 cycle, and needed to develop those relationships and ensure we were "speaking the same language" before we could collaborate more closely. Amy contends that such school-university partnerships lend themselves to this kind of collaborative approach:

> Generally I don't see a lot of challenges doing this kind of work with boards. They want the best for their teachers and they want the best for our students. When it comes to things like this, boards are very excited. It's rare for a board to say, "No thanks, we're not interested in being innovative." Usually someone is at least willing to discuss ideas.

Despite this openness, we have also faced challenges. Amy continued: "this specific project has taken us some time to figure out how to be most effective; how to set it up. We have to make sure that we're putting good practices into place." Shirley, for example, noticed that more participants in the 2019-2020 PLC articulated a beginner's mindset after the PLC spent more time unpacking how they were learning alongside one another. As she explained, "I saw this in action with [a student] and his partner teacher, as well as others, at the first session this year. I

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think we are getting to this better." Mike relates this to his experiences teaching the Professional Development course at the university that examines PLCs:

> Before this year, my focus was on the design mindsets—the protocols and the processes teachers were exploring as part of this PLC. Now my focus has shifted. The design is still there, it's central, but so is the process of professional learning that gets us there. The community has become a much more important layer.

Other challenges were logistical. At the beginning of the project, Amy served as the university's Director of Field Experience, and was brought on board to help integrate the PLC within existing program structures. She recalled:

> At the time there were two parts—largely because of my role. Number one, making sure it did not become a complicating factor in the Field Experience (practicum). We gave a lot of thought on the assessment practices in Field, and how this could become a concern.

We recognized, for example, that if a preservice teacher in the PLC were evaluated based on their performance in the PLC, they could be unfairly (dis)advantaged: How could we evaluate one preservice teacher on their ability to teach using design-based thinking, when no other teachers were expected to demonstrate that skill? To that end, while participating preservice teachers take up principles of design in these practica, they are evaluated according to the same criteria as their peers. We want our students to engage in this work, but we do not want to disadvantage them (or perhaps their peers) by shifting their expectations for graduation. Amy also shared a worry that the project could become "a logistical nightmare," especially in a large undergraduate program with a complex placement process. Yet, she also recognized the project's possibilities: "What I really loved was the partner teachers that were involved weren't experts either. It changes the dynamic." Taken together, we have found that the benefits of this opportunity exceed its challenges. Creating space for preservice teachers, inservice teachers, and

the university to safely express vulnerabilities has also created opportunities for us to demonstrate "the transformative power of learning for individuals and communities" (ACDE, 2017, p. 5), particularly through the lenses of professional learning and instructional design (IDEO, 2020; Timperley, 2011).

Moving Forward Together

For the past three years, we have sought to "expand the innovation ecosystem" (Brown, 2008, p. 8) and work together to deepen beginning teachers' understanding of how students learn (Willms et al., 2009). Moving forward, we recognize the critical importance of reflecting on the problems and possibilities we face, and articulating those learnings to each other and our students (Bullough & Pinnegar, 2001). Reflecting on our role as a research-intensive institution, Amy commented,

> This research is the next best step. We're close to the moment of looking at—does this continue as it is? Is it still serving its purpose? After a few years, you pretty much have to study an initiative to understand it, and to understand how to capitalize on it. It's not enough to think it's good—you have to know. You need evidence.

Once again, we find ourselves drawn to Timperley's (2015) work on professional learning as inquiry. We ask ourselves: "What knowledge and skills do our students need to meet curricula and other goals?" (Timperley, 2015, p. 798). How do we prepare teachers to "embrace empathy, optimism, iteration, creativity, and ambiguity" (IDEO, 2020, para. 10)? How do we foster resilience in a context of changing policy goals and increasing scrutiny of teachers and schools (Government of Alberta, 2020)? These questions prompt us to engage in our own cycles of inquiry, to examine our students' needs, to determine what we must do to support those needs and to evaluate the impact of our work. While these questions are necessarily focused on our context, we believe these approaches lend themselves to partnerships between other schools and

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universities. It is our hope that this chapter and the other contributions in this book position teachers to meet our vision for education, in order to "engage all learners through meaningful and challenging experiences, preparing them to understand, adapt, and successfully contribute to our changing global community" (RVS, 2020b, p. 3).

References

Alberta Education. (2006). *Program of studies: Science grades 7–8–9*. Alberta Education.

Alberta Teachers' Association (ATA). (2018). *"Who will help me to do well?" How to best support the professional growth of Alberta's newest teachers*. Alberta Teachers' Association.

Association of Canadian Deans of Education (ACDE). (2017). Accord on Initial Teacher Education. http://csse-scee.ca/acde/wp-content/uploads/sites/7/2017/08/Accord-Initial-Teacher-Education.pdf

Bambino, D. (2002). Critical friends. *Educational Leadership, 59*(6), 25–27.

Barron, B., & Darling-Hammond, L. (2008). *Teaching for meaningful learning: A review of research on inquiry-based and cooperative learning*. George Lucas Educational Foundation.

Berry, A., & Forgasz, R. (2018). Disseminating secret-story-knowledge through the self-study of teacher education practices. *Studying Teacher Education, 14*(3), 235–245.

Bragg, L.A., & Lang, J. (2018). Collaborative self-study and peer learning in teacher educator reflection as an approach to (re)designing a mathematics education assessment task. *Mathematics Teacher Education and Development, 20*(3), 80–101.

Brown, B., Eaton, S. E., Jacobsen, D. M., Roy, S., & Friesen, S. (2013). Instructional design collaboration: A professional learning and growth experience. *MERLOT Journal of Online Teaching and Learning, 9*(3), 439–451.

Brown, T. (2008). Design thinking. *Harvard Business Review, June 2008*, 1–9.

Bullough, R. V. Jr., & Pinnegar, S. (2001). Guidelines for quality in autobiographical forms of self-study research. *Educational Researcher, 30*(3), 13–21.

Chapin, C., Green, K., Randawa, N., & Spahmann, S. (2019, February 21). Rocky View

      School's design thinking cohort. Paper presented at the 2019 WestCAST Conference,

      Calgary, AB.

Christensen, K. S., Hjorth, M., & Iversen, O. S. (2016). Towards a formal assessment of design

      literacy: Analyzing K-12 students' stance towards inquiry. *Design Studies, 46*, 125–151.

Council of Ministers of Education Canada (CMEC). (2019). Global competencies.

      https://www.cmec.ca/682/Global_Competencies.html

Friesen, S., & Jacobsen, D. M. (2015). *A design-based approach to teachers' professional*

      learning. https://www.edcan.ca/articles/a-design-based-approach-to-teachers-

      professional-learning/

Government of Alberta. (2013). *Ministerial order #001/2013 on student learning*.

      https://education.alberta.ca/media/1626588/ministerial-order-on-student-learning.pdf

Government of Alberta. (2020). *Vision for student learning engagement*.

      https://www.alberta.ca/vision-for-student-learning-engagement.aspx

Hamilton, M.L., & Pinnegar, S. (2013). A topography of collaboration: Methodology, identity

      and community in self-study of practice research. *Studying Teacher Education, 9*, 74–

      89.

IDEO. (2020). IDEO design thinking. https://designthinking.ideo.com/

Keay, J. K., Carse, N., & Jess, M. (2019). Understanding teachers as complex professional

      learners. *Professional Development in Education, 45*(1), 125–137.

Kelly, J. (2013). Professional learning communities: The emergence of vulnerability.

      Professional Development in Education, 39(5), 862–864.

Kennedy, A. (2014). Understanding continuing professional development: The need for theory to

      impact on policy and practice. *Professional Development in Education, 40*(5), 688–697.

Kitchen, J., & Stevens, D. (2003). Self-study in action research: Two teacher educators review their project and practice. http://oar.nipissingu.ca/PDFS/V811E.pdf

McTighe, J., & Wiggins, G. (2012). Understanding by Design® framework. https://www.ascd.org/ASCD/pdf/siteASCD/publications/UbD_WhitePaper0312.pdf

Mitchell, C., & Sackney, L. (2009). *Sustainable improvement: Building learning communities that endure*. Sense Publishers.

Musanti, S. I., & Pence, L. (2010). Collaboration and teacher development: Unpacking resistance, constructive knowledge, and navigating identities. *Teacher Education Quarterly, Winter 2010*, 73–89.

O'Dwyer, A., Bowles, R., & Chróinin, D. N. (2019). Supporting collaborative self-study: An exploration of internal and external critical friendships. *Studying Teacher Education, 15*(2), 139–159.

Oddone, K., Hughes, H., & Lupton, M. (2019). Teachers as connected professionals: A model to support professional learning through personal learning networks. *International Review of Research in Open and Distributed Learning, 20*(3), 102–120.

Özek, Y. H., Edgren, G., & Jandér, K. (2012). Implementing the critical friend method for peer feedback among teacher librarians in an academic setting. *Evidence Based Library and Information Practice, 7*(4), 68–81.

Quinn, E., Bartlett, S., Alisat, L., McNeil, S., & Miner, K. (2018). Finding humanity in design. *Journal of the Canadian Association for Curriculum Studies (JCACS), 16*(1), 6–22.

Rocky View Schools (RVS). (2019a). Learning design with instructional leaders and U of C education students. https://schoolblogs.rockyview.ab.ca/makinglearningvisible/learning-design-with-instructional-leaders-and-u-of-c-education-students/

Rocky View Schools (RVS). (2019b). RockyTalks – #InnovatorsCAN – the six.

   https://www.youtube.com/watch?v=_5iuhRc-1nE

Rocky View Schools (RVS). (2020a). Day 2: Learning design with instructional leaders and U of

   C education students. https://schoolblogs.rockyview.ab.ca/makinglearningvisible/day-2-

   learning-design-with-instructional-leaders-and-u-of-c-education-students/

Rocky View Schools (RVS). (2020b). I can: Connect, achieve, navigate. 2019–2023 four year

   plan. https://www.rockyview.ab.ca/publications/assets_publications/four-year-

   plan/2019-2023-four-year-plan-year-1

Rocky View Schools (RVS). (2020c). Instructional design framework.

   https://www.rockyview.ab.ca/assets/archive/learning/copy2_of_do/instructional-design-

   framework/instructional-design-framework

Samaras, A. P. (2010). *Self-study teacher research: Improving your practice through*

   collaborative inquiry. SAGE Publications.

Stoll, L. (2011). Leading professional learning communities. In J. Robertson & H. Timperley

   (Eds.), *Leadership and Learning,* 103–117. SAGE Publications.

Stoll, L., Fink, D., & Earl, L. (2003). *It's about learning (and it's about time)*. Routledge Falmer.

Timperley, H. (2011). *Realizing the power of professional learning.* Open University Press.

Timperley, H. (2015). Continuing professional development. *International Encyclopedia of the*

   Social and Behavioural Sciences, 2(4), 796–802.

Werklund School of Education (WSE). (2019). Course outline for EDUC 546: Design-based

   thinking. Calgary: University of Calgary.

   https://werklund.ucalgary.ca/upe/files/upe/educ-546-design-based-thinking-course-

   outline-2019.pdf

Werklund School of Education (WSE). (2020a). Course outline for EDUC 556: Professional

    development and lifelong learning. University of Calgary.

Werklund School of Education (WSE). (2020b). Design thinking cohort.

    https://werklund.ucalgary.ca/undergraduate-programs/student-

    opportunities/professional-learning/design-thinking-cohort

Wiggins, G. & McTighe, J. (2005). Understanding by design (2nd ed.). Association for

    Supervision and Curriculum Development (ASCD).

Willms, J. D., Friesen, S., & Milton, P. (2009). *What did you do in school today? Transforming*

    classrooms through social, academic, and intellectual engagement. (First National

    Report). Canadian Education Association.

Yuen, J., Walkowicz, E., & Holden, M. (2020, February 20). Using design-based thinking to

    ignite student learning. Paper presented at the 2020 WestCAST Conference, Vancouver,

    BC.

By Using Architectural Principles Can Teachers Become Curriculum Designers, Not Simply Instructional Planners?

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Abstract

During the 2018–2019 academic year, ten teacher researchers participated with one education professor in a series of workshops meant to increase teachers' understanding and use of an approach to curriculum and instructional design grounded in architectural and town/city-design principles. Underwriting this approach is the view that if designing curriculum and instruction is, in fact, a design task, then the principles used by designers in other fields than education have relevance to the design of curriculum and instruction. At the end of the project, participants noted to what degree the workshops led to changes in (a) how they understood the relations and differences between the two concepts of curriculum and instructional *design* and curriculum and instructional *planning*; and in (b) the degree to which, following the workshops, they viewed design as a separate step that precedes planning instruction. According to their own reflections at

the end of the project, participants' changed understandings and practices ranged from slight to significant.

Résumé

Au cours de l'année universitaire 2018–2019, dix professeurs-chercheurs ont participé, sous l'égide d'un professeur en formation des enseignants, à une série d'ateliers afin de mieux comprendre l'approche fondée sur les principes d'architecture et de design urbain appliqués à la conception des programmes d'études et de l'enseignement. Cette approche s'appuie sur l'idée que si la conception du programme scolaire et de l'enseignement relève du design, par conséquent les principes utilisés par les designers dans d'autres domaines peuvent s'appliquer à la conception des programmes de cours et de l'enseignement. Au terme du projet, les participants ont relevé : (a) l'importance des ateliers dans la façon de comprendre les rapports et les différences entre programme et *conception* pédagogique d'une part et, d'autre part, *planification* du programme et de enseignement; et (b) dans quelle mesure le design peut se concevoir comme une étape distincte qui précède la planification de l'instruction. Suivant leurs propres réflexions, les participants ont noté à la fin de l'exercice qu'ils avaient soit peu, soit beaucoup modifié leur conception pédagogique et leur pratique de l'enseignement.

Introduction

This project grew out of the design philosophy of Christopher Alexander, now-retired professor of architecture at the University of California at Berkeley, and, in the view of many, a major philosopher of architecture. Alexander's two best-known works are *A Pattern Language: Towns, Buildings, Construction* (1977) and *The Timeless Way of Building* (1979). Alexander continued to write into the second decade of the new century, but most who base their design thinking on his patterns point to these two titles from four decades ago as their most powerful influences. Alexander used the word *patterns* to denote those features that seem to appear in all pleasing designs. In his schema, patterns run from the specific (a porch should be at least six feet wide to give space for a small table and permit people to get around that table) to the general (every design must have a centre). His book title, *A Pattern Language*, reflects his observation that no pattern works in isolation; rather, taken together, patterns work in combination with each other in the same way that words work together in a language.

Ken Badley, who initiated the project (and published a 2018 book on applying ten of Alexander's architectural patterns to curriculum and instructional design), argues that the *design first, plan second, build third* sequence used in building construction also applies to curriculum and instruction. In architecture and construction, design precedes planning and the two concepts are differentiated. This chapter argues that it is important to maintain a similarly differentiated use of the word *design* with reference to curriculum and instructional design and *planning*.

In this project, we set out to learn whether teachers would find utility in distinguishing between the two concepts of design and planning, and in considering design patterns prior to planning instruction. Specifically, the two research questions in this project were:

- To what degree can teachers learn to approach instructional planning by first designing, using Alexander's architectural patterns?

- To what degree does designing a course or unit prior to planning simplify teachers' planning processes?

Literature Review

Outside the fields of architecture and town planning, others began to take note of Alexander's work within a few years of the appearance of the two titles named above. Teams of software developers in the 1980s and 1990s worked on building what they called *pattern languages* for writing software (Coad et al., 1995; Gamma et al., 1995). They viewed pattern languages as an efficient way to frame and produce stretches of code that represented repeatable computer routines. These teams later formed a coalition, Pattern Languages of Program Design (also known as The Hillside Group), which continues to meet annually and promotes pattern languages as an efficient way to simplify and add elegance to the production of code (Hillside Group, 2020).

Computer science instructors, aware of how software developers were using Alexander's work, began in the 1990s and early 2000s to promote the use of pattern languages in the design of online instruction (Goodyear et al., 2004; Kohls, 2013; Warburton et al., 2015). However, adoption of Alexander's idea of pattern languages by the non-online educational community was slow (Mouasher & Lodge, 2016). One group that did grow out of Alexander's work is known as *the pedagogical patterns project* (Magnusson, 2006). Their hope was to reduce instruction to a specified number of patterns that other educators could copy and use in their own work as instructional designers.

This brief review brings us to Alexander's patterns themselves. In *A Pattern Language* (1977), he proposes 253 patterns, grouping them into three sections: towns, buildings, and construction. Alexander begins each section with a brief essay about how the patterns work together as a *pattern language*. He then provides brief descriptions of the dozens of patterns

belonging to each respective section. In *The Timeless Way of Building* (1979), he explained in more detail how a pattern language works and he added several more patterns to his original list of 253 patterns. He added still more in his later works, of which there are dozens. Interestingly, in what he considered his magnum opus, the four-volume *The Nature of Order* (Alexander, 2002a, 2002b, 2004, 2005), Alexander reduced his catalogue to the 15 patterns that in his view bring coherence to all the other patterns.

Alexander did not address curriculum or instructional design. But he did argue that if those who design spaces for people—rooms, buildings, cities—use a pattern language, then those designed spaces will be life-giving. Second—an important point for our purposes here—he argued that *design precedes planning*, and that planning precedes construction. We set out in this project to discover what application Alexander's patterns might have to curriculum and instructional design, and whether his distinction between design and planning makes sense to practicing teachers and helps them with their day-to-day work. The project took this form: During the 2018–2019 academic year, one professor and ten inservice and preservice teachers participated in a series of two-hour workshops during which we designed curriculum and instruction using patterns suggested by Christopher Alexander.

To avoid the intimidation and confusion that might have resulted had we tried to incorporate several hundred patterns, we worked with 10 of Alexander's patterns for the purposes of this project: centres; boundaries; entrances and exits; coherence and connection; green spaces; public and private; variety and repetition; gradients, harmony, and scale; master planning, piecemeal planning and roughness; and agile, light structures. We worked with these 10 patterns because they appeared as the 10 core chapters in the 2018 volume on curriculum and instructional design mentioned above. In the eight-year development of that book, these 10

patterns repeatedly proved to have the most obvious application to curriculum and instruction design.

Here we show how each principle can be interpreted in the context of curriculum design. In most cases, we provide no detail related to Alexander's original application of the pattern for architectural or town-design settings.

1. *Centres*: A course or a section of a course (unit, topic, theme) should have two or three major ideas, assessments, or activities.

2. *Boundaries*: Students should know clearly what is and what is not in the curriculum, course, unit, or lesson.

3. *Entrances and exits*: Students should know clearly that they have entered or exited a unit or lesson. This implies paying special attention to the first day of a unit or theme (the entrance).

4. *Coherence and connection*: Everything in a unit, topic, or theme should connect in obvious ways to the unit and every unit to the whole course.

5. *Green spaces*: People in cities need places to rest, relax, and breathe, and, metaphorically, so do students and teachers. Every course and unit should have such spaces built into it. Examples of instructional contents when students can relax a bit include the classroom visitor, video, poster displays, and presentations.

6. *Public and private*: Every unit should include work that all students will complete (public) and should also include choices among some work, so that all students can build unique routes through the material (private, a place of one's own).

7. *Variety and repetition*: Some elements need repetition so that students feel secure and know the deep structures of the classroom, course, or topic. Variety, especially in

teaching/learning strategies and daily allocation/order of the class minutes, is essential to prevent boredom.

8. *Gradients, harmony, and scale*: Instructional and assessment elements should come in different sizes, but the component parts of a day's instruction or a unit's work should fit together in ways that are obvious to students (harmony). Massive blocks of material should be presented in smaller parts, so they do not intimidate students (scale).

9. *Master planning, piecemeal planning, and roughness*: Although as teachers we must plan ahead weeks and months at a time, we do not know exactly how any block of instructional days will unfold. Therefore, we accept that we cannot plan every detail in advance. Likewise, we do not design for perfection. In curriculum and instruction, we fix, change, and adapt as we go, especially as we observe our students' responses to material term after term. This implies letting students know that our courses are works in progress, but that we constantly recalibrate and make improvements as we watch how students respond to our materials.

10. *Agile, light structures*: Overall structures should be easy for students to understand. Simple designs can have great strength.

These ten patterns (or principles) appear repeatedly in Alexander's work, and the first pattern we worked with in this project (centres) is arguably the thread that unifies Alexander's life's work. Alexander develops centres at great length in the first volume of *The Nature of Order* (*The Phenomenon of Life*, 2002a), arguing there that centres are the pattern that give coherence to all the other patterns.

We noted in the introduction some titles from Alexander's own corpus that shaped this project. Some of his other works bear mention. *The Oregon Experiment* (1975) recounts how Alexander and his colleagues worked with the University of Oregon in Eugene to develop a

campus plan that served the whole campus community. In the article, "Construction of the New Eishin Campus" (1985), and in the book, *The Battle for the Life and Beauty of the Earth: A Struggle Between Two World Systems* (2012), Alexander describes working with college officials and students to design a college campus in Eishin, Japan. Both article and book echo the philosophy that governed Alexander's work in Oregon. We mention these because he returns frequently in these two works to his argument that designs must suit or fit the people who will inhabit the spaces. Alexander does not offer this claim as a pattern in itself, but rather as a governing principle that underwrites the specific patterns. In this project, we took that as a governing principle for curriculum and instructional design.

Alexander presented his philosophy in more than 60 books and articles. Many of those, like the two we just described, are narratives of how Alexander and his architect colleagues responded to a client's needs in a specific location. Others are essays. Some are philosophical treatises. Having named the works that most directly shaped this project, we will not review the remainder of Alexander's extensive work here.

Methodology and Context

The inservice and preservice teachers who carried out this project responded in the fall of 2018 to an invitation from an education professor to attend at least three workshops during which, as a group, participants would apply Christopher Alexander's patterns to curriculum and instructional design. Six inservice teachers participated, ranging in classroom experience from one to six years, five in elementary classrooms and one in a middle-school classroom. During the project, three of the four preservice teachers were in the final year of their undergraduate Bachelor of Education degrees in elementary education and one was in her first year in the same program. Monthly, two-hour workshops were held between September 2018 and April 2019 with

all participants attending at least three, and most attending more than three. These participants are authors on this paper.

Prior to attending the first design workshop, each participant wrote a reflection in which they described their understanding of the conceptual relations between curriculum and instructional *design* and curriculum and instructional *planning*. These essays were meant to serve as a baseline that could later be compared to their understandings of the two concepts of design and planning after participating in at least three workshops. Participants responded to these two prompts:

- What recollections do you have of *instructional design* and *instructional planning* being distinguished in your teacher education program? If you have such recollections, please describe the context … class, school placements, textbooks, and articles, etc.
- With reference to curriculum and instruction, what differences and overlaps do you see between the two concepts of *design* and *planning*?

Based on a request to write a minimum of 100 up to 500 words, the participants produced pre-project reflections ranging between 76 and 479 words.

We spent our time in the workshops designing a specific unit of instruction that at least one participant would be teaching in the upcoming weeks. These units were always part of the Program of Studies (the curriculum) required by the provincial Ministry of Education. The ten patterns from Christopher Alexander's corpus that we noted above shaped our design work. Our goal was always to engage in overall design of a unit using Alexander's patterns before planning the instructional activities for each day in the unit. We identified the centre or centres of that unit (major classroom events, important assessments, culminating activities). We also identified the entrance (how to welcome students to, and draw them in, the unit) and the green spaces (the breaks, the days with lighter content). We specified the boundaries of the unit so that both

teacher and students would know what belonged in the unit and what did not. We specified where students could find a place of their own (Alexander's concept of *private*—work that no other student in the class would be doing). We attempted to bring each of Alexander's patterns to bear on our design discussion so that those patterns shaped the overall structure of the unit or block of weeks we were designing in each respective workshop. Badley organized and facilitated these conversations.

After the conclusion of the project, all participants wrote a reflection on the degree to which their thinking and practices had changed during the term of the project, with specific reference to their original understanding of the conceptual relations between design and planning.

Three participants in this project (David, Kristen, and Ashlynne) had attended a similar set of workshops during the 2017–2018 academic year. When the 2018–2019 project began, they were already positively inclined toward the idea of using Alexander's patterns in unit design. As well, inasmuch as they had already worked with Alexander's distinction between design and planning, their understandings of the relations between the two concepts differed from the understanding of those encountering pattern languages for the first time.

Findings and Post-Project Distinctions

Participants' post-project reflections ranged in length from 147 words to 355 words. Responses to the approach to unit design based on Christopher Alexander's pattern language varied. As a result of the workshops, some participants substantially adopted a design-based approach to their instructional planning. Others adopted elements of it. Some found it less helpful and reported that they would not change their practice as a result of the workshops.

Revisiting the Design/Planning Distinction

In the final paragraph of the methodology section, we noted that three participants attended a series of similar workshops during the academic year prior to the 2018–2019 project. We begin the discussion of the findings, with comments from these three participants who wanted to continue to explore the design approach they had already worked with. As well, all three saw clear differences between curriculum or instructional design and curriculum or instructional planning. In his post-project reflection, David, one of the three who had participated in workshops in 2017–2018 as a first-year teacher, notes the prominence of the backwards-by-design model (McTighe & Wiggins, 2005), and then stipulates that "planning and designing a unit diverge [because designing] considers the audience and users as part of the 'end' to keep in mind". He continues,

> Specifically, design is cognizant of, and concerned with, the intricate details of the surrounding environment—in education, this is everything from the day of the week, to the closeness of a break, to the time of the day, to the dynamics of a classroom. In a sense, design is a more "human" process. Design considers lived experiences and history of others, and incorporates practice beyond scaffolding lessons and into rich, natural experiences for students.

This comment would fit Alexander's philosophy of architecture perfectly if David had been describing a building. In fact, it echoes Alexander's narratives about the Oregon and Eishin projects (and several others we have not mentioned here). The subject of David's observation is instructional design, not building design, and it lends some support to the view that curriculum and instructional designers can take something from the fields of design and architecture. Furthermore, it reveals that teachers can think like designers.

Ashlynne, a preservice teacher who was in a 12-week practicum during the semester in which she attended the workshops, was one of the three who had attended workshops during the prior academic year. Ashlynne confessed to not having considered the relations between the two concepts of design and planning before attending the 2017–2018 design workshops. Having participated in several workshops, she writes as follows:

> When given the opportunity to think about these terms on their own, I was surprised at how vastly different they are. … I believe that unit design, because of the front-heavy thought effort you put in, fosters maximized learning; you can design experiences that fit with activities or events in the school community, and, if you use [this] planning model, can be worked around the [educator's] personal life, so as to avoid having a heavy-content day after a night you're out late with other commitments. This isn't something that is … ever directly taught or discussed, but in teaching, you need to think about how to best provide learning experiences for your students, and this undoubtedly means that you need to take into consideration the energy level of your class, and your own personal energy level.

As did David's comment above, this reflection echoes the more organic, piecemeal approach to planning Alexander used in the Oregon and Eishin projects.

Kristen, the third participant who had worked with Alexander's patterns during the previous academic year, viewed design as,

> The big picture [approach that] helps everything link and flow together, leaving no loose ends. This is where you view the curriculum as a whole. This allows you to weave in multiple areas of study and learning experiences, making the experience that the students are getting (inside and outside the classroom) more meaningful and authentic.

She continues, alluding directly to the universal design for learning (UDL) framework:

Curriculum/Instructional Planning is the process of taking the overarching design and breaking it down into small pieces allowing for the educator to specifically plan for each student in their classroom. It is looking at the small parts of a picture in this case. … It … provides more structure to the learning process. Educators will have their overall design but the pace in which they move through their design depends on their students and how they learn. This is why learning looks different in every classroom even if you are implementing the same design.

Overall, it is important to keep in mind that you need both curriculum/instructional design and curriculum/instructional planning to educate your students properly. They work hand-in-hand and you cannot have one without the other.

These three participants, having attended similar workshops the previous year, were already familiar with Alexander's idea of a pattern language, and they therefore functioned somewhat like a sub-cohort within the larger group of participants. Because of that exposure, it was not surprising that they distinguished the concepts of design and planning more clearly than other participants to whom these categories were new.

Initial Encounters with the Design/Planning Distinction

We turn now to those project participants who had no prior exposure to the patterns we used to design units in our workshops, beginning with representative comments taken from the reflections they wrote before attending any workshops related to the study.

Pre-Project Understandings

In their pre-project writing, these participants expressed a range of opinions regarding the differences and overlaps between the concepts of design and planning. For example, Dallas M. wrote, "I'm not sure that there is a significant difference between planning a unit and designing a unit, other than the eloquence of the language being used." Echoing several others, Dallas also

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reveals the important place the work of McTighe and Wiggins has in contemporary teacher education (1998, 1999, 2005, 2013). She writes as follows:

> Planning units is what teachers do. They consider outcomes from the curriculum and decide where they want students to "end up" after the study, which could generally take anywhere from 4 to 8 weeks. They then work backwards to create a logical flow of lessons, each one building on the one before, and each one connected to the outcomes of the unit. All the while, connections need to be made to all areas of curriculum and to students' lives.

Dallas notes that "the word *planning* could be substituted [for] the word *designing* without changing the meaning," that the two terms are synonymous, both having to do with considering the big picture.

Several participants distinguished overall design from specific planning in their pre-project writing. For example, Nadine, with six years of teaching experience before the project began, wrote this:

> Planning is deciding *what* students will be learning in a given year, month, week, or day. Planning comes after figuring out the topics that the students must know; those topics are broken down into manageable chunks for the teacher and students. Planning involves the nitty gritty of daily classroom life, such as what materials will be needed, creating back-up plans if things go off the rails, what behaviours to expect, etc. To me, planning is what comes after the design process. Planning is where you fill in the days with activities and projects you have created in the design process.
>
> Design is deciding *how* students will learn a given topic. Design comes at the beginning when first looking at the topics to be taught. This is the time for thinking about big ideas, big questions, and culminating activities for each topic.

This remark contains some helpful distinctions related to the semantic range of the two concepts *design* and *planning*. Nadine notes later in her pre-project reflection that design "informs how teachers should be planning; planning is chaotic and disjointed when the design process was not executed. However, I believe many teachers, new and experienced, struggle to separate the two." On this account, teachers who take time, prior to planning, to develop an overall design of a unit or module simplify their detailed planning of day-to-day instruction. That is, treating design as a separate, prior step simplifies and reduces the chaos sometimes associated with planning.

To varying degrees, other participants echo the sentiments expressed above by Nadine. For example, Dallas D. viewed design as "the overarching question [or] idea … where we see the end product and understandings we want students to have at the conclusion." She contrasted that with planning, which related to "the specific steps, lessons, and specific outcomes used to achieve the overarching end goal." Doug wrote that "planning a unit [produces] a day-by-day plan for … the unit. … Designing a unit is coming up with the ideas and methods of a unit." Emily wrote that "designing a unit is more of a 'big picture' method, whereas planning a unit is more focused. I see designing a unit as meaning that there is a common thread or goal throughout the unit, connecting all lessons." The idea of a common thread or goal in Emily's comment fits with Alexander's conception of centres and how they function in design, especially as he revisited his understanding of centres in his later work (2002).

Brittany, who had taught in adult vocational education for several years before this project began (and continued teaching during her education degree), viewed planning as tasks to do and design as "something much more intricate." She ended her pre-project essay with these words: "I view planning as a one-dimensional blueprint and designing as a 3D model of how that unit can work with an overall scope" (Brittany). Her comment bears unpacking. In his work, Alexander repeatedly stresses the conversational or iterative character of design. Whether for a

room, a building, or a square in the centre of a city, the designer aims to create a space that fits the lives and aspirations of the people who will use that space. "Overall scope" is not Alexander's language but it fits his vision for design. Janaye expressed something similar by comparing design to the beginning-to-end creation of a course or unit, and planning to the process or step that brings that creation "to life for students."

Post-Project Understandings

Several participants noted that over the course of the workshops they identified the importance of considering alterations in school schedules and fluctuations in energy that result from school or non-school events in teachers' and students' lives. Emily expressed her awareness of these factors:

> Through the sessions I realized the importance of considering the events that will be going on in my personal life, as well as attempting to anticipate when a number of students may be away or when their energy and focus levels might be affected. By taking the time to think about this I can attempt to shape the unit around these factors, instead of having to make as many adjustments in the midst of teaching the unit.

Nadine wrote along these lines, noting that taking an architectural approach implies a "more comprehensive and global understanding of the variables involved in learning design."

These comments echo those of Janaye, Brittany, and Dallas M. For example, Dallas, registered the concern that the backwards by design model helps teachers plan single lessons, but does not help them plan a whole course or unit. She observed:

> Upon talking to colleagues I have found that many preservice teachers who [have not studied this approach] do not know how to design instruction with entire units in mind, and instead plan day-to-day, outcome by outcome. I believe that these teachers are at a disadvantage as they have not been shown how to look at the overarching picture to

create more meaningful lessons that can generate learning that can be more easily transferred. As my experience was influenced by [this approach] from the start of my training, I was unaware that designing instruction, as I have been taught, may mean something different than planning instruction; hence, my initial notes that no real difference existed. I now know, however, that there is a very important difference and am grateful that I received training that makes designing instruction an integral part of my practice.

Nadine suggested that attending to school schedules, teachers' and students' energy, and personal schedules may even address a component missing in the universal design for learning framework. Alexander repeatedly called designers and architects to pay attention to a building's users' schedules, to their preferred meeting places, and even to the routes they chose to get to various destinations. Along with several others, including Emily, Dallas M., Ashlynne, Nadine heeded the educational parallel to Alexander's call by taking note of teachers' and students' energy and the schedules of the schools in which they worked.

In their post-project reflections, several addressed the project's original question of how teachers distinguish design and planning. Dallas M. wrote that, in design, "we looked at the four-week chunk in its entirety, as opposed to planning one lesson to tackle one outcome. This is the difference between design and planning."

Some participants' experience of the workshops and exposure to Alexander's patterns led them to begin to think about instructional design and planning in overtly architectural ways. Doug wrote this in his post-project assessment of the relationship between design and planning:

I think a unit plan is almost like the foundation of a house during construction. It plans the size of the house and not much else. It would be the equivalent of laying out what your class will be covering in social studies for the year; … the unit design is more like

the framework of the house. It is more detailed, it lays out the rooms, the size of them and the doorways [that lead] from one room to the next. This would be sitting down with a calendar and plugging in big ideas, field trips, and any kind of assessment and when to do it.

His comments are consistent with Alexander's principle that we design (the architect's work with the client), then we plan (the architect's work with the general contractor), then we build (the general contractor's work and interactions with the sub-trades as they complete their work), a sequence we referred to repeatedly in the workshops.

Dallas D. and Janaye concluded that curriculum design largely rests in the hands of those who oversee the curriculum in a provincial department of education. In this view, teachers are left mainly with planning tasks. Dallas D. expressed the wish for more autonomy regarding what is taught and Janaye observed that the architectural/design philosophy presented in the workshops freed her to think of herself as a curriculum designer. Janaye "has redefined design as something very personalized to a teacher and their classroom." She notes, "There are many benefits to designing curriculum, as opposed to merely planning for instruction. I feel that becoming a curriculum designer will increase my quality of life, as well as student success and productivity in my future classroom."

A few participants concluded that thinking of design as a separate step, prior to planning, would reduce their work and encourage student learning. Janaye wrote,

I believe designing a full semester or unit reduces the need for daily planning. By using some insightful forethought (in addition to the required Program of Studies) to design the semester around a calendar reflective of long weekends, personal time off, special events at the school, etcetera, a teacher can anticipate what the energy levels will be like in their classroom on any given day.

Janaye's reference to energy levels connects to the research of Parrish (2005, 2008, 2009), whose work parallels Alexander's concern that designers attend to the lived experiences of those who will inhabit the spaces architects design. Parrish describes what he calls *energy trajectories*, the ebb and flow of energy for learning that affect both students' and teachers' work days and work weeks.

Several participants reflected on the applicability or functionality of the design philosophy that underlay the workshops. Brittany noted the difficulty of applying the design patterns to intensive, vocational-education courses where the instructor is to teach prescribed content. Emily noted her earlier concern that viewing design as a separate step prior to planning might add time to the overall process of preparing instruction. Over the course of the project, Emily changed her thinking about design taking extra time:

> Initially, the concept of planning the week or [the] next few weeks felt like a very timely [*sic*; time-consuming] process, but if you are already constructing a day to day lesson plan, I don't feel that adding the extra step of including all at your personal calendar and holidays to be much further action.

Emily's conclusion that developing a design for several weeks' instruction did not add undue work accords with Alexander's persistent claim that design actually simplifies planning and gives direction to those involved in planning and subsequently in construction.

Two participants suggested that a design approach fosters interdisciplinarity (Kristen and Ashlynne). Kristen suggests that this possibility for interdisciplinary learning—what Ashlynne calls "cross-curricular connections"—arises specifically because an architectural/aesthetic approach starts with the big picture (of the unit) rather than with the big idea in the single lesson.

Discussion

The responses of the project's participants to this approach varied widely. Some found the design/planning distinction to be of little help in their day-to-day work of planning curriculum and instruction. Others made substantial changes to their thinking and practice.

The first research question was "to what degree can teachers learn to approach instructional planning by first designing, using Alexander's architectural patterns?" Based on the post-project reflections, clearly some teachers can learn to approach planning this way, with design as a prior step. Some encountered difficulties doing so. Those difficulties may have arisen in part because many teachers have become accustomed to other approaches to planning, and therefore thinking of design as a separate, prior step is simply unfamiliar. In their work, many educators commit what McTighe and Wiggins (2013) call the twin sins of planning: thinking first either about what activities students will participate in or about what curriculum content needs to be covered. Even those who follow McTighe and Wiggins and adopt a backwards by design approach may begin by thinking about the big idea for the lesson, rather than the overall design of four to six weeks of instruction.

Regarding the second question "to what degree does designing a course or unit prior to planning simplify teachers' planning processes?" some of those who found the approach helpful overall noted that it simplified their planning processes and saved them time; it was not simply a useful conceptual point since it actually worked in practice. On the other hand, at least one participant concluded that differentiating a design stage from the planning stage actually took more time.

The majority of the teachers who participated in this project assign to *planning* the more detailed tasks of preparing for instruction, and to *design* the conceptual and overall tasks that precede planning. By making this distinction, they reflect their broad acceptance of Alexander's

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view that design precedes planning and that planning precedes building. In common educational usage, design and planning are often conflated, with both referring to the same processes of deciding what to teach and preparing to teach it. But when educators are prompted to reflect on the relationship between the two concepts of design and planning, some note the two terms' differing connotations. That some who participated in this project came to see design and planning as separate steps may indicate a provisional answer to the driving question behind this book: Teachers can become curriculum designers.

The project had some limitations. Ten pre- and inservice educators participated at least three times in the workshops and wrote post-project reflections. The workshops were led by the author of a recent book that applied Christopher Alexander's design patterns to curriculum and instructional design, introducing a clear level of bias (Badley, 2018). Some attended more than three workshops. Three participants in this project had participated in similar workshops the year before this project. These factors imply that participants' exposure to and familiarity with this design first and plan second model varied quite markedly.

Conclusions

At this point, several future research possibilities present themselves. First is a task in semantics and linguistics. Educators would benefit from careful cataloguing work on the varied uses and meanings of the word *design* in the contemporary educational lexicon. This word is being called on to do many kinds of work, some of them quite different from others. Of course, human beings will never agree to one single meaning; that is not how language works. But educators would be served well by a catalogue of uses, especially as the word *design* overlaps with, and differs from, the word *planning*.

Second, those who find design approaches to planning helpful should set themselves the task of identifying and collecting examples of how the patterns work in different subject areas

and at different grade levels. This would literally be an encyclopedic task, but, in our view, a worthwhile task nonetheless. Such examples would enable classroom teachers in various grades to see more clearly how engaging in design, as a prior step, may clarify and simplify instructional planning.

We close by noting again that the participants' responses to this project ranged from not helpful to transformative. Distinguishing curriculum and instructional design from planning does not suit everyone, but given that the project was transformative for some, we maintain that more research should be done in this area to determine how this type of understanding of design might support the work of teachers and the learning of students.

References

Alexander, C. (1979). *The timeless way of building*. Oxford University Press.

Alexander, C. (1985). Construction of the new Eishin campus. *The Japan Architect 340*, August, 15–35.

Alexander, C. (2002a). *The phenomenon of life: The nature of order (volume 1)*. The Center for Environmental Structure.

Alexander, C. (2002b). *The process of creating life: The nature of order (volume 2)*. The Center for Environmental Structure.

Alexander, C. (2004). *The luminous ground: The nature of order (volume 4)*. The Center for Environmental Structure.

Alexander, C. (2005). *A vision of the living world: The nature of order (volume 3)*. The Center for Environmental Structure.

Alexander, C. (2012). *The battle for the life and beauty of the earth: A struggle between two world systems*. Oxford University Press.

Alexander, C., Ishikawa, S., Silverstein, M., Jacobson, M., Fiksdahl-King, I., & Angel, S. (1977). *A pattern language: Towns, buildings, construction*. Oxford University Press.

Alexander, C., Silverstein, M., Angel, S., Ishikawa, S., & Abrams, D. (1975). *The Oregon experiment.* Oxford University Press.

Badley, K. (2018). *Curriculum planning with design language: Building elegant courses and units*. Routledge.

Coad, P., North, D., & Mayfield, M. (1995). *Object models: Strategies, patterns and applications*. Yourdon Press/Prentice-Hall.

Gamma, E., Helm, R., Johnson, R., & Vlissides, J. (1995). *Design patterns*. Addison-Wesley.

Goodyear, P., Avgeriou, P., Baggetun, R., Bartoluzzi, S., Regalis, S., Ronteltap, F., & Rusman, E. (2004). *Towards a pattern language for networked learning*. Paper presented at the Conference for Networked Learning, Lancaster, England. http://www.rug.nl/research/portal/en/publications/towards-a-pattern-language-for-networked-learning(138e7703-7a90-4dc7-bf9f-432e4fb9e7b1).html!null

Hillside Group. (2020). *The Hillside mission*. https://hillside.net/

Kohls, C. (2013). *The theories of design patterns and their practical implications exemplified for e-learning patterns* [Doctoral dissertation, Catholic University of Eichstatt-Ingolstadt, Eichstatt, Germany]. https://opus4.kobv.de/opus4-ku-eichstaett/frontdoor/index/index/docId/158

Magnusson, E. (2006). *Pegagogical patterns: A method to capture best practices in teaching and learning*. Paper presented at the LTHs pedagogiska inspirationskonferens (The Pedagogical Inspiration Conference at the Faculty of Engineering, Lund University), Lund, Sweden.

McTighe, J., & Wiggins, G. (1998, 2005). *Understanding by design* (2nd ed.). ASCD

McTighe, J., & Wiggins, G. (1999). *Understanding by design handbook*. ASCD.

McTighe, J., & Wiggins, G. (2013). *Essential questions: Opening doors to student understanding*. ACSD.

Mouasher, A., & Lodge, J. M. (2016). The search for pedagogical dynamism: Design patterns and the unselfconscious process. *Educational Technology and Society, 19*(2), 274–285.

Parrish, P. E. (2005). Embracing the aesthetics of instructional design. *Educational Technology, 45*(2), 16–25.

Parrish, P. E. (2008). Plotting a learning experience. In L. Borruri & T. Stubbs (Eds.), *Handbook of visual languages for instructional design: Theories and practices* (pp. 91–111). Information Science Reference.

Parrish, P. E. (2009). Aesthetic principles for instructional design. *Educational Technology Research and Development, 57*(4), 511–528.

Warburton, S., Mor, Y., & Koskinen, T. (2015). Design patterns for open online teaching and learning (editorial). *eLearning Papers, 42*.

Professional Learning and the Teacher-Led Learning Team: Developing Capacity as Designers and Facilitators of Adult Learning

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Abstract

This chapter focuses on the processes used to develop the capacity of members of the Teacher-Led Learning Team (TLLT) to serve as facilitators of adult learning. The research explored the following question: How have the dynamic processes used by the TLLT impacted team members as designers and facilitators of professional learning? A phenomenological approach was adopted to explore the lived experience of individual team members. Seven team members participated in sequential interviews over a thirteen-month period. Multiple coding cycles enabled horizontal and vertical analysis of the data. The final coding cycle generated three themes: effective professional learning for teacher leaders, qualities and practices of highly effective teams, and continuous improvement of professional practice. Collaborative professionalism is used as a theoretical framework to assess the impact of team involvement on the participants. The chapter concludes with a discussion of the relevance of the research for teacher educators in university contexts.

Résumé

Ce chapitre porte sur les processus utilisés pour développer la capacité des membres de l'Équipe d'apprentissage dirigé par l'enseignant (EADE) à agir comme facilitateurs de l'apprentissage des adultes. La recherche a exploré la question suivante : en quoi les processus dynamiques utilisés par l'EADE ont-ils influencé la capacité des membres de l'équipe à agir comme concepteurs et

facilitateurs de l'apprentissage professionnel? Une approche phénoménologique a été adoptée pour explorer les expériences vécues par les sept membres de l'équipe qui ont participé à des entretiens séquentiels échelonnés sur une période de treize mois. Le recours à plusieurs cycles de codage a permis l'analyse horizontale et verticale des données. Le dernier cycle de codage a généré trois thèmes : l'efficacité de l'apprentissage professionnel des leaders enseignants, les caractéristiques et les pratiques des équipes hautement efficaces, ainsi que l'amélioration continue de la pratique professionnelle. Le professionnalisme collaboratif est utilisé comme cadre théorique pour évaluer l'impact, sur les participants, de la pratique d'implication dans l'équipe. En conclusion, le chapitre discute de la pertinence de cette recherche pour les formateurs d'enseignants en contexte universitaire.

To develop the capacity to design and facilitate adult learning, teachers require experiences that allow them to learn about the structures, environments, and processes that support adult learning. The innovation discussed in this chapter considers the processes that have been used to develop the capacity of the Teacher-Led Learning Team (TLLT), of the Manitoba Teachers' Society (MTS), to enable members to serve as facilitators of adult learning for their teaching colleagues. At the foundation of this recent innovation are the professional learning opportunities provided to the team, the collaborative nature of their work, and the ongoing cycles of data-driven inquiry used to revise their workshops and strengthen their facilitation skills. The research question was: How have the dynamic processes used by the TLLT impacted team members as designers and facilitators of professional learning? The capacity building processes used by the TLLT are assessed by examining the impact of involvement on individual TLLT members and their educational communities through the lens of collaborative professionalism.

Literature Review

Professional Learning Design

Three common features of quality professional learning are quality content, attention to learning design and implementation, and planning for sustainability and support (Campbell et al., 2016). Among other criteria, critical content and facilitation should be research-based, strategic design should include collaborative inquiry, and groups should work together over an extended period of time in order to enhance sustainability. Effective professional learning frameworks are job-embedded, action-oriented, facilitated, and data-driven (Darling-Hammond et al., 2017; Fullan & Hargreaves, 2016, Hargreaves & O'Connor, 2018; Learning Forward, 2014; OECD, 2016; Timperley, 2008). Teacher agency is developed in learning communities that use teachers as planners, designers, implementers, and decision-makers; where self-selected and self-directed teams develop norms; where learning is collaborative, constructivist, and based on adult learning

principles; and where protocols and feedback loops are used to monitor implementation (Calvert, 2016). Action research (Stringer, 2014) can provide an effective guide for structuring data-inquiry cycles that incorporate data collection and analysis to facilitate learning from practice.

Bowman's Learning Principles

Adult learners have multiple demands on their time and professional learning needs to be relevant and engaging to maintain their attention. Facilitators, who understand that adult participants are often already familiar with a workshop topic, are able to facilitate constructivist processes that help participants interact and collaborate to extend their existing knowledge. Bowman's (2009b) six trumps identify approaches that "trump" the alternatives and can be used to increase the engagement and relevance for learners (Table 1).

Table 1

Bowman's Six Trumps and Their Implication for Facilitators of Professional Learning

Trump	Research Support	Implications
"movement trumps sitting"	Movement increases oxygen flow to the brain.	Get people up and moving every twenty minutes
"talking trumps listening"	Learning is a social process that requires conversation	Include frequent opportunities for related dialogue in varied groupings
"images trump words"	Images are easier to remember than text	Use visuals on slides and during activities, share personal stories
"writing trumps reading"	Writing requires the full brain and enhances memory	Include frequent opportunities to write down important ideas or questions
"shorter trumps longer"	Small chunks of information are easier to remember	Create presentations using chunks of 10–20 minutes per topic
"different trumps same"	Novelty makes things memorable	Vary your instructional approach frequently to keep things exciting

Note. This table was created with information from Bowman (2009a; 2009b).

To develop constructivist learning that builds on the knowledge of workshop participants, Bowman suggests a four-step workshop design framework consisting of connections, concepts, concrete practice, and conclusions (2009a). Bowman recommends that facilitators engage learners from the first moment of contact and focus on "need to know" versus "nice to know" content. Bowman's brain-friendly principles encourage facilitators to provide: "positive

emotional experiences, multi-sensory stimulation and novelty, instructional variety and choices, active participation and collaboration, and informal learning environments" (2009a, p. 32). Bowman's learning principles assist facilitators in developing purposeful plans for learning.

Intentional Facilitation

Intentional facilitation of learning requires knowing what, how, when, and why to use particular strategies and making informed choices. Participating in learning strategies enables future facilitators to understand the "what" and 'how" of an activity and the emotions and thoughts it may generate for participants. Leaders who model effective facilitation strategies and clearly articulate their planning process provide the metacognition that explains the "when" and the "why" of their facilitation choices. These two activities, participating in the learning and witnessing the modeling and metacognition of effective practice, can help future facilitators develop the mindset of a workshop designer. Workshop designers are clear about their intent and select strategies purposefully to achieve their goals (Bowman, 2009a; Lipton & Wellman, 2011).

Three core elements that support the development of intentional facilitation are relational trust, collaborative practice, and data-driven inquiry. Relational trust includes four specific interpersonal considerations: "respect, personal regard, competence in core area responsibilities, and personal integrity" (Bryk & Schneider, 2003, p. 42). Leaders who model these principles can assist groups in developing a high level of relational trust (Bryk & Schneider, 2003; Kochanek, 2005; Tschannen-Moran, 2014). Relational trust develops in learning communities through relationships, group norms around risk-taking and change, and the leader's actions (Cranston, 2011, pp. 64–67). High levels of trust increase risk-taking, vulnerability, and comfort with change (Brown, 2010), and are essential when groups tackle new challenges. Relational trust is seen as the pre-requisite for collaborative practice: "We can't jump into collective professional

development until people have had the opportunity to develop trust in each other" (Cranston, 2011, p. 66).

Collaborative approaches demonstrate a strength-based approach to build upon and increase the capacity of group members (Donohoo et al., 2018). The assumption is that the necessary skills either exist or can be developed by group members, including how to manage conflict effectively (Aguilar, 2016). Collaborative curriculum design (Pieters et al., 2019) requires individuals to work together on a shared task, while strengthening their individual and collective efficacy (Bruner, 1977; Donohoo et al., 2018).

Ongoing cycles to analyze participant feedback data ensure that future facilitation decisions are deliberate and based on evidence (Stringer, 2014). The data-driven inquiry (Lipton & Wellman, 2012) process maximizes facilitators' responsiveness, stimulates continual growth, and enhances transparency. Decisions that are based on evidence drive future practice and initiate the subsequent inquiry cycles that facilitate continuous improvement. Relational trust, collaborative practice, and data-driven inquiry support intentional facilitation of professional learning.

Research Context

The TLLT is comprised of approximately two dozen public school educators who are released from their school responsibilities for up to four days per year to co-facilitate workshops for schools, divisions, and local teacher associations of the Manitoba Teachers' Society (MTS). In its capacity as the professional society that represents all public educators in the province, MTS uses members' dues to cover the volunteer educators' travel expenses for training sessions, planning meetings, and workshop deployments throughout the province. Deployment is the term MTS uses to signify a specific workshop date and location that is assigned to particular TLLT members. The minimal flat rate MTS charges for a teacher workshop is standard regardless of

geographical location, number of participants, or school size—a policy designed to ensure equitable access to professional learning province-wide. By accepting a two-year term, members agree to attend all team training events and to facilitate up to four workshops annually.

To facilitate the preparation of workshops, members of the TLLT participate in up to eight days of professional learning per year. The Summer Seminar is an intense three-day experience held in late August, followed by two two-day planning meetings in September and October, and a Day of Reflection in May. Team seminars focus on group dynamics, facilitation skills, adult learning, content knowledge, workshop preparation, group development, reflective processes, wellness, and community-building. An agenda for each session, distributed in advance, includes the intended outcomes, the learning intentions, and a required reading or task to be completed before the seminar.

During the training seminars, team members are assigned time to work in TLLT Design Teams, which are small groups of four to six members who share responsibility for developing, facilitating, and revising workshops on a specific topic. The six Design Teams active at the time of this research were:

- More than Classroom Management (CM)

- High Impact Teams (HIT)

- Working Effectively with EAs (WEE)

- Opening the Door to Reconciliation (ODR)

- LGBTQ+ Realities

- FISH! Food for Thought (positive mindsets based on fishphilosophy.com)

When a new member joins the TLLT, they are assigned to a design team to help develop, revise, and facilitate one workshop. In subsequent years, members may cross-pollinate by joining other design teams while continuing to facilitate their initial workshop topic.

Data collection processes are incorporated into all aspects of TLLT activities. To support the development of a strong team and quality workshops, team members complete participant feedback reports at the end of team seminars, provide peer feedback to design teams when they pilot their workshop, and write facilitator reports after each deployment. TLLT workshop participants complete Walking out With (WOW) slips, which identify their key takeaways, and complete participant feedback reports. MTS staff aggregate the workshop data to produce bar graphs and collate the written comments for design teams to review during TLLT seminars.

Methodology

Research Methodology

The research question for this study was: How have the dynamic processes used by the TLLT impacted team members as designers and facilitators of professional learning? As a phenomenological study (Moustakas, 1994), this research explored the impact of the TLLT membership, as lived experience, on individual team members. In accordance with the university's ethical guidelines, all current team members could volunteer to be included in the study. From the nine members who volunteered, seven participants were selected to be representative of the team, reflecting a diversity of geographical region, positions, language, length of time on the team, and type and number of workshops delivered. Table 2 provides a snapshot of the interview participants and their range of experiences.

Table 2

Interview Participants by Name, Years of Experience, Educational Positions, and First Year on TLLT

Name*	Experience (years)	Educational Positions	Position(s) During Interview Period	First year on TLLT
Allison	15	Learning Assistance Teacher Team Leader MY** Teacher Librarian MY	Teacher Librarian MY Y1 Teacher Librarian SY in Y2	2018
Andrée	14	Classroom Teacher K-8	Classroom Teacher K and 1 Local Teacher Association Leader	2015
Darryl	10	Classroom Teacher MY Divisional Technology Coach	Divisional Technology Coach (80% then 100%)	2017
Jeff	28	Classroom teacher MY/SY Teacher Librarian MY/SY Literacy Coach K-12	Divisional Instructional/Literacy Coach	2015
Nadine	21	Speech Language Pathologist K-12 Augmented Communication Adult Learning Facilitator	Acting Area Service Director (District of large division) Speech Language Pathologist (District)	2016
Roberta	19	Classroom Teacher EY/MY Student Services (school)	Instructional support teacher (divisional)	2015
Wayne	13	Classroom Teacher SY	Classroom teacher (2018–2019) Indigenous Support and Resource (2019)	2016

Note. *Pseudonyms for interview participants; **Manitoba grade levels include Early Years (EY) grades K-4, Middle Years (MY) grades 5–8, and Senior Years (SY) grades 9–12.

The manageable sample size allowed for two to four one-hour interviews with each volunteer over the course of one year. Initial interview questions asked participants to reflect on team training, workshop development and facilitation, how data was used to guide the team, and how they had been personally impacted by their TLLT involvement. Subsequent interviews included questions catered to each participant after reviewing their most recently recorded interview and the corresponding field notes. The twenty-two sequential interviews were recorded between November 2018 and December 2019, using Zoom videoconferencing tools. Transcripts were created from the recordings by a research assistant and the transcripts were subsequently checked for accuracy by participants.

Data Analysis

The data analysis process involved multiple recursive cycles in which the interview transcripts were examined through different lenses (Table 3). The final cycle using "themeing" [*sic*] (Saldaña, 2013) generated the three themes that are presented as findings in this chapter. Analyzing the interview transcripts through individual and comparative lenses exposed variations in how members experienced their time on the team. The range of experiences that contributed to their personal and professional growth during data collection added complexity to the analysis and findings of this study.

Table 3

Data Analysis Process

Unit of Analysis	Coding Method	Outcome Format
Interview transcripts per interview per participant	Attribute coding Structural coding Descriptive coding (Saldaña, 2013)	Participant synthesis chart Participant profiles (Seidman, 2006)
Interview transcripts Participant synthesis charts Participant profiles	Structural coding Descriptive coding Sub-coding Content analysis Thematic analysis (Saldaña, 2013; Thomas, 2009)	Thematic codes per category (Hesse-Biber & Leavy, 2006)
Participant synthesis charts Thematic codes per category Field notes Research literature Theoretical framework	Themeing [*sic*] the data (Saldaña, 2013)	Over-arching themes presented in the findings

The analytic process was strengthened by programmatic insights I acquired when conducting previous action research program evaluation (Stringer, 2014) of the team's first two years of operation. In the previous evaluation, I articulated a design theory that defined the essential features of the TLLT, synthesized key learnings from the first two years of operation, and described the impact of participation on the TLLT members' identities as teacher leaders (Fullan Kolton & Smith, 2018; Smith, 2018; 2019). I had encountered some of the individuals

previously in a professional capacity through my work as the program's evaluator, school leader, professional development facilitator, and university professor. As a result, my position as a friendly outsider (Greenwood & Levin, 2007) allowed me to bring theoretical sensitivity (Strauss & Corbin, 1990) to interpreting the research data. The study is limited by the number of participants, the time frame (only one-year), and its reliance on personal recollections.

Theoretical Framework

In this qualitative study, I acknowledge that reality is subjective and that my analysis of the data will inevitably be filtered through my own values, biases, and understandings of the phenomena. The research is situated within the social-constructivist paradigm (Bruner, 1977; Vygotsky, 1979), as I sought to fully understand the participants' perspectives and how their experiences with the TLLT impacted their work and personal lives.

Collaborative Professionalism

I examined the impact of participation on individual TLLT members and their educational communities using collaborative professionalism as a lens. The secret to high functioning teams is a high level of collaborative trust (Aguilar, 2016) and collaborative professionalism (Fullan & Hargreaves, 2016; Hargreaves & O'Connor, 2018; Osmond-Johnson, 2017), which includes: individual and collective accountability, continuous improvement, persistent action, and reflective feedback. Teams and team members who are able to be honest with each other in an atmosphere of trust are able to take risks and encourage each other to grow professionally. Team development processes that adhere to the principles of collaborative professionalism (Fullan & Hargreaves, 2016) embed diversity and ensure teacher leaders develop individual and collective capacity. Facilitating professional learning can be a powerful learning opportunity that involves teachers in "influencing, (co)developing and sharing professional

knowledge" (Lieberman et al., 2015, p. 96) with their educational colleagues. Thus, collaborative professionalism is used as a lens to assess the impact of involvement on team members.

Findings

The research findings are presented in three themes: effective professional learning for teacher leaders, qualities and practices of highly effective teams, and continuous improvement of professional practice. The structure of the themes and sub-themes to be discussed are outlined in Table 4.

Table 4

Themes Identified in Data Analysis and Used to Present the Findings

Theme	Sub-Themes
Effective professional learning for teacher leaders	Intentional design Respect for the adult learners Deliberate and emotionally intelligent modelling Learning stance
Qualities and practices of effective teams	Relational trust is an essential quality of effective teams Collaborative practices are essential for effective teams
Continuous improvement of professional practice	Collaborative data analysis Peer feedback Workshop revision

Effective Professional Learning for Teacher Leaders

The professional learning facilitated for the TLLT members was, for many participants, the highlight of their involvement with the team. Frequently they commented on the high calibre of their learning experiences and the very clear connection between their learning and the workshops they would be expected to facilitate in the field. The intentionality of the professional learning design ensured that their adult learning needs were respected. The emotionally intelligent coordinator modeled the design and facilitation strategies the participants would be expected to use, and a learning stance.

Intentional Design

It was evident to team members, when they received their first pre-Summer Seminar package, that decisions about the TLLT had been made with intention and were based on research. They were asked to complete Fast Pass (Bowman, 2009a) activities and immerse themselves in reading and reflection about upcoming seminar topics prior to their arrival on site. According to TLLT members, arriving at a seminar with background information and a clear vision for the seminar helped establish an anticipatory mindset and fostered team cohesion.

Respect for the Adult Learner

When participants were asked to reflect on their initial impressions of the TLLT Summer Seminar, their comments made it clear that they felt respected as professionals and as individual adult learners. Nadine described her memories,

> Okay so my first impressions were … really just wow they're treating me like a professional! … someone who spent a little bit of money on you, gave you a bag with Teacher Led Learning Team on it, you had a name tag … the anticipation of what we might want and need … you're just instantly invested in the ongoing success of the team because you've been invested in …

At their first seminar, in addition to their bag and name tag, members were provided with a team handbook and professional reading books. Members learned that later, when they went out on workshop deployments, they would be provided with a complete kit of resources including everything required to facilitate the workshop for a specific group. Respect was further demonstrated when the coordinator was reliable, adhered to the scheduled time frames, asked their permission to make changes, and considered practicalities such as the need for outdoor breaks, the benefits of a balanced day schedule, and the importance of nutritious meals. One individual remarked that when your adult learning needs were taken care of, you could thrive

within the structure. As a consequence of the careful and thoughtful planning for adult learning, team members described the seminars as having a profound impact through experiences that shifted their thinking and their identities.

Deliberate and Emotionally Intelligent Modeling

Learning is more powerful when there is consistency between the content of the instruction and the methods being used to teach the material. The strategies used by the coordinator to plan and facilitate the team's professional learning mirrored the approaches being suggested as models for the design teams. Jeff noted that: "The activities that we did mirrored what we would be doing once we went out into the field." This deliberate modelling of planning and facilitation during seminars allowed team members to observe the learning activities in action and experience them as learners. The coordinator was explicit about the decisions she made when selecting and designing the learning activities, and this high level of metacognition supported them as adult learners. The application of Bowman's (2009a) learning principles during seminars stood out for participants as supportive. Specific principles mentioned included honouring the wisdom of the adults in the room, the consistent use of collaboration, opportunities for movement and time outdoors, and a spacious and pleasant learning environment. As a facilitator, the coordinator took risks in her delivery, trying out strategies that were new to her, and these innovations fostered investment and trust amongst team members.

Intense and personal learning experiences can elicit strong emotions. It was important to the TLLT members that the coordinator modeled emotional intelligence in her leadership. She paid attention to developing and strengthening relationships with each team member. Frequent regrouping of team members during collaborative learning activities helped individuals to develop relationships with all the other team members. Through acknowledging and validating the strong emotions expressed verbally or non-verbally by team members, the coordinator

provided emotional support for the team and modeled ways in which they could provide such support for one another.

Learning Stance

The high level of risk-taking and support modeled by the coordinator reinforced and exemplified the expectation, among members, to adopt a learning stance in their teamwork. When the coordinator stumbled over a new learning protocol or things didn't work out exactly as she had envisioned for the group, she used those moments to exemplify the importance of a growth mindset. This gave permission to team members to also take risks, make mistakes, and identify areas for growth. Darryl valued "working with so many people that were of a growth mindset. So many people that were like interested in changing what they do all the time."

The intensity of the learning experience was overwhelming for many members at first. Many of those interviewed repeated one team member's description that it was like "being hit with a fire hose." As Darryl explained, "It's always overwhelming. Like you are always mentally exhausted about the time you leave just because there is always so much to learn and do." The expectation of accountability increased the immediacy of their learning: "Right away you figure out that you're completely accountable" (Jeff); "At TLLT we have to go up there and we have to show what we've learnt … immediately" (Wayne). So much of the content was applicable to their own teaching contexts, that team members immediately saw the relevance of what they were learning and the ways in which it would change their practice as educators: "Honestly the amount of professional development I got, the learning I got was incredible. It changed my teaching practice almost immediately" (Wayne). Nadine became empowered to learn independently.

As of late … I am empowered to do my own study … and use it in ways that … are

shifting my practice. So it keeps me stimulated … and I just guess that I feel more

empowered to be able to do that.

The overall learning experience was described frequently as exciting and many members

mirrored Roberta's oft repeated statement: "I really feel like it's been probably the best

professional learning of my life."

Qualities and Practices of Effective Teams

Team structures are embedded in the work of schools and in the TLLT**:** The group

functioned as one provincial team, while smaller teams designed and facilitated workshops, and

one of the design teams delivered a workshop titled High Impact Teams. The centrality of

teamwork to the format and content of the TLLT workshops made it critical that the coordinator

and team members understood the role that relational trust plays in building collaborative teams

that persistently demonstrate individual and collective efficacy.

Relational Trust is an Essential Quality of Effective Teams

Interactive seminar learning activities helped team members establish strong feelings of

trust in a safe environment. Rituals developed during the seminars, such as daily sharing circles,

helped strengthen the trust between members and as a team. "The way it was designed was to

really develop a culture of collaborative trust and it was so well done" (Roberta). Andrée referred

to the level of intensity and personal investment present during these sessions as the "TLLT

vibe." Experienced team members reported that they wanted (and expected) new members to

absorb this vibe rapidly and become a part of the team. Like the teaching profession, the TLLT

design was flat, meaning that new members had the same responsibilities and expectations as

their more experienced teammates.

Design team members were expected to support one another emotionally as they often dealt with difficult content. Nadine was one of a few members who described emotional fatigue after a difficult design team session:

> working with Indigenous and non-Indigenous participants on a topic that is so emotionally loaded—you can't depersonalize it. There's a really strong layer of cognitive dissonance that's required that I had to learn …; some of my greatest lessons came with some of my hardest interactions on TLLT.

The design teams were expected to use their high levels of relational trust to figure out their own issues without bringing them to the coordinator for resolution. However, for teams that focused on more emotionally challenging topics, such as reconciliation and equity, there were occasions when a design team called upon the full team for emotional support. Difficult emotional work required a high level of vulnerability and could impact individuals differently. Teams that had a high level of relational trust were able to tackle difficult work and establish safety mechanisms that could be activated when necessary.

Design teams tackled the difficult work of developing a workshop collaboratively, co-facilitating the workshop in the field, and reviewing feedback to improve the workshop. The collegial culture and relational trust developed on the teams supported this collaborative work. When they facilitated a workshop, design team members were accountable to follow the decisions made by the group, so it was important that new members were well prepared by the team before being asked to facilitate a workshop.

Trust is a living interpersonal dynamic that cannot be taken for granted. Because it can be disrupted by changes in routine, personnel, or tasks, trust may need to be renegotiated during periods of upheaval. Midway through data collection, an interim coordinator was appointed for TLLT, which introduced a degree of uncertainty for team members. When the appointment

became permanent, team members differed in how they experienced the change. Some individuals focused positively on the shift to the new coordinator and described any perceived differences in style as novel and exciting, while other team members described the atmosphere as uncomfortable and not emotionally safe. In earlier interviews, members had reported that trust was enhanced when tensions were named and addressed within the team. It appears that the shift in leadership disrupted the established levels of relational trust, that the emotional impact of the change had not been fully addressed as in the past, and that some individuals felt the need for relational trust to be renegotiated and re-established in response. The shift in leadership impacted all participants differently and the experience tested, without destroying, the previously high levels of trust on the team.

Collaborative Practices are Essential for Effective Teams

The interdependence of members of TLLT design teams meant there needed to be a shared understanding of what practices support effective collaboration. Among the core tenets of collaborative professionalism (Fullan & Hargreaves, 2016) are the concepts of collective autonomy and responsibility, individual autonomy and responsibility, and persistent action. In the following section, I elaborate on these three concepts in the context of my data.

Collaboration is central to the work of the TLLT design teams that share responsibility for the development, facilitation, and revision of workshops. This collective responsibility helped members build capacity as they learned "the dance of, you know, shared leadership, and co-facilitation and co-design work" (Nadine). While co-constructing workshops, individuals recognized the skills their coordinator modeled, such as active listening and consensus decision-making and compromise, were essential for collaborative work. Although the design teams had a great deal of autonomy in developing their workshops, they still required support from specialists

to acquire shared content knowledge, and from the coordinator to access resources and to finalize the workshop materials.

To be able to work effectively as a team, members reported that it was important for them to understand the characteristics of highly effective teams (Aguilar, 2016) and to develop group norms (Calvert, 2016) to ensure that all voices would be valued. Co-facilitation was a responsibility shared by design team members. Most of the interviewed people found co-facilitation to be more powerful than doing workshops alone, and that having a co-facilitator was very supportive when workshop content was difficult for participants. In reflecting on their experiences, members remarked that facilitating with another team member required strong communication skills and flexibility. When working closely together, team members learned that individuals viewed the pacing of the workshop with different degrees of rigidity. Despite the challenges of co-facilitation, members perceived it as a great way to collaborate and support each other before, during, and after a workshop.

Individual team members were accountable to maintain fidelity to the workshop that had been designed collaboratively. To support this process, each team member needed to understand the rationale behind workshop decisions. Understanding the design process increased confidence in the workshop and helped presenters to deal with their nerves when presenting. To help new members develop confidence, experienced team members found it satisfying to mentor new team members by having them observe a workshop or co-facilitate. When new members joined a design team, it was important that the individuals already on the team remained open to new ideas, as sometimes workshops needed to be changed to ensure all members were comfortable with the content. Reflecting on the experience of joining an established design team, Allison noted that a knowledge of group dynamics helped her to understand the team and what she could contribute. Individual perspectives differed on how well existing teams managed the challenge of

making space for new members, though most people interviewed felt that new design team members were welcomed with open arms.

With time, new design team members were able to figure out their role and quickly became senior members when a team's composition changed. With observation, familiarity, and experience, design team members gained confidence in delivering the workshop and learned how to make it feel authentic by sharing their own anecdotes. Jeff cross-pollinated with a number of design teams and found that his knowledge of "TLLT moves" (frameworks and facilitation strategies) made it easier to understand a workshop's structure and to feel comfortable quickly when facilitating a new topic.

Consensus around the individual responsibilities of team members and the collective responsibilities of design teams facilitated ongoing collaboration. The collective autonomy of design teams gave them control over development and delivery of their workshops through the processes of collaborative curriculum design and co-facilitation. Individual autonomy supported team members to find their own way when joining the team, to go on workshop deployments when they felt ready, and to personalize their workshop delivery to increase authenticity.

Collaborative work with a design team started on the first day of the first summer seminar that a member attended and continued throughout their term on the TLLT. Members were expected to maintain their focus on the work of the design team and the facilitation of the workshops they developed. All elements of the team's operations were selected intentionally to strengthen the learning experience for TLLT workshop participants. Persistence was visible in the prominent role of design team planning time during every team seminar. Nonetheless, some members who had joined teams with existing workshops had not had the opportunity to design a new workshop, something they would have liked to do. Persistence was also featured when time

pressures were placed on design teams. While the time pressures were experienced as stressful, members reported that pressure accelerated the decision-making process.

Responsibilities were not always equitably distributed amongst team members. The variable demand for workshops and varying professional roles and responsibilities made it hard to ensure an equal number of deployments per member. Some members used their four allocated days for workshops early in the year while others were left with unused days at the end of the year. Some members were in more demand than others to deliver their particular workshops because of their expertise, linguistic fluency, or Indigenous cultural heritage, and found they experienced fewer opportunities to cross-pollinate with other design teams.

Continuous Improvement of Professional Practice

Developing skills to understand and learn from the data (Lipton & Wellman, 2011) during team seminars helped teams move through the processes of data review and analysis that led to subsequent workshop revision. Their professional learning experiences and the use of protocols made the data review process more valuable for team members. Nevertheless, despite this preparation, members found that it took them time to understand the story the data was telling (Brown, 2010) and to develop familiarity with data analysis processes.

Collaborative Data Analysis

Members reported that the data review process used by the design teams was more powerful and rewarding because it was shared. Looking at the aggregate data together as a design team allowed members to depersonalize the feedback and focus on the workshop itself, rather than making recommendations based on their personal facilitation experiences. Since the data review process took place independently from the team coordinator, team members relied on each other to make sense of the data and deduce the significant findings. Jeff recalled,

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My memory is that the group is huddled over a table and we have all the readouts and

printouts on that table. And then if I remember correctly, I think we begin sorting it and

coming up with, you know, strengths, challenges, and next steps, … that was sort of the

general process.

Members found it helpful to review the collated participant feedback data presented in the form

of bar graphs, as well as the collated comments from WOW slips. The bar graphs provided teams

with a visual synthesis of the Likert scale responses, while the WOW slips helped the teams

identify positive features of the workshops that were resonating with participants. The traffic

light system on the facilitator reports that asked for suggested elements in the workshop to stop,

start, or adapt, generated many useful ideas for the teams. The excessive quantities of data could

be overwhelming for the teams, but by repeatedly engaging in data review and analysis over

time, they found they were able to recognize trends in the data.

Peer Feedback

Similar patterns were evident in the processes used with peer feedback. Co-facilitators

helped each other to depersonalize workshop feedback when they reviewed it together. Wayne

said he would often walk around the school with a co-facilitator during a break to share their

individual perceptions of the workshop's activities. Some individuals liked to read over the

participant feedback immediately with their co-facilitator, while others liked to do a personal

reflection on the drive home or the next day, before they read the participant feedback. Some

members reported that familiarity with the workshop and recency of facilitation influenced their

ability to provide meaningful feedback to co-facilitators during deployments and the

collaborative data review process. Yet during TLLT seminars, when design teams would pilot a

new workshop, members said that they felt capable of giving their peers feedback because they

understood the workshop development process. Wayne commented that peer feedback received

through the fishbowl approach (Aguilar, 2016), where design team members piloted a workshop and then listened to non-design team members discuss what they had noticed, was particularly powerful. Wayne attributed the honesty and value of the feedback to the high level of trust established on the team.

Workshop Revision

Insights gained through data analysis and peer feedback informed the workshop revision process. The shared desire to strengthen the workshop had to take precedence over the personal egos of team members. The revision process could be delicate and individuals agreed that it was important to show respect for the work of a preceding design team. Yet Roberta believed that "the more voice, the more eyes, the more ideas you can put around a given workshop, the better they become." As a newcomer observer of the process, Andrea observed a design team creating revisions that were guided by their personal needs for novelty rather than the workshop feedback. Jeff, Darryl, and Andrée reported that their design team reached a saturation point where they no longer wanted to make revisions to their workshop, because both facilitator and participant feedback were positive. In these types of situations, members deemed it particularly important that all voices be heard, as new members to a team could bring new perspectives to the revision process.

The consistent use of reflective feedback strengthened individual team members and honed their facilitation skills. The data-driven inquiry cycles drove the revision process that strengthened workshop design and delivery. All combined, these processes served as catalysts for the continuous improvement of the professional practice of members of the TLLT.

Assessing the Impact of Collaborative Professionalism on TLLT Members

Through this analysis, the practices of the TLLT and the experiences reported by members appear to align closely with Fullan and Hargreaves' (2016) features of collaborative

professionalism. The authors use the phrase "professional learning development" (PLD) to convey the importance of both pedagogical and personally enriching content. Participants reported that TLLT seminars attended to both foci. Seminars also exhibited the indicators of professional learning communities that build teacher agency, as articulated by Calvert (2016). The high level of relational trust developed amongst the team members facilitated the individual and the collective autonomy and responsibility as noted by Fullan and Hargreaves (2016). Relational trust (Bryk & Schneider, 2003) was reflected in the relationship between the coordinator and team members, and the capacities developed in team members. Design team members noted that collaborative curriculum design and workshop delivery required high levels of trust and facilitated growth in collective efficacy (Cranston, 2011; Donohoo et al., 2018). Fullan and Hargreaves assert that "professional expertise is acquired through persistent action, reflective feedback, and continuous improvement" (2016, p. 9). The reflective cycles used by the design teams to revise and improve their workshops and their effectiveness as facilitators mirror all three of these elements. Further, the authors describe strong teams as strength-based and thriving on diversity, both qualities that featured prominently in the members' interviews.

The data showed that the team members reported increased growth, confidence, and efficacy as individual and collective facilitators of adult learning, and greater agency to tackle new challenges. These findings align with Fullan and Hargreaves, who state that "cultures of collaborative professionalism … promote good variation of style, strengths, and overall approach, and increase individual as well as collective talent" (2016, p. 18). Such cultures are likely to stimulate personal and collective growth, develop more confident, mature, and accepting individuals who are more trusting and resilient than before. The authors identify six specific areas of individual and collective improvement that result from such cultures: autonomy,

impact, responsibility, inquiry, efficacy, and mindset. In the following paragraphs, I demonstrate how these six areas were evident in this TLLT research.

Individual and collective *autonomy* were developed through the collaborative work of the design teams. Participants noted that the sense of agency they felt with their design team transferred to other parts of their professional lives. Individually, TLLT *impacted* members positively by developing their comfort with risk-taking, even though it also increased the demands on their personal time. Being on the TLLT opened up new opportunities for individual members and they became more intentional in their professional work. As they applied the skills learned through the TLLT in their school and divisional contexts, members observed a shift in divisional approaches to professional learning. *Responsibilities* for the TLLT members increased during their involvement with the team; six of the seven members interviewed assumed positions with increased responsibility, such as learning support teachers or coaches while on the team, and four moved into division and/or community leadership positions. Individual members became *increasingly curious* about their own practice, and demonstrated their increased interest by seeking out new learning and sharing resources and ideas that they encountered through the TLLT with their professional colleagues.

The greatest impact on the TLLT members was in the area of individual and collective *efficacy*. Every person interviewed was confident that they had become a stronger, more effective teacher, facilitator, and collaborator as a result of their time on the team. Roberta remarked, "I'm more comfortable with the content …; I really have a sense of the pacing …; I feel like I'm really comfortable in my own skin as a facilitator." Every person interviewed had applied their learning by using TLLT strategies in multiple contexts including classrooms, schools, divisions, and professional associations. The varied strategies supported improved practice: "I am a better teacher because of TLLT …; I use TLLT in my classroom every day."

Two TLLT members interviewed moved into coaching roles within the same school division and remarked that their frequent use of TLLT approaches was shifting the norms and practices of professional learning within the division. Finally, members described how they had fully embraced a growth *mindset* which influenced the intentionality with which they approached their professional responsibilities and their desire to create optimum learning conditions for others. Nadine reflected on her practice:

> Pretty much most of my day is spent applying some techniques I've learned through TLLT, whether it's modelling of … instructional strategies that I've learned … or it's the core principles around adult learning, whether it's the protocol, like it's everything. I'm constantly throughout my day embedding principles that I've learned from TLLT.

Clearly TLLT practices align with the characteristics of collaborative professionalism and resonate with the related literature. The examples identified describe improvements in the individual and collective capacity of team members in the six identified areas (autonomy, impact, responsibility, inquiry, efficacy, and mindset) of outcomes that emerge within cultures of collaborative professionalism. Significantly, the collaborative professionalism characteristics align with the TLLT experiences which members credited for their increased capacity as designers and facilitators of adult learning.

Conclusion

To have impact, professional learning should be intellectually challenging, participatory, and collaborative. Educators are frequently disengaged and disappointed in the professional learning they experience as it fails to meet their needs as adult learners. The members of the TLLT interviewed for this study made it clear that their teaching, facilitation, and collaboration skills were enhanced significantly through professional learning, collaborative practice, and data-driven inquiry. These lessons can be applied by teacher educators in academic contexts to create

effective learning environments. Teacher educators should model intentional practice by incorporating current knowledge about brain-friendly learning into the design and implementation of instruction. Strategies utilized by the TLLT can be applied in academia to ensure that graduating students value a learning stance, develop personal efficacy, contribute to collaborative teams, engage in reflective practice, and make data-driven decisions. Faculty must ensure that the mid-career teachers and teacher leaders who enroll in graduate programs understand the theory and practice of collaborative professionalism that can be used to improve learning environments within classrooms, schools, divisions, and universities.

References

Aguilar, E. (2016). *The art of coaching teams: Building resilient communities that transform schools.* Jossey-Bass.

Bowman, S. (2009a). *Training from the back of the room: 65 ways to step aside and let them learn.* Bowperson Publishing.

Bowman, S. (2009b). *Using brain science to make training stick: Six learning principles that trump traditional teaching.* Bowperson Publishing.

Brown, B. (2010, June). *The power of vulnerability*. TEDxHouston. https://www.ted.com/talks/brene_brown_the_power_of_vulnerability?utm_campaign=teds pread&utm_medium=referral&utm_source=tedcomshare

Bruner, J. (1977). *The process of education.* Harvard University Press.

Bryk, A., & Schneider, B. (2003, March). Trust in schools: A core resource for school reform. *Educational Leadership,* 40–44.

Calvert, L. (2016). *From compliance to agency: What teachers need to make professional learning work.* Learning Forward and NCTAF. https://learningforward.org/report/moving-compliance-agency-teachers-need-make-professional-learning-work/

Campbell, C. Osmond-Johnson, P., Faubert, B., Zeichner, K., & Hobbs-Johnson, A. (2016). *The state of educators' professional learning in Canada: Executive summary.* Learning Forward. https://learningforward.org/report/professional-learning-canada/state-educators-professional-learning-canada-executive-summary/

Cranston, J. (2011). Relational trust: The glue that binds a professional learning community. *Alberta Journal of Education, 57*(1), 59–72.

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development.* Palo Alto, CA: Learning Policy Institute.

Donohoo, J., Hattie, J., & Eells, R. (2018). The power of collective efficacy. *Educational Leadership, 75*(6), 40–44.

Fullan Kolton, D., & Smith, C. (2018, June). Teacher-Led Learning Team. Canadian Teachers' Federation (CTF) Perspectives. http://perspectives-ctf-fce.ca/2018/06/14/teacher-led-learning-team/

Fullan, M., & Hargreaves, A. (2016). *Bringing the profession back in: Call to action*. Oxford, OH: Learning Forward. https://learningforward.org/docs/default-source/pdf/bringing-the-profession-back-in.pdf

Greenwood, D., & Levin, M. (2007). *Introduction to action research: Social research for social change* (2nd ed.). SAGE Publications.

Hargreaves, A., & O'Connor, M.T. (2018). *Collaborative professionalism: When teaching together means learning for all.* Corwin.

Hesse-Biber, S. N., & Leavy, P. (2006). *The practice of qualitative research.* SAGE Publications.

Kochanek, J.R. (2005). *Building trust for better schools: Research-based practices.* Corwin Press.

Learning Forward. (2014). *Standards for professional learning* [Ebook]. Learning Forward.

Lieberman, A., Campbell, C., & Yaskhkina, A. (2015). *Teacher learning and leadership: Of, by, and for teachers.* Routledge/Taylor & Francis.

Lipton, L., & Wellman, B. (2011). *Groups at work: Strategies and structures for professional learning.* Mira Via.

Lipton, L., & Wellman, B. (2012). *Got data? Now what? Creating and leading cultures of inquiry.* Solution Tree Press.

Moustakas, C. (1994). *Phenomenological research methods.* Thousand Oaks, CA: SAGE
Publications.

OECD. (2016). *School leadership for learning: Insights.* TALIS 2013, TALIS, OECD
Publishing. http:dx.doi.org/10.1787/9789264258341-en

Osmond-Johnson, P. (2017). Leading professional learning to develop professional capital: The
Saskatchewan professional development unit's facilitator community. *International
Journal of Teacher Leadership*, *8*(1), 26–42.
https://www.cpp.edu/~ceis/education/international-journal-teacher-
leadership/archives.shtml

Pieters, J., Voogt, J., & Pareja Roblin, N. (Eds.). (2019). *Collaborative curriculum design for
sustainable innovation and teacher learning.* Springer Open. https://doi.org/10.1007/978-
3-030-20062-6

Saldaña, J. (2013). *The coding manual for qualitative researchers* (2nd ed.). SAGE Publications.

Seidman, I. (2006). *Interviewing as qualitative research: A guide for researchers in education
and the social sciences.* (3rd ed.) [Digital version]. Teachers' College Press.

Smith, C. (2019, September). The Teacher-Led Learning Team: Collaborative professionalism in
action. *Research Connection 1*(4). Brandon University. https://www.brandonu.ca/research-
connection/rc-article/the-teacher-led-learning-team-collaborative-professionalism-in-
action/

Smith, C. (2018). Final report on the evaluation of the Teacher-Led Learning Team (TLLT) of
the Manitoba Teachers' Society (MTS) 2015–2017. Brandon University.

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures
and techniques.* SAGE Publications.

Stringer, E. (2014). *Action research* (4th ed.). SAGE Publications.

Thomas, G. (2009). *How to do your research project.* SAGE Publications.

Timperley, H. (2008). Teacher professional learning and development. International Academy of

Education (Educational Practices Series No. 18). Curtin University of Technology.

http://edu.aru.ac.th/childedu/images/PDF/benjamaporn/EdPractices_18.pdf

Tschannen-Moran, M. (2014). *Trust matters: Leadership for successful schools* (2nd ed.). Jossey-

Bass.

Vygotsky, L. (1979). *Mind in society: Development of higher psychological processes.* Harvard

University Press.

Instructional Design Through Universal Design for Learning:
The Voices of Two First-Year Teachers

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Abstract

The Universal Design for Learning (UDL) framework has caught the eye of teacher educators who must prepare new teachers to create inclusive learning environments that support teaching learners with diverse needs. There are potential benefits for teacher educators to introduce preservice teachers to the UDL framework and to support the implementation of UDL during their practicum experiences and at the beginning of their teaching years, in order to assist all students, promote inclusion and acceptance, and engage students in authentic learning experiences. Based on an action research framework and the use of narratives of two beginning teachers, the study provides an opportunity for teacher educators and inservice teachers to consider the potential benefits and challenges of designing curricula in action. The results of the study add to the body of research that explores the ongoing transformation of an accessible and inclusive teaching and learning environment for all learners through the implementation of a UDL framework. The chapter concludes with recommended directions for future research.

Résumé

La conception universelle de l'apprentissage (CUA) a retenu l'attention des universitaires en éducation soucieux d'engager les futurs enseignants à créer un environnement d'apprentissage favorisant l'intégration des apprenants aux besoins variés. La familiarisation des futurs enseignants avec le modèle pédagogique CUA s'avère potentiellement avantageux et cela, dès leur stage de formation et en début de carrière, puisque la CUA vise l'acceptation, le soutien et l'intégration de tous les élèves dans un cadre réel d'apprentissage. Ancrée dans la recherche-action et s'appuyant sur les témoignages de deux enseignants débutants, la présente étude offre l'occasion aux universitaires en éducation, ainsi qu'aux enseignants en milieu scolaire, de jauger les bénéfices et les défis potentiels liés à la conception pédagogique en action. Les résultats de l'étude viennent contribuer à la recherche en cours sur l'accessibilité et l'inclusion de tous les apprenants dans un milieu scolaire en pleine transformation, grâce à la mise en œuvre du modèle CUA. En guise de conclusion, le chapitre offre des orientations pour la recherche à venir.

Introduction

Inclusion is a well-known goal of educational systems, and many policies and practices have been developed to ensure students' individual needs are being met. Classroom teachers are expected to support students with a range of strengths, needs, and interests, in order to meet curriculum outcomes (Bender, 2008; McGuire et al., 2006; Meyer & Rose, 2000; Nova Scotia Department of Education and Early Childhood Development, 2019). Based on the importance of equity, diversity, and inclusivity, teacher education programs need to prepare teachers to create inclusive teaching and learning environments. Pedagogical frameworks, such as Universal Design for Learning (UDL; Rao et al., 2014; Vitelli, 2015), can support teachers in designing curricula that promote teaching and learning for all learners (Bender, 2008).

Universal Design for Learning

Universal Design for Learning designates the paradigm advocated by David Rose, Anne Meyer, and other members at the Centre for Applied Special Technology, otherwise known as CAST (Edyburn, 2010; Glass et al., 2013). UDL uses a "proactive design that takes into account learner variability," and "can be used to reduce barriers in the curriculum and integrate flexible and engaging pedagogical supports from the outset" (Smith et al., 2019, p. 174). This framework considers the classroom as an ecosystem which promotes interaction among students, teacher, resources, and the environment (Nelson, 2014).

UDL is designed to present content in multiple forms so that it is accessible and appropriate for students with diverse backgrounds and abilities (Courey et al., 2012). Rather than modifying sections of instruction, making multiple lessons, and leaving differentiation strategies to the end, UDL ensures that teachers present choices at the beginning of a lesson and throughout its duration. UDL highlights that instruction should be delivered using multiple platforms (visual, tactile, and auditory, to name a few) and that adaptations must be incorporated for the entirety of

a lesson. UDL has three beneficial principle guidelines for teachers and preservice teachers to follow when designing curricula (CAST, 2018).

Three Guiding Principles of UDL

The three main principles of UDL are: multiple means of engagement, representation, and action and expression (CAST, 2015). Engagement is the "why" of learning and recognizes the need to understand a purpose and meaning of curriculum content to enhance student motivation. Representation refers to the "what" of learning and, depending on on student profiles, involves presenting learning content in multiple ways to promote access for all learners. Expression refers to the "how" of learning and a curriculum design that allows for multiple ways students can express their knowledge (CAST, 2015). Each guideline comes with descriptions on how to incorporate and use them successfully in everyday lessons, including how to access, build, internalize, and achieve goals (CAST, 2018).

Implementing a UDL pedagogical framework for curriculum design allows teachers to address the cognitive, social, and emotional variability of all learners in new and flexible ways. However, the question remains whether teachers can function effectively as instructional designers considering the many daily demands on teachers (Edyburn, 2010) associated with serving the needs of diverse student populations. Edyburn (2010) suggested that the developing and implementing of UDL strategies leaves us to "our own devices to try to apply the UDL principles to create more accessible accommodations" (pp. 35–36), and this creates challenges for implementing the potential of UDL within the limitations of the design and product development (Edyburn, 2010). Harkins and Barchuk (2016) explored experienced teachers' perceptions of their use of UDL principles and found that although participants recognized the importance of using the UDL framework for meeting the diverse needs of all students, they were struggling with the implementation process. The importance of implementing inclusive teaching

and learning pedagogies such as UDL also arises in the need for "teacher education programs ... to be more attentive to the changes in reform policy and to address the changing landscape of our classrooms" (Courey, et al., 2012, p. 18).

UDL and Preservice Teacher Education Programs

With the ever-developing diversity in student populations, teacher education programs must continue to adapt their pedagogical frameworks and ways in which programs are delivered. Preservice teachers need to gain an understanding of the necessary skills to plan effective lessons, promote inclusion, adapt instruction, and perform meaningful assessments through pedagogical approaches such as UDL (CAST, 2015). Studies have found that universally designed concepts might also save teachers planning time by "creating modified lesson plans rather than changing them after the fact" (Spooner et al., 2007, p. 11) and that strategies, developed for specific children using UDL principles, improved the learning and accessibility for all students while less time was spent on addressing student behaviour in the classroom (McGuire-Schwartz & Arndt, 2007). However, as McGuire-Schwartz & Arndt (2007) point out:

> There is a lack of research about how to prepare teacher candidates in the planning and carrying out of universally designed lessons. We do not know what works and what does not work, what is effective and what is not. (p. 129)

Although research on UDL and preservice teacher education is limited, there are programs at varying stages of integrating UDL into teacher education programs. For example, East Carolina University (ECU) has implemented three courses (Special Education Assessment, Classroom Management, and Instructional Planning) to help student-teachers develop their knowledge on inclusion using the UDL framework. At ECU, teacher educators model an effective use of UDL in the education program by teaching, demonstrating, and modelling ways to foster a positive and accessible learning environment, with a focus on students' individual ways of learning

(Evans et al., 2010). Smith et al., (2019) also stressed the importance of teacher educators to model the implementation of UDL in their teaching practices in teacher education preservice programs.

McGuire-Schwartz & Arndt (2007) found that when preservice teachers were required to develop weekly lessons using the UDL framework in their six-week practicum, the participants stated that "the students in their practica were more actively engaged and involved in their lessons. Through assessments, they found that students' understanding was increased" (p. 136). Using workshop discussion groups with participants from higher education, local education agencies, and/or educational policy, Smith et al., (2019) concluded, however, that further research is needed on the essential components of UDL and the implementation process.

The purpose of this study was to explore two preservice teachers' perceptions of their use of Universal Design for Learning (UDL) in their secondary teacher education program and their first year of teaching. The research questions were: As preservice teachers, what were your experiences using a Universal Design for Learning (UDL) framework? From your perspective as a first-year teacher, what are the benefits of designing and implementing a UDL framework in your teaching practice? What are the challenges?

The Design of the Study

This paper is based on a qualitative study developed to explore preservice teachers' experiences implementing a UDL framework in their practicum setting and as they enter their first year of teaching. The researchers are three teacher educators from two university preservice teacher education programs, and two second-year secondary education preservice teachers, who, during this study, completed their two-year preservice teacher education program and began their first year of teaching.

As researchers, we subscribe to the view that reality is socially constructed through the lived experiences of people (McGregor & Murnane, 2010; Wiersma & Jurs, 2009) and the interaction of individuals (Grix, 2004). As practitioners, we are committed to a continuous improvement of our teaching and learning. Therefore, we based this study on action research, which is a framework for exploring questions and finding solutions to problems that people confront in their daily lives (Stringer, 2014). Throughout the cycles we used oral discussions, and the first-year teachers completed written narratives in the final cycle. We drew on classic narrative inquiry (Clandinin, 2012) that enabled us to focus on studying experience as story, since we sought to understand the breadth and deeper meaning of the UDL classroom experiences of the first-year teachers. Narrative writing can help teachers understand their professional lives (Forrest et al., 2010) by providing descriptions of "how individuals make sense of events and actions in their lives with themselves as agents of their lives" (McAlpine, 2016, p. 34). The methodological stance was that of a naturalist's narrative in which the descriptions, provided by the two first-year teachers' stories of their UDL use, served as data to set the stage for questions such as: "What experiences has this person had? What do these experiences mean to them? What complicating actions and evaluative aspects are highlighted?" (McAlpine, 2016, p. 35).

Reason and Bradbury (2008) stressed the value of action research as a collaborative inquiry in which "engagement, curiosity and question posing are brought to bear on significant practical issues" (p. 1). Action research means that "everyone is involved in the design and management of the inquiry; everyone gets into the experience and action that is being explored; everyone is involved in making sense and drawing conclusions" (Heron & Reason, 2006). Action research often takes the form of a collaboration between practitioners and researchers working together to solve a problem (Nicodemus & Swabey, 2015). In this study, the three

teacher educators and the two preservice/beginning teachers were all recognized as authors of the research, and collaboratively reflected on key questions about UDL and all aspects of the study. As we worked together on this collaboration, we practiced "an ethics of care" (Noddings, 2020) that reflects the values of UDL.

Action research is cyclical in nature, including multiple cycles. The first cycle goes through the steps of planning, action, observation, and reflection, which are later used to modify the process in the next cycle (Hopkins, 1985; Kemmis & McTaggart, 1990). The action research cycle in our study started with the teacher educators and preservice teachers sharing their interest in UDL and discussing the key aspects of the UDL framework. Early questions included: What does UDL mean? What does it look like in a secondary school classroom? What does representation look like in an instructional design and how does this differ from expression? How do you address student engagement in your instructional planning? This led to more meetings and questions on the focus of the inquiry, and further actions needed for designing and implementing curriculum for all learners. The final cycle involved the preservice teachers who were now first-year teachers, writing final reflective narratives of their experiences implementing UDL in their teaching practices. Throughout this process, the researchers would collaboratively discuss and analyze the preservice teachers' descriptions and reflections in order to explore the implementation of the UDL framework based on what had been learned (Kemmis et al., 2014). The final stage of this cycle was a thematic analysis of the two narratives which involved a constant comparative method of identifying a pattern of similarities and differences (Charmaz, 2006), and writing up the key themes.

Narratives

Moving from a Preservice Teacher Education Program to Becoming a First-Year Teacher: Jonathan's Story, Part 1

I am a first year, secondary education teacher and I am now teaching in a high school of approximately 1,000 students from grades 7 to 12, in rural Nova Scotia. I was introduced to UDL during my Bachelor of Education degree. In Nova Scotia, this is a two-year degree program with a practicum experience of five weeks in year one and twelve weeks in year two. In year one of my practicum, I was not familiar with the framework for implementing UDL, nor was I confident it would be supported by my cooperating teacher and university supervisor; however, I was exposed to many concepts that can be used within a UDL framework such as gamification, adaptations, multimodal texts, flexible learning environments, and assessment menus.

In the second year of my Bachelor of Education program, UDL was a focus across the curriculum. All professors provided insights and explanations to the UDL framework in year two by modeling this for us. During year two [of my] practicum, I was able to collaborate with a teacher in a different subject area on a living wall project. I taught a mini-unit on how global warming impacts global food production. The class was tasked with designing a living wall structure as a means of combatting this issue of food production. Once the designs were submitted, I collaborated with the industrial arts teacher who chose a design that could be constructed in that class. The industrial arts class built and installed the living wall in our wing of the school. Students then planted seeds and tended to the wall as a part of their science class, and then had the option of taking the plants home at the end of the school year. For the most part, I was practicing my very superficial understanding of UDL, because I was not confident with the concepts

and it was not something practiced by my cooperating teacher. I also did not have conversations with my university advisor about practicing UDL and was unsure of how I would be supported in taking this approach. Students engaged a lot more with the lessons that followed a UDL framework and took ownership over the living wall project in a way they did not with other assignments. At that point I undertook additional independent studies in UDL and developed a plan for how to better implement it into my teaching practice.

Teaching the American Dream and Tapping Creativity Through UDL in First Year Teaching: Jonathan's Story, Part 2

This year, I taught three sections of grade ten English at a high school in rural Nova Scotia. This experience posed specific challenges to taking a UDL approach. Grade ten students in Nova Scotia are required to write a provincial exam that tests students' abilities in reading comprehension and writing skills. This standardized test is written on paper with a pencil, unless students have a diagnosed learning disability which … allows for technology use. This forced me to build test-taking skills and rubrics into my teaching practice more than I normally would. Despite this perceived limitation, I was able to implement a UDL approach into my five-week thematic unit on the American dream.

This unit consisted of three main stories—*The Veldt* by Ray Bradbury, *Death of a Salesman* by Arthur Miller, and *The Great Gatsby* by F. Scott Fitzgerald—and was enhanced with lessons related to American history, immigration, gender, and race. All teaching resources were posted to the digital classroom providing students access to class materials in the classroom, and at home if they had internet access. These resources included text and audiobook versions of the stories covered, movie adaptations of the stories, an interactive dictionary, character charts, maps, podcasts, an interactive slideshow, and news articles that provided deeper context and contemporary examples of

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the themes we were exploring. These resources were carefully curated in the digital classroom for ease of use.

Getting the Assessment Practice Out of the Way

The class started the unit by reading *The Veldt* by Ray Bradbury and completing some reading comprehension questions to practice answering questions about short stories, in a similar format to what they would see on their provincial exam. The next week I introduced American history through a trivia game which was completed using Kahoot! This trivia acted as a formative assessment to assess the students' knowledge of American history. Their knowledge was quite limited so the next day I followed up with an interactive slideshow that introduced American history from colonization to 9/11, condensed into a thirty-minute presentation that was enhanced with images. The slideshow contained a number of hyperlinks to photo histories, documentaries, podcasts, and articles which the students could revisit on their own time.

Once my students had a foundation in American history and context for the material we were about to cover, they were asked to write a persuasive essay discussing whether or not they thought the American dream was something that could be achieved by anyone. Many students discussed barriers to success including class, race, gender, and geography in their essays and gave me a sense that they were highly critical of this concept. The American dream essay acted as practice for the provincial exam. I wanted to do something that was closely connected to their learning and to front load a bit of the challenge, because rather than focusing on the grade, I was focusing on constructive feedback.

Using Drama to Achieve Speaking & Listening Outcomes

Following the American dream essay, we moved onto reading *Death of a Salesman* by Arthur Miller. We had physical copies of the play and PDF, audiobook, and film versions posted to our digital classroom. The class completed a dramatic read aloud of the play with a cast of characters that rotated each day. I also played key scenes from the 1985 version of the movie when confusing transition scenes occurred in the read aloud. Students were given one class to split into small groups and complete scene studies; this gave all the students an opportunity to read in a smaller group or with a partner to obtain speaking outcomes. The play culminated in voluntary presentations in each class of these scene studies. Seeing these scenes acted out helped breathe life into the play for some of my students who were struggling with the text. After reading *Death of a Salesman*, students were asked to write an essay exploring one of six topics related to the text. Students who still struggled to understand the text were encouraged to watch the film version to get a better understanding of the story or were given class time to write the essay in an alternative setting with a resource teacher. Students who continued to struggle with the essay were given one-on-one help at lunch time.

The Great Gatsby and Assessment Menus

After completing *Death of a Salesman,* the class read *The Great Gatsby* by F. Scott Fitzgerald. I created an interactive dictionary with definitions and hyperlinks to images or websites that provided further explanation to some of the more obscure or dated terms found in the book. We would display the terms on the projector while reading the book so students could have a dictionary definition of difficult terms while we are reading the text. There was an optional viewing of the film in my room at lunch time, over three days.

Having completed two major essay assignments in four weeks, I felt confident giving the class complete freedom to choose how they would represent their knowledge of *The Great Gatsby*. I provided sixteen options for projects that ranged from music and art to dance and videogame design. I told the class that they could choose any project idea that was an interest or a hobby and made a connection to *The Great Gatsby*. This was a summative assessment that was scored on creativity, connections to the text, the medium chosen, and a personal reflection that discussed their creative choices and how their project connected back to the text.

The submissions I received included a board game, a video of two students dancing the Charleston in 1920's era dress, an interview with Jay Gatsby, a rap song, a short story, a clay model, clothing designs, paintings, gossip columns, a playlist for a movie score, a script of the mysterious phone calls Jay Gatsby received, a catering menu for one of Gatsby's famous parties and lemon squares (which the student baked and provided to her classmates), a graphic organizer of the character connections in the story, an updated map of the setting for the story, and a painting of T.J. Eckleberg. These projects were all completed in three days. The creative energy of the students was impressive, but perhaps the most interesting part of the project were the personal reflections that students submitted.

The students were able to discuss their creative processes in a detailed way that added depth and understanding to their projects. In these reflections, some students discussed how researching one specific aspect of the book in which they were interested dramatically improved their understanding of the text and their connection to it. One student even discussed how they are going to continue choreographing dance routines

because it was something they enjoyed doing while they were younger, but rarely had the time or opportunity to do anymore.

The Impact of UDL in Our Classroom

UDL research indicates that the flexibility within the framework can lead diverse learners, including those with learning delays, to achieving educational outcomes (Cook & Rao, 2018). In my experience, the students who were already achieving at a high academic level excelled in this looser, creative atmosphere and took the biggest risks. However, my students who were at a low level of academic achievement also excelled on *The Great Gatsby* project, including a student who was on an individual program plan, had a diagnosed learning delay, and generally struggled to submit work on time. He submitted two pieces of instrumental music and an oral reflection. The instrumental music incorporated the sound effects of a car crash and samples of swing music that was popular during the jazz era. In his oral reflection, the student was able to explain elements of the story and how the musical composition he created related to *The Great Gatsby*. The way he communicated his ideas was beyond what I have ever seen him accomplish through writing.

Teachers frequently experience time poverty in their work and UDL can seem like an overwhelming challenge to plan for; however, I have found the process not only worthwhile but necessary. When students were engaged in their learning, I experienced fewer behavioural issues and the class was able to move through the material much more efficiently than I had expected. This approach changed my role as a teacher by encouraging me to focus less on lecturing, and more on getting to know my students' strengths and interests; it also encouraged them to make connections between their personal interests and the learning outcomes, therefore engaging them further in the

learning process. The more experience I had with implementing UDL lessons, the more I wanted to practice it because I saw immediate results in how my students engaged in the learning process. Implementing UDL requires a significant time commitment in terms of planning; however, the more I practice UDL, the more I want to practice it.

The Opportunities and Challenges of UDL from the Perspective of a First-Year Teacher: Laura's Story Part 1

I am now a first-year teacher, working as a casual substitute at the secondary level, and a literacy tutor at the elementary level. It is from the perspective of both of these roles, plus my previous role as a student teacher, that I will reflect on my experiences with and perspective of Universal Design for Learning.

I entered my Bachelor of Education degree immediately after completing an undergraduate degree in political science, sociology, and English, with the long-term goal of becoming a critical and holistic educator. I was eager to engage with frameworks for challenging inequity and empowering individuals through education. One such framework was Universal Design for Learning (UDL), which was discussed in several of my BEd courses, including practicum seminars and curriculum practices courses. UDL, though somewhat daunting in its potential complexities, immediately appealed to me because it not only acknowledges but embraces [a] diversity of learners and, in doing so, presents a philosophical challenge to the traditional industrial model of schooling (CAST, 2020; Rapp, 2014).

Experiences During Practicum

During my practica terms (five weeks in year one and 12 weeks in year two), I implemented the principles of UDL to the best of my ability. In my second year, I taught at a small but diverse school serving seventh to ninth grade students from varying socioeconomic and cultural backgrounds. As in many local schools, in recent years there

has been an increase in new immigrant students from a variety of backgrounds. For most of the students, English is an additional language; they work hard to tackle both English language acquisition and curricular content and may be provided adaptations or individual plans. There are also a number of students with disabilities and unique learning and personal needs, as in any school. My impression has been that most teachers work hard to support the students, but do not always have the skills and resources that they need to help students reach their full potential.

As a new educator with a great deal to figure out, it sometimes felt overwhelming to consider multiple pathways for engagement, representation, and expression for every outcome and activity, so I started small and experimented with different methods. My cooperating teacher and advisor were supportive but not very familiar with UDL; my cooperating teacher gave me free rein to explore and experiment, so I never felt hindered in my efforts. That being said, when I did ask for my cooperating teacher's perspective on UDL, he expressed that to him it seemed like another passing trend in pedagogy that is pressed upon teachers and then just as quickly forgotten. In the case of my university advisor, contact was minimal and our conversations were limited to reviewing my evaluations, so UDL principles were not discussed in a direct or significant way.

To open multiple pathways of engagement, I made personal reflection, class discussion, and background knowledge checks core elements of my teaching, the goal of which was to find the points where students could connect personally with the learning and build authentic understanding. I allowed students to select their own topics within the scope of their learning outcomes: For example, in English Language Arts, students could hone their research skills by investigating any topic they wanted, and in Citizenship, large

topics like government spending and activism were broken down into multiple specific issues, such as healthcare and education, from which the students could choose.

To represent concepts in multiple ways, I included images, videos, and occasionally simulations or games in addition to written texts and "teacher talk." I discovered the power of an impactful image to stimulate reflection and discussion: For example, when studying John Steinbeck's *The Pearl*, examination of the text's portrayal of economic inequality and colonial oppression was supplemented by a contemporary image of impoverished "slums" directly bordering luxury accommodations in Mumbai, India. I doubt that my students would have been as impacted by this aspect of the text if they had not viewed and discussed this image—it made extreme economic inequality more tangible for them. Indeed, the discussion that resulted from viewing this image was one of the most fruitful of the entire novel study, with multiple students demonstrating an increased understanding of, and emotional engagement with, the text's themes. The image was also brought up by students in subsequent Citizenship lessons, allowing for valuable interdisciplinary connections.

Finally, I strove to find ways of allowing multiple means of expression. For example, journal responses in Healthy Living and English Language Arts could be expressed through writing or through drawing. I also incorporated visual expression in Citizenship, encouraging the use of diagrams and concept maps to express understanding. Additionally, after reading *The Pearl* students could reflect on the text through a visual collage, a written parable, or a research project that could take the form of an essay, a video, or a digital presentation using Google Slides, Prezi, or other similar tools. This was paired with an ongoing response journal that also incorporated visual along with written expression. Students responded positively to being given a choice and I received a wide

variety of final projects, a few of which went above and beyond the requirements of the assignment: For example, one student did additional research on the setting of the novel from a geographical perspective.

Experiences as an Early Teacher: Part 2

Currently, being a casual substitute gives me the opportunity to implement and observe the lesson plans of other teachers, and while doing so consider how UDL principles could apply. I see very few lessons that significantly embrace UDL; for the most part, I see lessons where the majority of the class is asked to engage with, perceive, and express concepts in the same way, with modifications being made for students with documented adaptations and Individual Program Plans. One noteworthy exception was a novel study assignment where students were able to select their own novels and express their understanding through both writing and drawing, and activities that prompted them to connect the text to their own lives and interests. Allowing audiobooks and varying means of expression, for example, allowing students to record or dictate responses, would further embrace UDL and make this learning experience more accessible.

I have observed throughout my time in classrooms that when only students with adaptations and IPPs are given a different task from a majority of the class (for example, when a handful of students are given a different article to annotate), they may feel embarrassed and singled out. In my experience, it is not unusual for these students to refuse to engage with adapted material and technological aids because they do not want their classmates to see them as less intelligent. This further impedes their own learning, and it is not difficult to see how this can become a vicious cycle. Often, these students have had adverse peer experiences that support their fears. The principles of UDL offer an opportunity to address this problem: If everyone is being given choices, and is

approaching learning in varied ways, differences are less likely to be perceived as a mark of weakness or failure, and could become a celebrated norm rather than a perceived exception in classroom culture.

UDL in the Context of Small Group and One-to-One Tutoring

As a literacy tutor with a local not-for-profit literacy program, I work with elementary students who are at least one grade level behind expectations in their reading and writing. Working with groups of four or fewer students at a time, I have an opportunity to get to know the individual needs of the learners and find ways to make literacy more accessible for them. For example, I vary the means of engagement by getting to know the interests and reading preferences of my students and providing them with suitable texts based on this information. Sessions always include a mix of reading, writing, and games, allowing students to build their vocabulary, phonemic awareness and fluency through different mediums. Visual representation and expression, as well as movement-based activities, are frequent additions. The students have made progress this year based on an approach based in both foundational skills and UDL. This can open pathways to building fundamental skills for all learners.

Final Thoughts

The principles of Universal Design for Learning have my endorsement. Nevertheless, like any pedagogy, UDL has its challenges and points of tension with the complex demands of our education system. One challenge has to do with outcomes-based learning: The more specific and prescriptive the outcome is, the more difficult it is to incorporate UDL principles to their fullest extent. This is especially true if the means of engagement, representation, or expression are themselves dictated by the outcome. For example, many English Language Arts outcomes specify that students need to *write*, or to

speak—two specific means of expression. However, this does not mean that the principles of UDL have to be completely abandoned in these cases. For example, if you cannot vary the means of expression, perhaps you can still offer multiple angles from which students can engage with concepts and demonstrate understanding by allowing them to choose between multiple topics.

Finally, in my experience implementing UDL means more time spent planning lessons and marking. UDL can require additional preparation and organization, especially as a novice still building my "toolbox" of skills and resources. For busy teachers with little or no time to spare, an approach that requires additional time and effort will not be attractive. Therefore, encouraging a UDL approach in our schools also means advocating for adequate teacher planning, collaboration, and professional development time. Teachers also need access to tools and resources for UDL: digital and other technologies, diverse texts, and a flexible classroom space.

Universal Design for Learning is worth the time, effort, and flexibility that it requires. It has the potential to address some of the key goals of progressive education: supporting the diverse needs of students, promoting inclusion and acceptance, and genuinely engaging and empowering young people. The principles of UDL will continue to inform my teaching and learning going forward.

Findings and Discussion

The findings of the study clearly demonstrate the potential benefits and challenges of the UDL framework. The two teacher narratives provide an opportunity for teacher educators and inservice teachers to consider possible ways to design universal and accessible curricula for all learners. The key themes in their narratives relate to UDL in teacher education coursework and practica, the benefits of UDL, and the challenges of UDL.

Teacher Education and UDL

Both Jonathan and Laura were introduced to the UDL framework in their teacher education program, mostly in coursework in the second year of their two-year program. They became interested in UDL as a framework for developing unit plans and were highly motivated to implement UDL during their student teaching experiences. The two preservice teachers began to implement UDL principles in their second year, 12-week practicum; however, at that time, UDL was not a framework formally supported by their university advisors or associate classroom teachers. They were both informally supported by their classroom associate teachers, in that they were given a certain amount of latitude to implement a UDL framework into certain aspects of their teaching practices. This experience enhanced their interest in using UDL in their teaching practices; however, as Edyburn (2010) has stressed, teachers are being left on their own to implement UDL principles and to address potential challenges, and this was true for these preservice teachers. It appears that teacher education programs need to go beyond providing an awareness of UDL framework in various courses and to examine the disconnect between coursework and practicum experiences. Although this disconnect is not the focus of the study, it is an important issue that can impact preservice students' ability to bridge theory and practice and their willingness to implement innovative pedagogical approaches and strategies. This disconnect is identified in the research as a long-standing issue in many teacher education programs (Goodnough et al., 2017).

Benefits of UDL

Both Jonathan and Laura identified one of the greatest benefits of UDL as the opportunity for student choice of multiple ways of representing and expressing their knowledge and skills. This appeared to enhance students' engagement and learning, and reduce disruptive behaviour. The UDL framework also allowed the teachers to identify and support the range of students'

abilities and interests. All students in their classes became engaged in these authentic approaches to learning that valued their ways to represent and express their understanding of acquired knowledge and skills. The findings of enhanced engagement of students, improved learning outcomes, and reduced disruptive behavior, are supported by other researchers (CAST, 2020; McGuire-Schwartz & Arndt, 2007; Smith et al., 2019).

As preservice teachers and later as beginning teachers, Jonathan and Laura were able to provide different types of open-ended opportunities from which students could choose to engage. They used strategies and techniques ranging from no tech to high tech. Their narratives describe the types of choices teachers can provide for students and examples of innovative teaching strategies using different materials and resources such as textbooks, novels, movies, podcasts, interactive slide shows, webcasts, hyperlinks, drama, music, cooking, artwork, games, simulations, images, and apps.

The UDL framework allowed the two preservice/first-year teachers to develop and implement a vast array of innovative and authentic student learning experiences, as they supported all students in meeting the prescribed learning outcomes of the curriculum. As noted in the research, the UDL curriculum design allows for multiple forms to accommodate the content to be accessible and appropriate for students with diverse backgrounds and abilities (Courey et al., 2012). The flexibility in the representation of information, the multiple ways for students to express their learning, the enhancement of student engagement, and a reduction in barriers to student access to the curriculum, are all benefits supported in the research on UDL (Edyburn, 2010; King-Sears et al., 2015; Meyer &Rose, 2000).

Challenges of UDL

The study identifies challenges posed by implementing UDL into the present educational system. Jonathan and Laura reported systemic and socio-economic issues that impact the use of a

UDL framework. As first-year teachers, they identified the need for preparation time, materials, and other resources. As beneficial as UDL can be, it can also be very time consuming for any teacher to begin to plan for all learners' strengths and interests (Harkins & Barchuk, 2016; Vitelli, 2015). Additional issues involved administrative expectations in the present system, the inflexibility of standardized tests for assessment, the unequal access to reliable internet and technology, the need for UDL implementation support in teacher education programs, and professional development opportunities for all teachers.

The above-mentioned issues involve the need for change in existing practices and policies. For example, standardized tests pose a specific challenge to implementing UDL principles because they can be inflexible by design. Standardized tests typically require students to complete the tests using pen and paper in timed sessions. In certain cases, for example, if a student has a diagnosed learning disability, they may be granted permission to use a read-aloud text or word processing software to complete their assignments or to write their test in an alternate location within the school. These tests require all students to read the same material and respond to the same questions in the same way, which runs counter to the universal design approach. Issues of inequality related to students' limited access to required technology were identified. Rappolt-Schlichtmann et al., (2013) also reported that when using UDL with an emphasis on technology, challenges include hardware-related issues, limited access to reliable computers, and inadequate broadband services for access to the Internet.

Curriculum learning outcomes that are heavily prescriptive in terms of means of engagement, representation, and expression, also reinforce the very barriers to accessing curricula that UDL attempts to remove. Neoliberalism is the predominant ideology in 2020 that largely regulates and controls how teachers teach and are assessed (Rodriguez & Russell Magill, 2016). Sleeter (2008) argues that neoliberal forces in teacher education programs have

influenced the preparation of teachers as technicians and defined teacher quality in terms of mere testable content knowledge. A school system that perceives some students as too academically needy, incapable of achieving educational standards, or not worth the investment will not support a pedagogical framework such as UDL that requires a rich investment of time and resources. Neoliberalism's systemic indoctrinating and dehumanizing influence have prompted the new teachers in the study to use humanistic UDL principles in their classrooms. This leads us to question whether teachers can really be considered as instructional designers in the existing system.

Conclusion and Directions for Future Research

This study demonstrates the benefits and challenges of using a UDL pedagogical framework in the preparation of teachers and their practice as beginning teachers. Provided teachers are given the resources and time to truly implement its principles, the UDL framework helps teachers to respond in innovative and creative ways to the increasing variability and diverse needs of their students. This study adds to the body of research that explores the transformation of the teaching and learning environment, in order to make it fully accessible and inclusive of all learners.

Meyer and Rose (2000), cofounders of UDL, stress that the framework allows for a continuum of learning differences and flexibility in the planning and implementation process; these aspects support accessibility and inclusivity for all students in the learning environment. The benefits of UDL include the opportunity to build upon the strengths and interests of students, to enhance student engagement, and to provide and support inclusive teaching and learning for all students. UDL promotes a "sense of belonging" (Katz, 2015, p. 4) by fostering more inclusive classrooms and school cultures that embrace rather than resist difference. Systemic challenges

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include the need for access to technology, planning time, and the skills to deal with the pedagogical tensions associated with prescribed learning outcomes.

This qualitative research study is based on an action research design and the use of narrative inquiry, which focuses on the narratives of two preservice teachers. These narratives described their perspectives as beginning teachers, from their teacher education program to becoming first-year teachers. Overall, they recognized the benefits and challenges of using an UDL pedagogical approach to enhance student engagement and learning. The use of reflective discussions and narrative writing prompted them to provide rich descriptions of UDL in action. These new teachers identified positive changes in their teacher-student relationships that promoted student engagement and enhanced the achievement of learning outcomes; they raised important questions to consider for future research—questions we find both applicable to preservice teacher education programs and to professional learning opportunities for inservice teachers.

Although there is considerable research on the UDL framework, additional research on the implementation of UDL is needed, particularly in preservice teacher education programs. This study is limited to two first-year teachers' narratives. However, we have identified recommendations for future research directions for designing and implementing a UDL framework in two key areas: the role of the classroom teacher in the design and implementation of UDL; and UDL's impact on student engagement. UDL is a framework and not a set curriculum; the expectation of the teachers is to design and implement student experiences that are accessible to all students in the teaching and learning environment. Considering the daily demands on teachers working in today's complex classrooms and the trend for online teaching, further research is needed to study UDL across a range of institutional contexts and to identify the resources and the support needed for teachers who opt to implement UDL.

Research is also needed to take us beyond a surface awareness of UDL theory in teacher education programs, and to a deeper and essential exploration of how the three key principles of UDL may be implemented in schools. Student engagement—considered a critical aspect of the UDL teaching and learning environment—requires further study to identify how the implementation of the UDL framework can more fully support student engagement and measure the many ways UDL impacts all students' learning.

References

Bender, W. N., & Council for Exceptional Children. (2008). *Differentiating instruction for students with learning disabilities: Best teaching practices for general and special educators* (2nd Ed.). Corwin Press.

Center for Applied Special Technology (CAST). (2015). *Universal Design for Learning* [Ebook]. http://www.cast.org/

Center for Applied Special Technology (CAST). (2018). *Universal Design for Learning guidelines version 2.2.* http://udlguidelines.cast.org

Center for Applied Special Technology (CAST). (2020.) *Universal Design for Learning*. http://castprofessionallearning.org/about-udl/

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis*. SAGE Publications.

Clandinin, J. D. (2012). Afterword: Reflections on narrative inquiries into teacher education identity making. In E. Chan, D. Keyes and V. Ross (Eds.), *Narrative inquirers in the midst of meaning-making: Interpretive acts of teacher educators* (pp. 143–148). Emerald Group Publishing.

Cook, S., & Rao, K. (2018). Systematically applying UDL to effective practices for students with learning disabilities. *Learning Disability Quarterly, 41*(3), 179–191.

Courey, S. J., Tappe, P., Siker, J., & LePage, P. (202). Improved lesson planning with universal design for learning (UDL). *Teacher Education and Special Education, 36*(1), 7–27. https://doi:10.1177/0888406412446178

Edyburn, D. L. (2010). Would you recognize universal design for learning if you saw it? Ten propositions for new directions for the second decade of UDL. *Learning Disability Quarterly*, *33*(1), 33–41.

Evans, C., Williams, J.B., King, L., & Metcalf, D. (2010). Modeling, guided instruction, and application of UDL in a rural special education teacher preparation program. *Rural Special Education Quarterly, 29*(4), 41–48.

Forrest, M., Keener, T., & Harkins, M. J. (2010). Understanding narrative relations in teacher education. *Asia-Pacific Journal of Teacher Education*, *38*(2), 87–101.

Glass, D., Meyer, A., & Rose, D. H. (2013). Universal design for learning and the arts. *Harvard Educational Review, 83*(1), 98–119.

Goodnough, K., Falkenberg, T., Macdonald, R., & Murphy, E. (2017). Making sense of divides and disconnects in a preservice teacher education program. *Education, 23*(1). https://ineducation.ca/ineducation/article/view/322/922

Grix, J. (2004). *The foundations of research*. Palgrave MacMillan.

Harkins, M.J., & Barchuk, Z. (2016). Teaching in a digital society: Current teachers' perceptions of meeting the diverse deeds of all learners. In M. Hirschkorn & J. Mueller (Eds.), *What should Canadian teachers know? Teacher capacities: Knowledge, beliefs, and skills* (pp. 403–427). Canadian Association for Teacher Education/Association canadienne de la formation en enseignement. https://drive.google.com/file/d/0B-36OcipMmoPbTdia2hrN1F5RjQ/view

Heron, J., & Reason, P. (2006). The practice of co-operative inquiry: Research 'with' rather than 'on' people. In P. Reason & H. Bradbury (Eds.), *Handbook of action research: Concise paperback edition,* (pp 144–154). SAGE Publications.

Hopkins, D. (1985). *A teacher's guide to classroom research.* Open University Press.

Hutchinson, N. L. (2014). *Inclusion of exceptional learners in Canadian schools: A practical handbook for teachers* (4th Ed.). Pearson.

Katz, J. (2015). Implementing the three-block model of universal design for learning: Effects on

teachers' self-efficacy, stress, and job satisfaction in inclusive classrooms K-12. *International Journal of Inclusive Education, 19*(1). https://doi:10.1080/13603116.2014.881569

Kemmis, S., & McTaggart, R. (1988). *The action research planner* (3rd Ed.). Deakin University Press.

Kemmis, S., McTaggart, R., & Nixon, R. (2014). *The action research planner: Doing critical participatory action research*. Springer.

King-Sears, M. E., Johnson, T. M., Berkeley, S., Weiss, M. P., Peters-Burton, E. E., Evmenova, A. S., Menditto, A., & Hursh, J. C. (2015). An exploratory study on universal design for teaching chemistry to students with and without disabilities. *Learning Disability Quarterly, 38*(2), 84–96. doi: 10.1177/0731948714564575

McGregor, S.L.T., & Murnane, J.A. (2010). Paradigm, methodology and method: Intellectual integrity in consumer scholarship. *International Journal of Consumer Studies*, *34*(4), 419–427.

McGuire, J. M., Scott, S. S., & Shaw, S. F. (2006). Universal design and its applications in educational environments. *Remedial and Special Education, 27*(3), 166–175.

McGuire-Schwartz, M.E., & Arndt, J.S. (2007). Transforming universal design for learning in early childhood teacher education from college classroom to early childhood classroom. *Journal of Early Childhood Teacher Education,* 28(2), 127–139. https://doi: 10.1080/10901020701366707

Meyer, A., & Rose, D. H. (2000). Universal design for individual differences. *Educational Leadership, 58*(3), 39–43.

Nelson, L. L. (2014). *Design and deliver: Planning and teaching using universal design for learning*. Paul H. Brookes.

Nicodemus, B., & Swabey, L. (2015). Action research. In C. V. Angelelli & B. J. Baer (Eds.), *Researching, translation and interpreting* (pp. 157–167). Routledge. https://doi.org/10.4324/9781315707280

Nodding, N. (2002). *Educating moral people: A caring alternative to character education.* Teachers College Press.

Nova Scotia Department of Education and Early Childhood Development. (2019). Inclusive Education Policy. https://www.ednet.ns.ca/docs/inclusiveeducationpolicyen.pdf

Rao, K., Ok, M. W., & Bryant, B. R. (2014). A review of research on universal design educational models. *Remedial and Special Education*, *35*(3), 153–166.

Rapp, W. (2014). *Universal Design for Learning in action: 100 ways to teach all learners*. Brookes Publishing.

Reason, P., & Bradbury, H. (Eds.). (2008). *The SAGE handbook of action research: Participative inquiry and practice* (2nd Ed.). SAGE Publications.

Rappolt-Schlichtmann, G., Daley, S. G., Lim. S., Lapinski, S., Robinson, K. H., & Johnson, M. (2013). Universal Design for Learning and elementary school science: Exploring the efficacy, use, and perceptions of a web-based science notebook. *Journal of Educational Psychology, 105*(4), 1210–1225. doi: 10/1037/a0033217

Rodriguez, A., & Magill, K. R. (2016). Diversity, neoliberalism and teacher education. *International Journal of Progressive Education*, *12*(3), 7–24.

Sleeter, C. (2008). Equity, democracy, and neoliberal assaults on teacher education. *Teaching and Teacher Education, 24*(8), 1947–1957.

Smith, S.J., Rao, K., Lowrey, K.A., Gardner, J.E., Moore, E., Coy, K., Marino, M., & Wojcik, B. (2019). Recommendations for a national research agenda in UDL: Outcomes from the

UDL-IRN preconference on research. *Journal of Disability Policy Studies,* 30(3), 174–

185. https://doi:10.1177/1044207319826219

Spooner, F., Baker, J.N., Harris, A.A., Ahlgrim-Delzell, L., & Browder, D.M. (2007). Effects of

training in universal design for learning on lesson plan development. *Remedial and*

Special Education, 28(2), 108–116.

https://www.researchgate.net/publication/249835282_Effects_of_Training_in_Universal_

Design_for_Learning_on_Lesson_Plan_Development/link/53f6666c0cf22be01c425ae3/d

ownload

Stringer, E.T. (2014). *Action research* (4th Ed.). SAGE Publications.

Vitelli, E. M. (2015). Universal design for learning: Are we teaching it to preservice general

education teachers? *Journal of Special Education Technology, 30*(3), 166–178.

https://doi:10.1177/0162643415618931

Wiersma, W., & Jurs, S.G. (2009). *Research methods in education: An introduction* (8th ed.).

Allyn and Bacon.

Part 3: Designing in the Disciplines

Capabilities-Development-Within-Nature Pedagogy:
Science Education Through and For Well-Being

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Abstract

This chapter introduces and elaborates on the idea of preparing teacher candidates for purpose-focused instructional design thinking in science education through purpose-focused science teacher education. A particular purpose of school education will be privileged: education for well-being. The chapter elaborates on this specific purpose and then proposes a particular approach to design thinking for the teaching of science that builds upon the identified school-educational purpose. Finally, the chapter suggests that such purpose-focused instructional design thinking can be the foundation for science teacher education that contributes to school education for well-being, and how this can be achieved.

Résumé

Dans le cadre de la formation conceptuelle des futurs enseignants, ce chapitre présente et développe la notion d'une adaptation de l'enseignement des sciences. Il a pour but principal l'enseignement du bien-être qui se trouve au coeur des objectifs privilégiés de l'enseignement scolaire. Le chapitre conclue, tout en en exposant les modalités d'application, qu'une telle conception pédagogique de l'enseignement des sciences, alliée à l'objectif éducatif scolaire

poursuivi, peut servir de base à la formation des professeurs de sciences qui contribuent à

l'enseignement scolaire du bien-être.

While there are many ways to define design thinking, its central idea can generally be described (Cross, 2011; Razzouk & Shute, 2012) as a cyclical problem-solving process that involves:

- trying to understand the situation or people involved;

- addressing critically the assumptions behind the problem and even the problem itself;

- creating prototypes to address the problem; and then,

- testing and evaluating those prototypes.

Design thinking has its roots in engineering and architecture (Lawson, 1980). More recently, design thinking has branched out into a number of other fields, most notably in business and education (Brown & Kātz, 2009; Laurillard, 2012).

In the field of education, design thinking has been conceptualized as a tool for providing students opportunities to address real-world problems. More to the focus of this chapter, design thinking has also been used within the field of teacher education to broaden the role of teachers from classroom *practitioners* to that of *curriculum designers* (Henriksen et al., 2020). There are a number of models of design thinking related to educating teachers as curriculum designers, such as the Stanford Design Thinking Model (Roman, 2018, pp. 140–141).

While one of the primary traditional focuses of teacher education programs has been on teaching practice and its connection to theory (Carlgren, 1999), it has been argued that teacher education programs have typically not emphasized the role of teachers as designers of curriculum. Rather than advocating for a specific design thinking process, this section provides a concrete example of teachers as curriculum designers within a unique pedagogical approach called the Capabilities-Development-with-Nature Approach, which we describe below. This chapter explores the idea of preparing teacher candidates as curriculum designers in science education for well-being through this particular educative approach. The Capabilities-

Development-with-Nature Approach seeks to address the foundational needs of students through the development and enactment of capabilities designed by teachers with parents' collaboration. The process of designing opportunities for the development and enactment of needs-linked capabilities is elaborated upon in the following pages. This teacher-designed approach provides a tangible example of teachers as curriculum designers, which may be of interest to both teacher educators and teaching practitioners interested in the development of a science-based education for well-being approach.

An Education for Well-Being

A number of researchers have suggested making the concern for humans to live a flourishing life (a life of well-being) the primary focus for school education (e.g., Brighouse, 2006; White, 2011). Some approaches to human well-being consider the availability of capabilities to address human needs a core aspect of what it means to live a flourishing life (e.g., Falkenberg, 2019; Nussbaum, 2011). Bringing both scholarships together, we arrive at the position that a primary focus of school education is to develop in students those capabilities required for them to live a flourishing life. In this section, we draw on this literature in order to make the case for an education for well-being.

Brighouse contends that as adults, our role in the care of children involves making certain choices with regards to what an education for well-being looks like, just as we would make certain choices regarding what a healthy meal for a child looks like. Consequently, it falls upon the adults who care for children to decide what makes a life lived well and how we might educate for one (Brighouse, 2006, p. 42).

First of all, there are both present and future interests concerning child well-being. With regard to the need to participate in social life, children presently require the capability to make and maintain friendships in order to flourish (present interests). In the long-term, this capability

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is equally important and may also be categorized as a future interest. The capability to participate in civic life, through various perspectives that reflect personal values, is an example of a capability linked to the need to participate in social life that leans further towards a future interest categorization. Although, in the present engagement of children and youth in demanding greater attention to the climate crisis, this too may be seen as a present interest in which an education for well-being might need to give consideration.

In addition to present and future interests, Brighouse argues that there are fundamental universal interests towards a flourishing life, for example, the interest in being capable of securing food and shelter or making choices with regards to religion (p. 44). However, children also have particular interests that are unique to them, such as the development of certain types of music or sports. The challenge for teachers and parents is in determining those "fine-grained judgements," as Brighouse calls them. Administrators and policy-makers concern themselves with broader decisions directed at the general interests of students, "and how to set up an institutional framework within which those general interests are well served, and in which teachers … can make and implement good fine-grained judgements about particular interests" (Brighouse, 2006, pp. 44–45). Brighouse identifies autonomy as a general and universal interest that is an important aspect of a flourishing life, one that should be taught in schools (Brighouse, 2006, chap. 3). As elaborated below, the development of autonomy based on students' rights to agency plays a key role in the successful development and implementation of the Capabilities-Development-with-Nature Approach.

The question for the teacher as curriculum designer then becomes what experiences should be made available to students. White (2011) argues that the primary purpose of schools should be to equip "everyone with the wherewithal for a flourishing personal and civic life" (p. 144). White asserts that schools should continue to teach knowledge, but in ways that are more integrated and

meaningful to students. How might we come to decide or agree upon what a flourishing personal and civic life looks like? Brighouse (2006) suggests learning about parenting, dealing with stress in the workplace, recognizing and responding to the pressure of over-consumption, and making good use of leisure time, among other suggestions along these lines (pp. 54–55). While the traditional curriculum has served as an obstacle to the development of well-being and has benefited those with privilege, White (2011) argues for an inclusive approach to an education for well-being, one that is in the service of all. If those who have not had a voice in schools should be served in the pursuit of well-being, who then decides what the focus will be? White (2011) contends that schools—including teachers, students, and parents—should have the freedom to decide upon the goals of a schooling for well-being approach. The participatory involvement of the school community plays also a key role in the Capabilities-Development-with-Nature Approach (see below).

As a liberal moral philosopher, Nussbaum (2011) is interested in what opportunities or freedoms are equitably available to individuals in order for them to live the life that they consider worth living. However, as the Capabilities Approach suggests, to actually have such opportunities and freedoms, people need to develop and be able to enact agentic capabilities. While Nussbaum (2011) states that the decision concerning the capabilities that are valuable need to be communally debated and decided upon (pp. 32–33), she does suggest that there is a "widely shared understanding of the task of government" in securing certain minimum threshold levels of what she calls "Central Capabilities" (p. 33), among which she lists: being able to have good health, being able to engage in critical reflection about the planning of one's life, being able to engage in various forms of social interaction, and being able to participate effectively in political choices that govern one's life.

A central feature of Nussbaum's Capabilities Approach is agency. The individual must have freedom and control over the enactment of their capabilities. While the opportunity to develop (further) and enact capabilities towards well-being is made available, people can decide for themselves whether or not they want to enact that capability in a given situation. Meeting basic human needs that contribute to well-being and allowing for agency over the enactment of the capabilities relevant to a need, may be seen as a matter of social justice or an equitable distribution of opportunities necessary to live a good life. For example, a child may have a natural "ear" for music (an individual characteristic), but no external opportunity to experience or learn a musical instrument due to conditions of poverty (external features). For certain agentic capabilities to develop, opportunities must be available. Schools may be seen as places where opportunities are made available to children to grow and develop. The nature of the school will dictate how narrow or broad (or how explicit or hidden) the opportunities for children to develop capabilities will be.

In order to make decisions concerning what capabilities are worth developing, one might ask "to what end?" Those concerned with human well-being may begin by considering what basic human needs are needed for a flourishing life. Max-Neef (1991) developed a list of nine fundamental human needs: subsistence, protection, affection, understanding, participation, idleness, creation, identity, and freedom. These needs are addressed in the form of "needs satisfiers," which are, as the name suggests, attempts to satisfy needs. The fulfillment of any of the needs contributes to well-being, while a deficiency in any of the needs results in a "poverty" of that aspect of well-being. Also, the interconnectedness of the needs is such that a satisfaction of one need may potentially lead to the impoverishment of another.

Building on Max-Neef's fundamental human needs model and Nussbaum's capabilities approach, Falkenberg (2019) offers a framework for the conceptualization of human well-being

called the Well-Being and Well-Becoming Framework (WB2-Framework). This framework is characterized by a systems perspective that includes people as "bio-psychic systems" and "as social actors of social and ecological systems" (p. 4). The WB2 Framework provides a framework for conceptualizing well-being. This conceptualization necessarily "requires the consideration of the social-cultural context in which an understanding of well-being and well-becoming is needed" (p. 5). The WB2-Framework is an integrated approach to understanding well-being and well-becoming, drawing from many disciplines to arrive at a holistic understanding of what it means to live well. A key feature of the WB2-Framework that the Capabilities-Development-with-Nature Approach is adopting is the notion that human needs must be met in order for humans to live a flourishing life (a life of well-being).

Another core characteristic of the WB2-Framework that is particularly relevant to the idea of an education for well-being is the notion that humans are constantly "becoming" (Falkenberg, 2019, p. 13). Such becoming is the result of the ongoing interaction between a human being and their environment:

> This dynamic systems view of human *beings* suggests that even as we assess our own or someone else's state of being at a given time, there is a dynamic element in that being, namely the potential of the system to develop in certain ways rather than in others and to be attentive to certain ways of system disturbances by the environment rather than to other ways. (p. 13)

The dynamic aspect is "integral to understanding the quality of a person's present state (well-being)" (p. 5). As Falkenberg writes, "*well-becoming* expresses the dynamic aspect of well-being and *well-being* expresses the momentary state of well-becoming" (p. 14).

Nussbaum's Capabilities Approach and Max-Neef's fundamental human needs approach to human well-being, brought together by Falkenberg's WB2-Framework, provides a foundation for The Capabilities-Development-with-Nature Approach to Science Education.

The Capabilities-Development-with-Nature Approach to Science Education

While there have been fluctuations in emphasis, most of the goals of science education have remained fairly consistent over the past several decades (see, for instance, DeBoer, 1991; Donovan & Bransford, 2005; Duschl et al., 2007; Pedaste et al., 2015). Broadly speaking, the teaching of science may be divided into three categories:

- learning of knowledge disseminated by scientists

- learning the ways of scientific thinking

- learning the practices of scientific inquiry

Many students of science have experienced an emphasis on the learning of knowledge, often in the form of reading a textbook and reproducing the knowledge disseminated in it, with little to no emphasis on ways to think scientifically and practices of scientific inquiry. This chapter focuses on an approach to science education that provides students opportunities for scientific inquiry in a way that fosters the development of capabilities required for them to live a flourishing life.

An Illustrative Case Study of the Approach in Action

One of the authors (Link, 2018) studied an approach used in a Manitoba elementary school to teach science for its impact on the development of students' capabilities required for their well-being. Link called this approach to teaching science the Capabilities-Development-with-Nature Approach. This teacher-developed pedagogical approach integrates outdoor education with a Reggio Emilia-inspired philosophy of education. In this approach to science teaching, the

outdoors are utilized to provide opportunities to develop capabilities required to fulfil human needs and positively contribute to well-being.

In the Reggio Emilia approach, children are viewed as curious beings with many questions about the world around them. In response to this view of children, the teacher designs the curriculum based on children's questions but also designs the classroom in such a way as to provide opportunities for child-led research and creative work. The following (see Edwards et al., 2012) describes the central features of the Reggio Emilia approach to teaching and learning:

- The focus of curriculum is informed by the interests of the children.

- Teachers and children communicate and collaborate to answer questions through inquiry and project work. Teachers make curricular decisions based on the children's questions and interests.

- The environment is designed as a third teacher in order to spark the child's curiosity and creative work.

- Teachers document children's learning through creative visuals.

- Teachers recognize the numerous ways that children may express themselves. This is called the "one hundred languages of children."

- Opportunities for inquiry projects and creative work are designed to encourage collaborative, rather than individual, efforts.

A typical Reggio Emilia classroom includes well-organized areas for different types of engagement, including quiet individual engagement, small and large group discussions, inquiry and creative work, and imaginative play (Edwards et al., 2012). As Fraser (2006) describes it, such a classroom—understood as "the third teacher"—also recognizes the child's voice: "A classroom that is functioning successfully as a third teacher will be responsive to the children's interests, provide opportunities for children to make their thinking visible, and then foster further

learning and engagement" (p. 67). The child's voice is represented in the design of the classroom concerning the questions investigated and the opportunities for creative work and play. As Heard and McDonough (2009) observe:

> We need to think about creating classroom environments that give children the opportunity for wonder, mystery, and discovery; an environment that speaks to young children's inherent curiosity and innate yearning for exploration is a classroom where children are passionate about learning and love school. (p. 2)

Following the Reggio Emila philosophy, in the Capabilities-Development-with-Nature Approach the third teacher extends into the natural world. "Wonder, mystery, and discovery" are all readily fostered through immersion in the outdoors. Children's questions and interests are recognized and reflected in the way in which engagement in outdoors is designed. By extension, the experiences in the outdoor environment (third teacher) can also provide provocations for inquiry and creative work and play in the indoor environment.

Using nature as a third teacher, this outdoor education approach sparks the children's curiosity and offers them opportunities to develop and enact the capability of asking questions about the natural world they encounter. In the Reggio Emilia approach to teaching and learning, students are provided with a provocation or something that triggers their curiosity, thereby leading to an inquiry project. Provocations in the Reggio Emilia approach typically happen within the classroom. In the Reggio Emilia-inspired outdoor education approach studied in Link (2018), it is the use of nature that provokes curiosity.

In the Capabilities-Development-with-Nature Approach, students are provided opportunities in nature to develop and enact capabilities that have been identified as necessary to meet fundamental human needs, and to ask and voice questions and ideas about what they encounter. These questions are recorded by the teacher and then may form the basis for a

student-led investigation. The development of this particular capability (asking questions) may also lead to, or overlap with, other capabilities. As children are provided opportunities to ask questions, they are also afforded opportunities to develop the capability to explore and discuss the ideas and questions they have about nature, and also to care, appreciate, and connect with the natural world.

What capabilities are valuable for development? Who decides? The capabilities supporting well-being in schools are selected by parents, teachers, Elders, and others through the lens of a fundamental human needs framework developed by Max-Neef (1991), as discussed above. The school community group participating in the study determined the focus of the evaluation based on the following questions:

1. What needs, as aspects of student well-being, are you interested in investigating?

2. What student capabilities are required to fulfill those needs?

Once both the human needs and corresponding capabilities were identified by the school community group, teachers then began the work of curriculum design. Teachers created experiences to provide students opportunities to develop and enact the identified capabilities. Select capabilities were directly linked to student engagement in scientific inquiry. The following examples illustrate the link between a particular way of engaging in scientific inquiry and the development of well-being capabilities.

A group of grade 1 and 2 students were returning from a walking field trip when two students noticed some bumblebees floating between the dandelions. They stopped, crouched down, and observed this behaviour. The rest of the class, with the teacher's encouragement, followed suit. When the students returned to the classroom, the teacher asked the children to reflect on the experience. She asked them what questions came to mind. Some of the students had ideas that the bees were involved in this behaviour in order to make honey, but they had

many questions involving how this all happened. These questions formed the basis for student-led research into the behaviour of bees. In this example of the pedagogical approach, the teacher provided opportunities for the students to develop and enact the capability to voice questions that they had about what they observed in nature (and the opportunity to observe the bees in the first place) and to explore the questions they had through teacher-supported research.

Table 1 outlines the entire list of needs and capabilities, identified by school community members, that led to the study of the Capabilities-Development-with-Nature Approach, along with some more examples of the development and enactment of those capabilities.

Table 1

Needs, Capabilities, and Examples From the Findings

Need	Capability	Example from the findings
Creation	To make choices about what to create	A representation of a garden gnome village in the forest, built with elements of nature
Understanding	To ask questions about the natural world	Observing and asking questions about forest tent caterpillars on the window ledge of the school
Freedom	To explore student-generated questions and ideas about nature	Exploring questions about water insects (back in the classroom) that were inspired by a trip to the local pond
Affection	To appreciate and care for nature	Appreciating bees and caring for spiders
Identity	To experience a connection to nature	The peaceful heart meditation practice at the forest, pond, and other local sites.
Participation	To voice questions and ideas, and to listen to others' questions and ideas about nature	Voicing and listening to ideas and questions during a cankerworm debate (should the cankerworms here be destroyed to prevent them from destroying this tree?)

Note. This table is taken from Link (2018, pp. 68–69).

A Capabilities-Development-with-Nature Approach to Science Education underlines the meaningful aspect of the practice of engaging in scientific inquiry by providing opportunities for students to explore questions that they have about the natural world.

Theorizing the Capabilities-Development-with-Nature Approach to Science Education

The example of the Capabilities-Development-with-Nature Approach described in the previous section illustrates the following principles of this approach to science education:

Theoretical Principles:

- To have capabilities that allow humans to address their fundamental human needs and to have opportunities to enact those capabilities are core components of what it means for humans to live a flourishing life.

- A core purpose of school education is (a) to develop students' capabilities that allow them to address their fundamental human needs as students and future adults; and (b) to provide students with opportunities to enact such capabilities.

- Human needs and the capabilities needed to address them can only be understood within a socio-cultural context.

- Human needs can be addressed through capabilities that involve our relationship with the natural environment. In light of our general disconnect from the natural environment, and of the consequences that that has on our ability to address fundamental human needs, concern for capabilities involving our relationship with the natural environment in order to address human needs has become imperative.

Science Teaching Design Principles:

- The central purpose of science education is to contribute to the core purpose of school education described above.

- The socio-cultural community (e.g., through parents) ought to be involved in identifying a community-relevant understanding of human needs and of capabilities required to address those needs that science education can and should address.

- Wherever possible, learning experiences for students are planned and provided within and through engagement with the natural environment for the purpose of developing capabilities needed to address identified human needs.

Above we have referenced three broad categories of learning that frame current science pedagogy: learning of knowledge disseminated by scientists; learning the ways of scientific thinking; and learning the practices of scientific inquiry. Drawing on the principles of the Capabilities-with-Nature Approach to Science Education, we can now use the following questions as criteria for assessing the appropriateness of learning opportunities designed to address each of the three categories of science teaching:

- How are the knowledge and the ways in which that knowledge is developed by students contributing to the development of students' capabilities that can inform their ability to address their fundamental human needs in order to live a flourishing life as students and future adults?

- How are the ways of scientific thinking (and the possible neglect of other forms of thinking) and the ways in which those are learned by students contributing to the development of students' capabilities that can inform their ability to address their fundamental human needs in order to live a flourishing life as students and future adults?

- How are the practices of scientific inquiry and the way in which those practices are learned by students contributing to the development of students' capabilities that can

inform their ability to address their fundamental human needs in order to live a

flourishing life as students and future adults?

- To what degree are the knowledge development, the learning of scientific thinking, and

  the learning of scientific practices happening within and through engagement with the

  natural environment?

In the next three sub-sections, we briefly illustrate some implications that the lens of the

Capabilities-with-Nature Approach to Science Education and the WB2- Framework has for

purpose-focused design thinking in each of the three categories.

Learning of Knowledge Disseminated by Scientists. The Capabilities-with-Nature

Approach to Science Education suggests that the capabilities to be developed in science

education are *agentic* capabilities in the sense explicated in the WB2-Framework

(seeFalkenberg, 2019, pp. 16–20). This implies, among other things, that the capabilities are

grounded in a *range* of forms of knowing. Following Mingers (2006), we can distinguish

between propositional knowing and performative knowing (though there are more forms to

distinguish). While the former involves being "cognisant of states of affairs" (p. 137), the latter is

"to know *how*" (p. 137). When Mingers (2006) points out that to know how "generally involves

explicit training in order to develop the necessary skills" (p. 137), he points to the distinction that

one can know states of affairs within a life domain without being practically able to actually live

"knowledgably" within that life domain, because one misses the "know-how" required for it. In

terms of knowledge disseminated by scientists within school education, this distinction between

knowing that and knowing how suggests that we can propositionally know what makes for a

healthy meal—by studying the propositional knowledge developed in nutritional science—

without actually being able to live a culinary and nutritionally healthy life, because the latter

requires a complex set of skills, including preparing appropriate meals within certain budgetary

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constraints and the availability of certain kinds of food. Thus, for the design thinking in science education, the Capabilities-with-Nature Approach to Science Education suggests to consider *multiple forms of knowing* to expand the contribution science teaching and learning can make to the development of capabilities for students' present and future well-bein.

Learning the Way of Scientific Thinking. One way in which the lens of the Capabilities-with-Nature Approach to Science Education impacts the learning way of scientific thinking is by emphasizing a *moral imperative* for scientific thinking grounded in a sense of responsibility toward the ecological system that is the Earth. Environmental education scholars (e.g., Orr, 1991, chap. 2) and ecological economists (e.g., Schumacher, 1999) have emphasized the moral imperative of living responsibly and sustainably in the natural environment of which humans are an integral part. For the Capabilities-with-Nature Approach, the purpose of science education is to help develop students' capabilities that allow them to address their human needs as students and future adults; however, the approach does so from a perspective of an ethics of sustainable well-being as it has been, for instance, proposed by Falkenberg (2020). Thus, the Capabilities-with-Nature Approach suggests the design thinking in science education must include a moral imperative to direct and frame all scientific thinking.

Learning the Practices of Scientific Inquiry. The Capabilities-with-Nature Approach to Science Education suggests that the central purpose of science education is to contribute to (a) developing students' capabilities that allow them to address their fundamental human needs as students and future adults; and (b) providing students with opportunities to enact such capabilities. Such a purpose orientation for science education provides *the* ultimate purpose of any practice of scientific inquiry in an educational context. For instance, in the current science curriculum for grades 5–8 in Manitoba (Manitoba Education and Training, 2000), the practice of scientific inquiry is divided into four steps (p. 2.5). The first step is the *purpose* of scientific

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inquiry, which is "seek[ing] answers to questions that humans have about the natural world" (p. 2.5). Once particular questions are asked, the second step consists of *applying scientific inquiry strategies*, such as hypothesizing and experimenting, in order to answer the questions posed. The third step is then *the proposing of explanations* for the phenomena that the second step produced. The fourth step consists in the exploration of three possible parts: inquiring into new questions that arose from the explanations, and thus starting a new scientific inquiry; considering social applications and environmental implications of the explanations; and engaging in personal actions arising from the explanations. If we consider these four steps as *the* four steps of the practice of scientific inquiry, then the purpose orientation of the Capabilities-with-Nature Approach to Science Education suggests that each of these four steps is guided and framed by the ultimate purpose of science education described above. For the design of science teaching, it means that, when designing learning activities linked to each of the four steps of the practice of scientific inquiry, the core design question is "What capabilities that help students live a flourishing life can be addressed at this stage of the practice of scientific inquiry?" For instance, at the purpose stage, teachers can design activities to help students identify questions they might have about the natural world that directly affect their living a flourishing life. At the application stage, teachers can design activities that might help students understand the link between the explanations of natural phenomena they inquired into and the quality of their own lives.

Science Teacher Education for Well-Being

In terms of educating teacher candidates, it is, broadly speaking, necessary to consider exactly what to teach and how to teach it. Through the lens of science teacher education for well-being, we may also consider what capabilities teacher candidates require for their well-being, and by extension, what experiences (designed by the teacher educator) will help the teacher candidate to develop these capabilities. Science teacher education that aims to prepare teacher

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candidates as instructional designers from the perspective of the Capabilities-Development-with-Nature Approach to Science Education would engage teacher candidates from the same premise outlined for the approach in the previous section: Science teacher education is education for teacher well-being, whereby well-being as a teacher encompasses their professional practice as a core aspect of their teacher life, as we will illustrate below. This is directly linked to the first and second theoretical principle of a Capabilities-Development-with-Nature Approach to Science Education, that is, in order for humans to live a flourishing life, they need to have capabilities that allow them to address their present and future fundamental human needs and to have opportunities to enact those capabilities. Teacher candidates need certain capabilities in order to help them fulfill their fundamental human needs and they require opportunities to develop those capabilities. We will provide some examples of such opportunities further below.

The importance of understanding human needs and the capabilities needed to address them within a socio-cultural context is another key theoretical principle. Through the science teaching design principles listed above, teacher candidates (the socio-cultural community) are involved in identifying an agreed-upon understanding of human needs and capabilities required of teachers of science. Such a discussion could take place on the first day of the course, or ideally before the course begins, perhaps through an online discussion.

Concerning the final theoretical principle, the question is: What might the importance of involving our relationship with the natural environment in the development of capabilities look like in the preparation of science teacher candidates? As with the design of science teaching in a K-12 setting, experiences for the development of teacher candidates' capabilities need to be designed wherever possible through engagement with the natural world. As science teachers, a relationship with nature that is based upon wonder, curiosity, and respect will enhance overall

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well-being, in addition to the teacher's ability to teach science in a way that sparks awe and reverence in their students.

Teaching Science Education as Inquiry and Argumentation

We referred earlier in this chapter to the categorization of science teaching into three broad categories: learning of knowledge disseminated by scientists; learning the ways of scientific thinking; and learning the practices of scientific inquiry. The Capabilities-Development-with-Nature Approach to Science Education includes all three, with a focus on the latter, learning the practices of scientific inquiry. But what is meant by scientific inquiry in a pedagogical sense? Scientific inquiry provides students with opportunities to explore a problem, search for potential solutions, ask questions, make observations, test ideas and intuition, and participate in creative work (e.g., Gillies & Baffour, 2017). Pedagogically, providing opportunities to engage in scientific inquiry involves offering students experience in which they do the work of science, such as wondering about what they observe in their encounters with nature and natural phenomena and, in turn, developing questions about their wonderings, exploring possible ideas and explanations concerning their questions, expanding on scientific ideas and processes, and reflecting on their understandings with regards to discovered evidence. Based upon the educational theory of constructivism, teaching from a scientific inquiry approach involves: (a) presenting problems to students that confront their understandings about natural phenomena; and (b) considering whether their current thinking needs to be altered in light of evidence and research (e.g., Rennie, 2005). The teaching of scientific inquiry requires the skill, on the part of the teacher, to spark the students' curiosity concerning a subject of study and then to orchestrate experiences and opportunities to investigate the questions they have (e.g., Gillies et al., 2015).

Science teacher education has come to emphasize the value of involving students in the processes and practices of science, rather than focus on the testing of science concepts and

content (e.g., Schwarz, 2009; Simon et al., 2006). Consequently, science teacher education may ideally provide teacher candidates opportunities to develop understandings and strategies for teaching science to students by means of building an argument for an idea that explains a natural phenomenon. Scholars of science teacher education contend that presenting science-as-argument provides an effective framework for teacher candidates to conceptualize science pedagogy (e.g., Zembal-Saul, 2009). Through the lens of a science-as-argument framework, science teacher educators provide teacher candidates opportunities to consider and practice pedagogical approaches and experiences that allow for the practice of science.

Reframing Science Teacher Education to Serve the Purpose of Well-Being Education

Building upon the theoretical section of this chapter, we now consider how science education serves the purpose of well-being in teacher education. As the name implies, the Capabilities-Development-with-Nature Approach focuses on designing opportunities for children to develop capabilities through engagement with nature. How could science teacher education develop capabilities to support the goals of well-being education? One particular need required for teachers is professional autonomy and freedom. Freedom in this context may involve the freedom to make choices or develop awareness (Max-Neef, 1991, p. 33). What are the freedom-linked capabilities that future teachers may need? Here are a few examples:

- The capability to develop an awareness of the needs of a student.
- Linked to the previous one, the capability to design learning opportunities that support the needs of students in their learning and development.
- The capability to become aware and make choices from various research-based pedagogies in support of student learning and development.
- The capability to collaborate with students, teachers, Elders, parents, administrators, and community members and organizations, and then to make choices based upon that

collaboration (and the further awareness of the school, family, and community context) to

support student learning and development.

- The capability to become aware and reflect upon one's teaching practice—to identify

  strengths and struggles and to act in such a way as to further develop and enrich one's

  own teaching practice.

For the teacher educator, the question then becomes how to design opportunities for

teacher candidates to develop and enact these capabilities in support of their well-being. For each

of the capabilities listed above, the teacher educator may carefully craft experiences that help

teacher candidates consider the theoretical underpinnings of each capability (perhaps through a

reading of a relevant article and subsequent in-class dialogue) and provide opportunities to

practice the capability in either practicum settings or pseudo-situations within the science

education classroom or lab. As an example, in design for opportunities to develop the capability

to collaborate with parents and others, the teacher educator may begin by engaging the teacher

candidates in a selection from the appropriate literature (e.g., Tali Tal, 2004) through a

discussion. Afterwards, the development of this capability may be realized through the practice

of a mock school-setting fishbowl discussion in which the teacher candidates divide into a

number of groups, each respectfully representing one perspective of various vested members of

the community (i.e., teacher, parents, Elders, principal, students, and so on). The teacher

candidates would be provided with a description of the mock school and community highlighting

specific needs, strengths, and characteristics. In their groups, teacher candidates would consider

their assigned roles and create talking points to present respectfully their perspectives and ideas

to contribute to the collaborative intent of supporting the needs of the students. One chair for

each role would be placed in a circle and group members take turns representing their character

while the teacher educator facilitates discussion.

In this experience, teacher candidates have the opportunity to develop the capability to collaborate with others from various perspectives within the school and the community. The capability to collaborate with others to support the needs of students is arguably an essential capability for a teacher, a capability that strengthens the teacher's ability to build awareness of the wider context of school, family, community, and culture, and subsequently contributes to the teacher candidates present and future well-being.

It is a common practice among post-secondary teachers, including teacher educators, to design their courses with learning outcomes or objectives in mind. In order to focus the efforts of a purposeful design towards teacher well-being, a familiar approach is to use learning outcomes to highlight the development of capabilities. For example, a freedom-linked learning outcome on a science education course outline may read something like, "by the end of the course, the teacher candidate will be able to make choices about pedagogical approaches to teaching with nature." The purpose of this outcome may be made explicit either through discussion with the teacher candidates at the outset of the course or by extending the outcomes statement to include the intention. By highlighting and designing our teacher education curricula for teacher well-being, teacher education programs may contribute to the flourishing and well-being of teacher candidates both in their lives as students and their future careers as teachers. Notably, the modelling of the Capabilities-Development-with-Nature Approach within a teacher education program gives teacher candidates the opportunity to experience a pedagogical approach that may also benefit their own students.

We have argued here that well-being may be met when human needs are satisfied. When teacher educators design experiences and opportunities to develop and enact capabilities that satisfy basic human needs, teacher candidates may flourish. This is the primary focus of a Capabilities-Development-with-Nature Approach.

Conclusion

In this chapter we have outlined the theory and illustrated the practice of a particular approach to science education—the Capabilities-Development-with-Nature Approach to Science Education—and its implications for purpose-focused instructional design thinking in science teaching and science teacher education. The approach takes its starting point in the premise that education is first and foremost about opportunities to develop and engage capabilities that allow the learner to live a flourishing life (a life of well-being). This premise together with a particular understanding of what it means to live a flourishing life have specific implications for curriculum designing with respect to each of the three general goals of science education, which we illustrated in this chapter: learning of knowledge disseminated by scientists, learning the way of scientific thinking, and learning the practices of scientific inquiry. Finally, the premise about the primary purpose of education has the same general implications for science teacher education, and this chapter provides some examples of such implications.

As with any other subject-specific school education, science (teacher) education and the work of teachers as curriculum designers cannot be separated from the core purpose(s) of school education. In this chapter, we have illustrated how design thinking in science (teacher) education is impacted by a specific response to the question about the core purpose of school education.

References

Brighouse, H. (2006). *On education*. Routledge.

Brown, T., & Kātz, B. (2009). *Change by design: How design thinking transforms organizations and inspires innovation*. Harper Business.

Carlgren, I. (1999). Professionalism and teachers as designers. *Journal of Curriculum Studies*, *31*(1), 43–56.

Cross, N. (2011). *Design thinking: Understanding how designers think and work.* Berg Publishing.

DeBoer, G. (1991). *A history of ideas in science education: Implications for practice*. Teachers College Press.

Donovan, M.S., & Bransford, J. D. (Eds.). (2005). *How students learn: Science in the classroom*. The National Academies Press.

Duschl, R., Schweingruber, H. A., & Shouse, A. W. (Eds.). (2007). *Taking science to school: Learning and teaching science in grades K-8*. The National Academies Press.

Edwards, C., Forman, G., & Gandini, L. (2012). *The hundred languages of children the Reggio Emilia experience in transformation* (3rd ed.). Praeger.

Falkenberg, T. (2019). *Framing human well-being and well-becoming: An integrated systems approach*. http://wellbeinginschools.ca/paper-series/

Falkenberg, T. (2020). An ethic of sustainable well-being and well-becoming: A systems approach to virtue ethics. In H. Bai, D. Chang, & C. Scott. (Eds.), *A book of ecological virtues: Living well in the Anthropocene* (pp. 157–177). University of Regina Press.

Fraser, S. (2006). *Authentic childhood: Experiencing Reggio Emilia in the classroom* (2nd ed.). Nelson.

Gillies, R., & Baffour, B. (2017). The effects of teacher-introduced multimodal representations

and discourse on students' task engagement and scientific language during cooperative, inquiry-based science. *Instructional Science, 45*(4), 493–513. https://doi.org/10.1007/s11251-017-9414-4

Gillies, R., Nichols, K., & Khan, A. (2015). The effects of scientific representations on primary students' development of scientific discourse and conceptual understandings during cooperative contemporary inquiry-science. *Cambridge Journal of Education*, *45*, 427–449. https://doi.org/10.1080/0305764X.2014.988681

Heard, G., & McDonough, J. (2009). *A place for wonder: Reading and writing nonfiction in the primary grades*. Stenhouse Publishers.

Henriksen, D., Gretter, S., & Richardson, C. (2020). Design thinking and the practicing teacher: Addressing problems of practice in teacher education. *Teaching Education, 31*(2), 209–229. https://doi.org/10.1080/10476210.2018.1531841

Laurillard, D. (2012). *Teaching as a design science: Building pedagogical patterns for learning and technology*. Routledge.

Lawson, B. (1980). *How designers think: The design process demystified*. Architectural.

Link, M. (2018). *Nature, capabilities, and student well-being: An evaluation of an outdoor education approach* [Doctoral dissertation, University of Manitoba]. http://hdl.handle.net/1993/33289

Manitoba Education and Training (2000). *Grades 5 to 8: Manitoba curriculum framework of outcomes*. https://www.edu.gov.mb.ca/k12/cur/science/outcomes/5-8/full_doc.pdf

Mingers, J. (2006). *Realising systems thinking: Knowledge and action in management science*. Springer.

Nussbaum, N. C. (2011). *Creating capabilities: The human development approach*. The Belknap Press of Harvard University Press.

Orr, D. W. (1991). *Earth in mind: On education, environment, and the human prospect*. Island Press.

Pedaste, M., Mäeots, M., Siiman, L., de Jong, T., van Riesen, S., Kamp, E., & Tsourlidaki, E. (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. *Educational Research Review*, *14*(C), 47–61. https://doi.org/10.1016/j.edurev.2015.02.003

Razzouk, R., & Shute, V. (2012). What is design thinking and why is it important? *Review of Educational Research*, *82*(3), 330–348.

Rennie, L. (2005). Science awareness and scientific literacy. *Teaching Science, 51*(1), 10–14.

Roman, A. (2018). *Thinking-driven testing: The most reasonable approach to quality control*. Springer.

Schumacher, E. F. (1999). *Small is beautiful: Economics as if people mattered*. Hartley & Marks.

Schwarz, C. (2009). Developing preservice elementary teachers' knowledge and practices through modeling centered scientific inquiry. *Science Education, 93*, 720–744.

Simon, S., Erduran, S., & Osborne, J. (2006). Learning to teach argumentation: Research and development in the science classroom. *International Journal of Science Education, 28*(2–3), 235–260.

Tali Tal, R. (2004). Community-based environmental education: A case study of teacher-parent collaboration. *Environmental Education Research*, *10*(4), 523–543.

White, J. (2011). *Exploring well-being in schools: A guide to making children's lives more fulfilling*. Routledge.

Zembal-Saul, C. (2009). Learning to teach elementary school science as argument. *Science Education*, *93*(4), 687–719. https://doi.org/10.1002/sce.20325

Preservice Teachers' Conceptions of Citizenship: Implications for Action in Social Studies

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Abstract

This chapter has three related purposes. In the context of preservice teacher education about Social Studies teaching, it explores how cognitive frames uncovered through a recent phenomenographic study about citizenship are understood among preservice teachers. An initial finding of the study was that cognitive frames about the concepts that preservice teachers hold can be changed with specific and deliberate use of strategies to support conceptual understanding in teacher education. Secondly, using one central Social Studies concept—citizenship—the authors describe the process of studying cognitive frames among a convenience sample of preservice teachers, and explore the intended and unintended outcomes of the study regarding how cognitive frames seem to expand among preservice teachers during their teacher education program. Finally, the chapter presents a continuum of cognitive frame development that appeared, among this sample of preservice teachers, to be linear, sequential, and unvaried as they expanded their conception of what they meant by the term *citizenship.* Implications for course foci in preservice teacher education are offered in response to these findings.

Résumé

Ce chapitre poursuit un triple objectif. Dans le cadre de la formation des enseignants en études sociales, il explore d'abord les repères cognitifs de ces derniers autour du concept de citoyenneté à partir d'une étude phénoménographique récente. Un résultat préliminaire de l'étude démontre que ces repères peuvent être modifiés grâce à une intervention stratégique concertée en pédagogie de l'enseignement ayant pour but l'apprentissage conceptuel des enseignants en formation. S'appuyant sur un concept central en études sociales, celui de la citoyenneté, les auteures exposent en second lieu le processus d'analyse des cadres cognitifs auprès d'un échantillon d'enseignants candidats; elles se penchent ensuite sur les résultats anticipés et non anticipés de l'étude, à savoir comment les cadres cognitifs s'accroissent chez les candidats en cours de formation. Enfin, le chapitre révèle que dans cet échantillon, le continuum du développement cognitif des candidats s'avère linéaire, séquentiel et invariable au fur à mesure qu'ils enrichissent leur compréhension du concept de citoyenneté. Les retombées d'un tel enseignement ciblé dans la formation des enseignants sont discutées en réponse à ces observations.

Teacher educators play a pivotal role in helping to shape the competencies of preservice teachers (Meyer, 2004; Rodriguez & Polat, 2012). In order to do so effectively, it is important for teacher educators to become aware of cognitive frames, which are best described as the way preservice teachers perceive, filter, and conceptualize information in ways that form the foundation of decisions and action (Hambrick & Mason, 1984). These cognitive perceptions or frames are represented as mental models and are visualized using cognitive and conceptual maps (Axelrod, 1976; Goffman, 1974; Johnson-Laird & Shafir, 1993; Senge 1990).

Learners can use these knowledge representations to think about and understand concepts (Alexander, 2006; Vosniadou, 1999), and apply their personal cognitive frames when addressing disciplinary thinking. In any constructivist context in teacher education, experience working with concepts and relating concepts to each other can strengthen the overall conceptual knowledge of the teacher educators, and in turn, their preservice teachers. For new teachers, the act of working on developing curriculum and developing effective strategies for teaching (i.e., pedagogical content knowledge) helps teachers enrich their own conceptual knowledge, thereby strengthening the potential knowledge creation with students (Goh, 2013; Hill at al., 2005; Shulman, 1987).

In order to develop rich conceptual knowledge in students and to use that knowledge to create frames about concepts (also called cognitive frames), teachers and preservice teachers need to be consciously aware of the frames they hold and of the sources that influence these frames (Hughes & Sears, 2004). Typically, in schooling contexts cognitive frames are organized along disciplinary lines as reflected in the structure of the curriculum guidelines (e.g., Ontario Ministry of Education, 2018). Curriculum guidelines for specific disciplines prioritize particular visions for learners which ought to be reflected in the cognitive frames. For example, the Ontario Ministry of Education Social Studies Guideline Grades 1–6 (2018) provides a graphic to

conceptualize the intended outcome of the guideline (Ontario Ministry of Education, 1998, p. 8), which helps identify the disciplinary priorities of the subject and elements of disciplinary thinking.

Citizenship is a key social studies concept prioritized in Ontario, the jurisdiction targeted in this study. In the preservice context, teacher educators are expected to understand citizenship and be able to teach preservice teachers how to expand their own students' understanding of the concept as reflected in the guideline's intended outcome. However, there is little evidence to suggest that preservice teachers themselves have a comprehensive understanding of the concept of citizenship or other complex concepts that they are required to teach (Meyer, 2004; Rodriguez & Polat, 2012). While there is currently extensive research on how complex issues related to citizenship (e.g., contested issues related to immigration and national identity) are developed in students (see for example, Enslin, 2000; Evans, 2006; Geboers et al.; 2013; Knight-Abowitz & Harnish, 2006), little is known about the extent of preservice teachers' own conceptions of citizenship and other complex concepts, or how they acquire and develop the conceptions that they hold.

The inclusion of concept maps as part of teacher education curriculum in social studies could strengthen a conceptual framework for teaching such complex concepts as citizenship. It could guide our instructional thinking and practice about how to teach preservice teachers to engage their own students in learning complex concepts and in strategies to expand students' conceptual frames. Understanding how preservice teachers develop their teacher knowledge about concepts is a complex undertaking.

This chapter will first summarize prior research related to preservice teachers' conceptions of citizenship and, more specifically, how their cognitive frames appear to develop. Next, it will report on current research that explored the existing conceptions of preservice

teachers who were participants in a phenomenographic study of these cognitive frames. Additionally, appropriate pedagogies to ameliorate weak and immature cognitive frames in preservice teachers' understanding of citizenship and other complex concepts will be examined, with the goal of providing examples of preservice pedagogy. These examples have the potential to enrich both the conceptions of the preservice teachers and improve their disciplinary thinking for the benefit of their future students.

Literature Context

Concepts of Citizenship

Citizenship in a democracy gives membership to those within a political unit. By defining who they are through a "meaning-making" lens (Oyersman et al., 2012, p. 69), it provides individuals with an identity. It is built upon a set of values and standards usually interpreted as a commitment to the common good of a particular political unit. Citizenship also involves practising a degree of participation in the process of political life. An understanding of citizenship helps individuals appreciate the laws that govern their political unit as well as its processes of governance. Finally, it enables citizenship to be part of a group that shares the same beliefs (Enslin, 2000). While this is not an exhaustive definition of citizenship, it provides a structure for understanding the concept both as an isolated conception and as an example of a conception within a larger context.

Much of the research about citizenship to date has focused on trying to define and delineate the elements of citizenship to clarify the concept. For example, Colley (2017) supported strategies often referred to as "the four Cs of Citizenship," i.e., controversy, conflict, conformity, and co-operation. Koutselini (2008) framed the process of interrogating conceptions of citizenship on an active/passive continuum. Koutselini recognized that internal cultural conflicts at a national level might pose a threat to national identity, thereby strengthening the

obligation of citizens to support national ideals, while concomitantly suspending the questioning of their own personal beliefs in favour of stability in their country. That is, some cultures may experience an internal identity threat (whether real or imagined) to citizenship from unharmoniously blended cultures, which may make citizenship concepts more insular and protective. Tonen (2013) acknowledged that the concept of citizenship might be fluid depending on how stable the society is and how the teachers are educated to teach citizenship. He referred to this type of fluidity as the "positive right" (p. 13). In Tonen's positive right conception, citizens' participation in their own citizenship rights and responsibilities is seen as a response to immediate social needs. The fluidity of the central concept of citizenship lays the groundwork for us to consider the relative stability or fluidity of other core concepts in curriculum.

Multiculturalism across societies is creating shifts in the concept of citizenship, moving towards the balance of several factors in the context of an upset political landscape where "multiculturalism is first and foremost about developing new models of democratic citizenship, grounded in human-rights ideals, to replace earlier uncivil and undemocratic relations of hierarchy and exclusion" (Kymlicka, 2012, p. 8). A new ideology seems to have emerged based on a multicultural perspective that balances unity and diversity, as well as national identity and global understanding, attributes that should inform the development of citizenship courses and curricula (Banks, 2004, p. 7). Similarly, we might expect that a large influx of people from a particular culture would have an impact on the evolution of any core concepts in the curriculum (e.g., citizenship).

The reality is that political context matters (Koutselini, 2008) when we discuss the concept of citizenship and the evolution, or devolution, of the cognitive frames that support the concepts related to citizenship. Koutselini (2008) noted that:

European citizens cannot be considered 'harmonized' in their understanding of

citizenship as the political, social, economic and educational realities in different

countries imply different discourses, experiences and internalizations of similar concepts.

(p. 173)

Similarly, Sandoval Moya (2003) noted that:

Most of the citizenship fights in the second part of the twentieth century can be

understood as a group of efforts for extending the view of the subject of rights including

new forms of citizenship: gender and citizenship, rural citizenship, multicultural

citizenship, and during the recent years, youth citizenship. (pp. 34–35)

Given the fluid understanding of the concept of citizenship, we can anticipate it will

continue to broaden as globalisation and migration expand. We can also anticipate that the

stability of the conceptions may devolve with global conflicts or regional instabilities that may

influence the beliefs of citizens. Koutselini (2008) framed the evolution of citizenship concepts

as the tension between a global view of citizenship in contrast to a national view; additionally,

she framed a tension between human rights and civic rights. In an effort to look forward to the

evolution of the concept of citizenship, Szelényi and Rhoads (2007) focused on the need to

develop individual citizenship responsibility and what Archibugi and Held (1995) called

reaching across national borders. This recognises the continued relevance of the nation state and

embraces global citizenship that includes an expansion of an already broad set of intersecting

identities, where citizens identify themselves as members of a group at a local level while

recognising their membership in larger groups at the national and global level. Accepting

multiple citizenship identities can support tolerance and the universal acceptability of human

rights (Koutselini, 2008).

Clarifying the concept of citizenship is a challenge because of the complexity of it being both fluid and ill-defined. Teacher educators are encouraged to see citizenship within its current civil, social, economic, educational, and political lenses of influence. Citizenship concepts can be delineated by: outlining obligations as citizens, defining how citizens should act in accordance to civic virtue, and questioning identity as citizens.

Westheimer and Kahne's (2004) three citizenship dimensions are an excellent way to understand how the concept of citizenship is viewed in the minds of preservice teachers. In this study, preservice teachers' concept maps were analyzed to identify their conceptions of citizenship. Being able to order the preservice teachers' diverse perspectives of citizenship according to the three distinct dimensions mentioned above allows teacher educators to uncover and acknowledge many differing concepts of citizenship, as well as other complex concepts outlined in the literature. How preservice teachers think about the concepts they teach helps to understand how citizenship education is taught.

Most recently Straub's (2020) phenomenographic study of twenty preservice teachers at one Ontario university uncovered the conceptual frames preservice teachers hold about citizenship. This research was situated at the intersection of two complementary theoretical frameworks. The first is framed through a civic republican lens "with its emphasis on public education, civic involvement, and achieving the common good through civic virtue" (Babcock, 2009, p. 517) and provides a useful construct for thinking about how to make individuals behave in more responsible ways for the greater good of society. The second theoretical framework that informed the study drew on constructivist learning theory. That framework emphasizes how individuals come to every learning situation with their own prior knowledge. Constructivist research aims to discover and understand the nature of students' prior conceptions in order to influence curricula and develop teaching approaches, measure the impact of approaches, and

ultimately increase a student's ability to meld new and more complex knowledge into that which they already know (Hughes & Sears, 2004). In this study, preservice teachers formed the group of students whose conceptions of citizenship were explored both prior to and after a Social Studies course in a teacher education program.

Methodology

Phenomenography

Phenomenographic research is premised on the assumption that there is a limited number of qualitative ways that individuals can relate to conceptual understanding. Researchers categorize the difference in experiences expressed by study participants (Åkerlind, 2005; Marton, 1981). In phenomenographic research, hierarchical categories can emerge from the analysis of data sets provided by participants, and through this method the researcher can uncover and better understand how participants understand concepts. This research approach has been used to deconstruct learning processes in many academic areas (Case & Light, 2011; Ornek, 2008; Prosser, 1994; Reid & Petocz, 2002; Sjöström & Dahlgren, 2002, among others). Additionally, phenomenography has been used as an approach to study students' ability to incorporate new and more complex knowledge into what they already know (Hughes & Sears, 2004).

The Range and Purpose of Phenomenography Research

In phenomenographic research, categories of response are not predetermined but evolve hierarchically from participants' responses to the topic, while building on variation theory (Booth, 2008; Hella & Wright, 2009; Lam, 2013). Variation theory holds that conceptual development is based on individual experience variations. Phenomenography recognizes the common understanding of the concepts shared by a group, while also recognizing the variations that exist amongst its individual members. This methodology allows researchers to uncover

cognitive complexity levels that signal participants' understanding of the phenomenon. In this case, the phenomenon is citizenship, and phenomenography allows for a study of how participants understand this phenomenon.

Data Collection Strategy

Phenomenography is both rigorous and recursive. The strategy used in this study integrated multiple sources of qualitative data including interviews, document analysis (of concept maps and course syllabus), and observations (Patton, 2002). This combination of strategies allowed the researcher to uncover emerging themes, patterns, concepts, insights, and understandings (Patton, 2002, pp. 261–283) using data triangulation to increase trustworthiness. Figure 1 shows the details of the phenomenographic methodology.

Figure 1

Stages of Phenomenographic Research
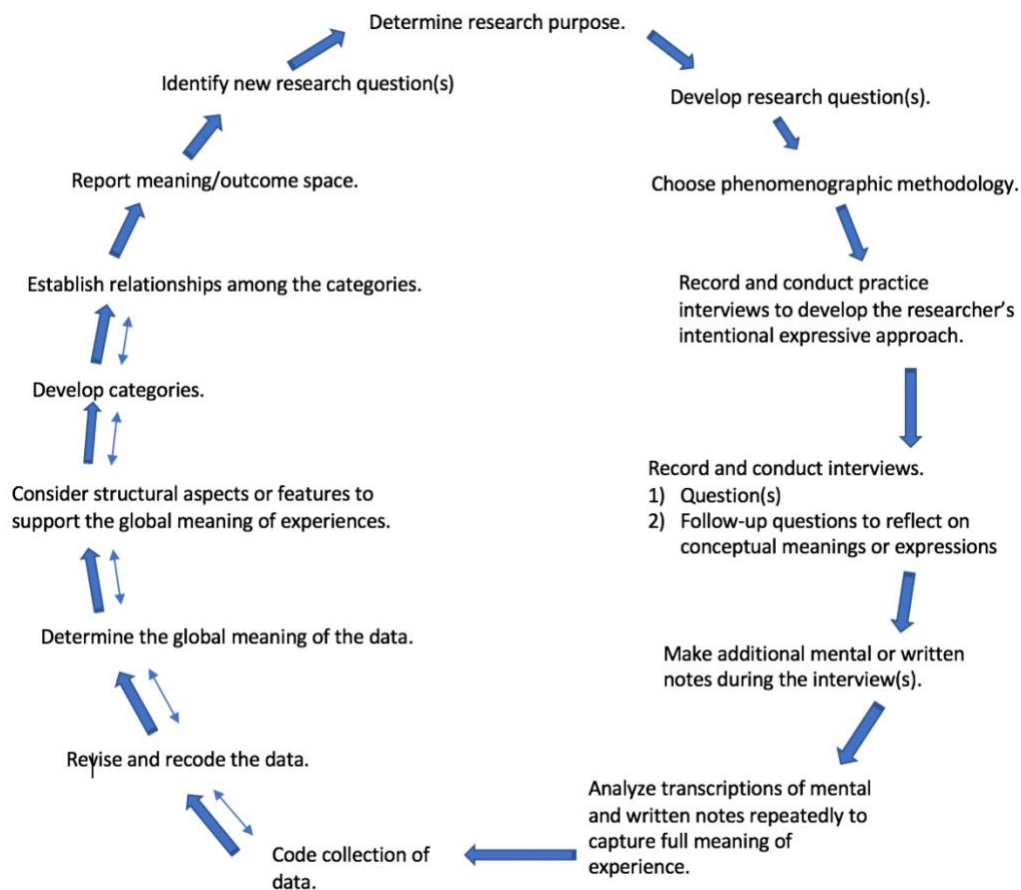
The model (Figure 1) was created by Straub (2020) for this research project to help identify each step in the phenomenographic process. The items presented are adapted from phenomenography literature (see Åkerlind, 2008; Entwistle & Marton, 1994; Goh, 2013; Gunton et al., 2013; Kinnunen & Simon, 2012; Lindberg, 2000; Marton & Booth, 1997; Marton & Pong, 2005; Saldana, 2008).

Timeframe

All data were collected between September and December 2017.

Participants

Data were collected within the context of a 36-hour social studies course as part of a two-year teacher preparation program. All course participants attended the same small Canadian university and were invited to participate in the study. Twenty preservice teachers volunteered as participants (N=18 females; 2 males) and ranged between the ages of 24 and 33. All participants self-identified as Canadian; none of the participants identified with an ethnic minority group. Two participants identified as first-generation Canadians of European decent.

Data Collection Procedures

Semi-structured interviews and concept maps provided the key sources of data for this study from pre- and post-course data collection sessions. Both interview sessions included the same initial set of questions and were followed by participant-specific probes. Additionally, the primary researcher attended lessons during the social studies course to observe the explicit teaching of citizenship concepts. A third source of examined data included support documents, including the course syllabus and transcripts of classroom group work. These data allowed the researcher to understand the concept of citizenship from the participants' perspectives. While a wide range of data were collected through this study, this chapter addresses data analysis and discussion focused on outcomes specifically related to concept maps and how our understanding of concept maps, as a pedagogical tool for enriching cognitive frames, can assist preservice teachers in their development as curriculum designers.

Data Analysis and Knowledge Claims

Data for the entire study were collected in response to the two focal research questions:

1. How do preservice teachers understand citizenship?

2. What are the factors that influence the cognitive frames that preservice teachers hold regarding citizenship?

The data analysis provided a mechanism to allow the researcher to gain insight into factors that might have influenced pre-and post-course conceptions of citizenship. Using Åkerlind's strategies of data analysis, the researcher maintained "a focus on the transcripts and the emerging categories of the set, rather than on individual categories" (p. 323). This was essential to sustain the focus on the collective experience of the group. Analysis of pre-and post-data was further based on Bowden and Walsh's (2000) approach to phenomenographic analysis to support the focus on referential (i.e., meaning) and structural components (i.e., what they did not say about their understanding of the concepts) of the categories of emerging descriptions, including similarities and differences within the categories. Further analysis used methodologies that were supported by previous researchers (Gardner, 1993; Iguanane et al., 1999; Kinchin, 1998; Lourdel et al., 2007; Marchard, 1997; Novak, 1990; Saādanit & Bertrand-Gastaldy, 2000).

Since the focus of this chapter is on the changes in conceptual frames shown by preservice teachers as a group, we report results from before and after specific instruction about the concept of citizenship.

Outcomes from the Study Related to the Research Questions

Since this study was conceptually rich, and data were drawn from a number of sources, data were analyzed separately. However, the analysis of different forms of data appeared to show consistently the same categories of descriptions of the preservice teachers' conceptual understanding of citizenship. From all sources of data including interviews, observation, and concept map analysis in pre- and post-course contexts, five categories of descriptions emerged, including:

    Category 1: Citizenship as Place

    Category 2: Legal Dimensions of Citizenship

    Category 3: Socio-Cultural Dimensions of Citizenship

Category 4: Civic Engagement

Category 5: Civic Orientations

The first theme is the *place* dimension. Preservice teachers in this study appeared

to have a clear understanding of *Jus soli* ("right of the land") whereby citizenship on the basis of

birth in a country's domain automatically designates individuals as citizens of that nation, and

that those who were not born there are excluded (Echeverri-Gent, 2011). The participants in this

study demonstrated a limited knowledge of what is *legal* and *non-legal* citizenship status. They

understood that citizenship as a concept means that Canadians have inherent rights, but as a

group they offered few examples to highlight the rights they stated as a concept. They

understood employment rights, healthcare rights, and the right to a passport. As a cohort group

they also understood that having dual citizenship was a legal status given to those who qualified

for this right. Although the term *rights* appeared as a concept with high frequency and group

resonance, it is clear that preservice teachers in this study had a limited understanding of legal

and non-legal citizenship status.

The *socio-cultural dimensions* highlight an understanding of belonging, community,

sense of pride, identity, and culture. The preservice teachers in this study felt that belonging to a

group was an important part of citizenship. However, the importance of belonging was not as

evident at the end of the term. The participants felt proud to be Canadian and their understanding

of pride increased to share cognitive frames that might indicate the beginning of a shift from

personal conceptions of pride to "communities with multiple possibilities" (Anne, Interview 2);

it seems they began to see the pride not as their own personal pride as a Canadian, but how pride

was a feeling shared by most Canadians. When comparing the cognitive frames of the

participants between the beginning of the term and the end, there appeared to be a shift in their

understanding. There is evidence that as a group they were beginning to explore concepts that

were less passive and were beginning to see citizenship in terms of action. Preservice teachers do experience citizenship in socio-cultural ways. There is evidence that the conceptions they hold about culture and diversity reflect the identities of their own privilege as white middle-class students. In the study, none of the participants acknowledged that discrimination exists in Canada and only one participant of 20 mentioned "racism is a challenge for some new immigrants" (Straub, 2020).

How people engage in formal politics, political advocacy, and civil organizations formed the cognitive frames related to *civic engagement*. In the first phase of the study, preservice teachers explored in limited ways concepts related to politics, volunteering in general, and participation in civil society organizations. Only one participant described *politics* as a concept that indicated her understanding of citizenship. In the first part of the study, four participants discussed voting as a concept related to citizenship, and three participants described volunteering as an aspect of citizenship. However, statements referring to civic engagement more than doubled in the post-course interview. For many, their understanding of civic engagement was directly linked to being a "good citizen." Emma-Eliana characterised her understanding of civic engagement as a means of "being involved in a lot of volunteer activities that have definitely impacted … my understanding of what it means to be engaged" (Interview 2).

Preservice teachers in this study held *civic orientations* that were primarily reflective of a personally-responsible citizenship orientation as outlined by Westheimer and Kahne's (2004) framework. While some previous studies (Patterson et al., 2012) indicated that few teachers hold that civic orientations that are reflective of participatory citizenship, social action, and social justice, it is important to recognize that preservice teachers are very much engaged in volunteerism as a form of participatory civic engagement. Some participants adopted common views relating to more sophisticated cognitive frames about their civic orientations by sharing

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some of the lessons and activities focused on social action and social justice that they experienced during their practicum/field placements. While these social action/social justice orientations *expressed* in the individual interviews and concept maps *did not distinctively* represent the cognitive frames of the group, the in-class observations clearly showed that some participants were assimilating new cognitive frames that demonstrated understanding of many of the more sophisticated constructs through dialogue and as part of the Social Studies course activities. For example, one group felt that a participant's experience was representative of their group's understanding of social action/social justice:

> I did a novel study [on practicum] on *Iqbal* (D'Adamo, 2003) about child labour in Pakistan and the students were so emotionally invested in the characters that there were tears at the end. In the story and [sic] the main character actually dies. They [young students] were really invested in the issue and really cared about the children even if it was a fictional account and interested and keen to do what they could . . . [and] we talked about the different ways that you can personally work towards ending child labour like making sure that you're buying products that are responsibly sourced. (Katherine, in-class observations)

Acknowledging that complex concepts can be assembled into categories and sub-categories of understanding is an important curriculum design principle and will be explored later as a curriculum design skill for teacher educators. We recognize that this is a very brief outline of the research question findings for this study. However, due to the length limits for this chapter, we chose to focus further discussion on the unexpected outcomes that emerged from the data analysis. For further details about the outcome of the five categories of citizenship descriptions that emerged from the research questions, see Straub (2020).

However, before addressing the unexpected findings from the study, it is worth noting the finding of a theme of privilege that emerged as the conceptual frame of preservice teachers' understanding of citizenship. That is, preservice teachers in this study experienced the concepts that they are required to teach through a lens of privilege. This privilege may hinder the participants' ability to develop as curriculum designers who recognize critical social studies concepts that are influenced by their privileged perspective. For example, it was also clear that participants in the study saw the privilege of adding citizenship (e.g., dual citizenship) to their existing global status, but did not recognize that Canadian citizenship remained out of reach for many new immigrants. Participants frequently regarded volunteering as participation in society to help others, such as new immigrants to Canada, but almost exclusively avoided personal risk to their privileged status. One preservice teacher expressed how she struggled to establish a sense of personal identity within a group of professional peers: "You adopt or allow certain actions [like anti-immigrant comments] to take place or be acceptable that you would otherwise not accept as an individual" (Quinn, Interview 2). There was a lack of depth in their reflective responses, which was evidenced by their inability to provide extensive examples of social action as a symbol of civic engagement. For example, in response to a prompt about what she might do to act as a privileged Canadian in support of less privileged people, one participant stated "I don't know … following the laws … being involved" (Quinn, Interview 1). While this issue of preservice teachers' privileged status is important, the remainder of the chapter will focus on unexpected outcomes from the study.

**Unexpected Outcomes from this Study**

Despite concerns over preservice teachers' privileged perspectives, data from the same study also provided an optimistic view of the potential of preservice teachers' program-embedded learning as a site for growth. Within this study, interview and concept maps were a

key source of data, and analysis of these data showed that course content impacted conceptual growth. Pre-and post-concept maps and utterances related to these citizenship concepts allowed the researcher to look closely at the structure of conceptions as they were presented visually (see Kinchin, 1998). While preservice teachers had some prior knowledge of what a concept map was, the researcher provided no explicit instruction in the research design on the types of concept maps participants could use to explain how they understood citizenship. From the data analysis, a predictable and consistent sequence of growth in concepts emerged, moving from undefined concept maps (using a picture or diagram rather than a concept map), to diagrammatically spoked concept maps (a central concept expanded to spokes on a wheel), to a chain concept map (relating a concept to another one in a linear but not necessarily hierarchical fashion) and, finally, to a net concept map (where concepts are interconnected and interrelated).

What was most notable in this growth sequence is how every participant followed it. That is, each participant's outcome followed a distinct pattern of development in the types of concept maps they used to express their conceptions of citizenship (see Figures 2 to 5).
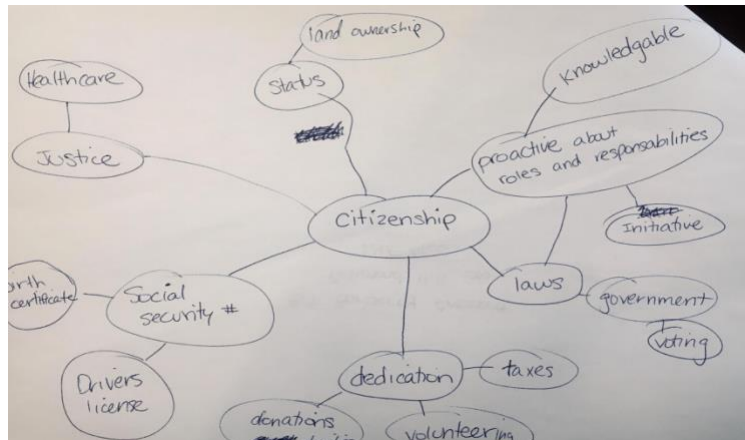
Figure 2

Spoke Citizenship Concept Map From Study Participant
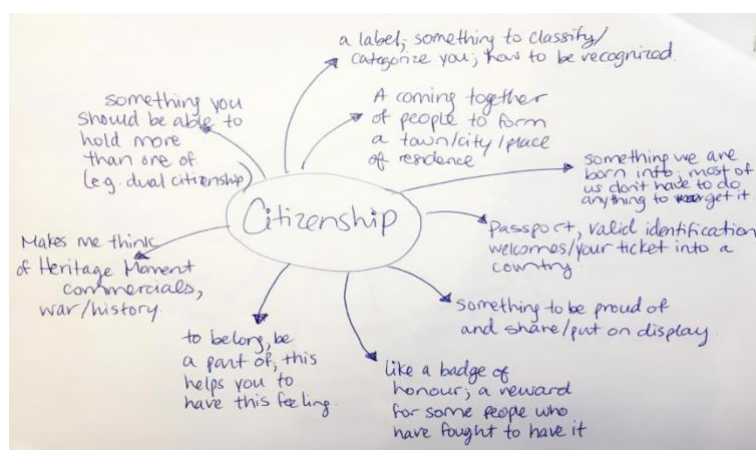
Figure 3

Chain Citizenship Concept Map From Study Participant

Figure 4

*Net Citizenship Concept Map From Study Participant*

For example, a participant who initially shared a spoke map (imagine the spokes of a wheel) may have moved toward using a chain map (see Figure 4), but in no case did any participant skip stages of the concept map continuum from the first map iterations to the second map iterations in the post-mapping exercise. This may be an important finding for the development of teacher education programs as it implies that a progression in complexity of conceptual understanding may be predictable, sequential, and growth oriented (see Kinchin et al., 2000). Knowing that such a conceptual sequence was evident with participants in this study, and so consistently evident across the group of participants, can lead to the hypothesis that similar conceptual

progression may be expected across a similar population of emerging professionals in relation to other complex concepts that they are required to build into their curriculum. This sequence is presented as concept map continuum in Figure 5.

Figure 5

Concept Map Continuum
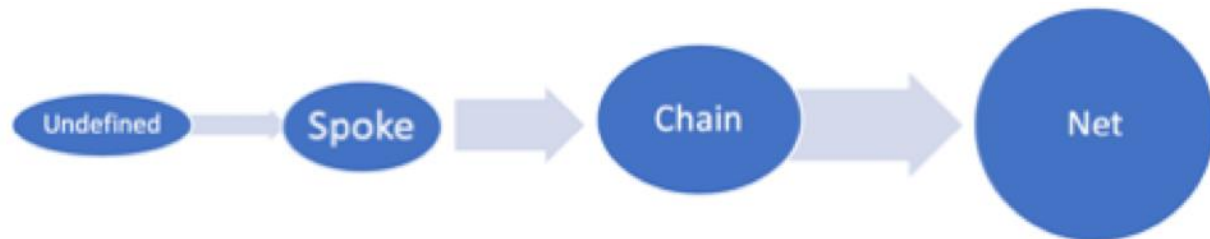
Discussion and Implications: Key Contributions

This study had both outcomes related to the research questions (for further detail see Straub, 2020) and unintended knowledge outcomes. While the study set out to increase understanding in the context of two research questions (i.e., How do preservice teachers understand citizenship?; What are the factors that influence the cognitive frames that preservice teachers hold?), the researcher's methodological approach to data collection and analysis through rigorous phenomenographic approaches led to a key discovery that may have significance for teacher educators as they approach instruction of curriculum design with preservice teachers.

The findings help to discern how teacher educators might approach conceptual development in teacher preparation programs. Phenomenographic analysis of the content in the data sources (i.e., concept maps, participant interviews, course syllabus, and in-class observations) to examine cognitive frames of preservice teachers resulted in an understanding of citizenship that could be sorted into five categories, as outlined earlier in this chapter. Interestingly, all five categories had the overarching concept of teacher privilege that appeared to

influence the outcome space in both the choice of statements and the examples that participants provided in the concept maps. These categories can be used in future research to inform course analysis and as a starting point for curriculum mapping, within any preservice social studies course to enrich the curriculum design learning outcomes of preservice teachers.

Another important but unintended outcome of this study points to the development of a continuum of concept maps that can be used to inform how preservice teachers teach concept mapping as an instructional strategy. The ability to analyze concept maps on a continuum to consider the depth of understanding of learners may allow preservice teachers to enrich their curriculum planning and support the development of connections among concepts in courses they design. In a recent PhD course taught by the second author, this finding was applied to a course assignment about situating a research plan into a range of educational theories (pre-modern, modern, and post-modern). Anecdotal evidence showed that exposing the course participants to the concepts of spoke, web/chain, and net conceptual maps helped them to produce complex net maps to demonstrate their understanding of nine educational theories (see Figure 6). Further research is needed to understand more fully how modelling the types of conceptual maps influences the learners' understanding of possibilities and their explorations of complexities through visual representations.

Figure 6

Net Concept Map of Educational Theories

Epistemological Net Diagram
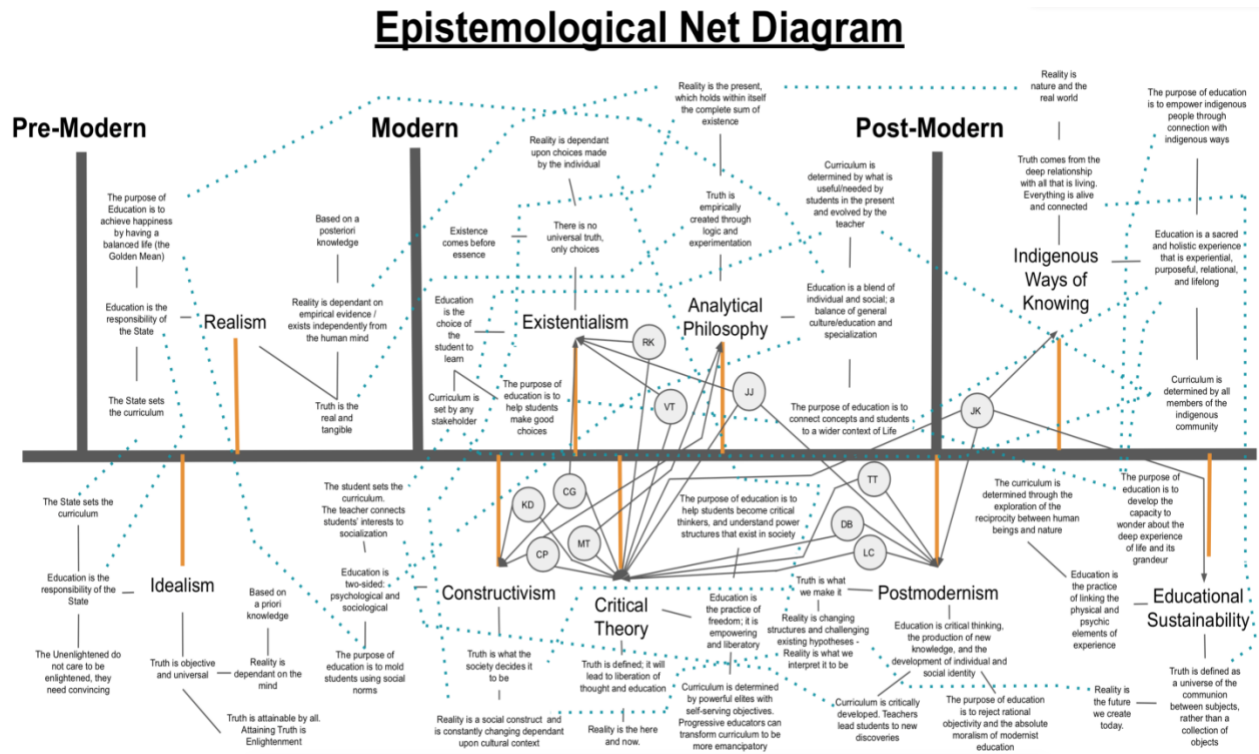
Implications for Teacher Education Programs:

Preparing Preservice Teachers to be Curriculum Designers

The ways in which preservice teachers learn to use specific instructional strategies is a major component of their teacher preparation program (Marzano et al., 2003). Our current knowledge of instructional strategies, such as the use of concept maps (Marzano et al., 2001), can highlight the importance of non-linguistic representations (i.e., 27% increase in student learning) and summarizing/notetaking (i.e., 34% increase in student learning). As well, data from the current study (Straub, 2020) suggests that targeted dialogue about social studies topics in group contexts can help support preservice teachers' growth in conceptual understanding, as represented by growth and progression in their concept mapping strategies. This outcome

suggests that preservice teachers' understanding of their own growth can be a formative curriculum design approach.

This research underscores the potential value of using concept maps as an instructional strategy. We know from prior research that concept maps can work well to improve student understanding (Iguanane et al., 1999; Marzano et al., 2001). The purpose of using concept maps is to identify participants' knowledge as well as to represent how this knowledge is interconnected in long-term memory (Iguanane et al., 1999). It follows that the use of concept maps to help preservice teachers understand important curriculum concepts can be equally robust. However, what has not been well understood up until this point is that concept map complexity requires explicit and specific attention within teacher preparation programs. If teachers can see a continuum of complexity in concept maps, they may be able to teach concept map development to invite deeper thinking with their own students. It also follows that the opposite may be true: if they are only exposed to the use of concept maps at the spoke level, they may be likely to teach concept maps only at a spoke level. However, if teacher educators teach the continuum of concept mapping to preservice teachers, as outlined in Figure 5, we can support growing sophistication in preservice teachers' understanding of curriculum development, as represented by their concept map strategies, to the benefit of future learners.

Curriculum Design Strategies

Several strategies can be used within teacher preparation programs for teacher educators to include concept map development strategies that build upon the findings of this study. Four such strategies are explored in the next paragraphs.

Concept Map Continuum Instruction

Teacher educators can leverage preservice teachers' strengths, rather than focusing on perceived shortcomings in their cognitive frames, since we now know that their frames may be

developed in a systematic and predictable sequence. Previous research (Heinbach et al., 2019) suggests that by focusing solely on the challenges that preservice teachers have about curriculum design, teacher educators may create a deficit mindset about preservice teachers, which may lead to "problematic assumptions" (Heinbach et al., 2019, p. 2) about core concepts like those related to citizenship. However, if teacher education is approached from a strength-based (also called a growth mindset) frame of reference, we might be able to counter a deficit mindset (Heinbach et al., 2019). With a growth mindset, preservice teachers could individually develop concept maps and then, through subsequent group analysis, the cohort group can be exposed to more sophisticated conceptions. The work of Vygostky (as reported in Kozulin et al., 2003) highlights how scaffolding from the learner's zone of proximal development can be applied strategically with concept maps to expose preservice teachers to the representation of concepts that are increasingly complex. The strongest concept maps, reflecting a strength-based approach, can serve as models for preservice teachers whose current conceptual representations may be less robust

Conceptual Frames Related to Curriculum Concepts

Teacher education curriculum design can also be enriched by providing preservice teachers with explicit instruction of the various types of conceptual frames related to curriculum concepts across subject areas, including social studies. For example, to help preservice teachers understand the scope of civic engagement that they may envision for their students, teacher educators can require preservice teachers to prepare concept maps related to civic engagement concepts. One way to enrich cognitive/conceptual frames is to learn about Sears' (2014) four domains of civic engagement—volunteering, participating in civil society organizations, being active in political advocacy work, and taking part in formal politics. In the preservice program, teacher educators can develop experiences for preservice teachers that expose preservice teachers

to rich contextual examples that are relevant to the curriculum and to such advanced conceptual frames. The preservice teachers would then be in a position to select critically considered approaches for their own students as they design classroom curricular activities. Such approaches can themselves be used as initial cognitive frames that can be expanded by preservice teachers. While a social studies example has been used here, this recommendation extends to cognitive/conceptual frames from any topic of instruction that can benefit from this approach.

Theory to Practice through Strategic Practica

Teacher education programs include classroom teaching practicum experiences to allow preservice teachers to apply theory and strategies within actual classroom contexts. Additionally, some teacher education programs also include alternative practica for preservice teachers to apply theory in non-traditional settings. For example, in some programs preservice teachers may have alternative practica in alternative leadership settings, or service learning opportunities, often with some education components where the teaching may be peripheral to the role (e.g., museums, science centres, community projects, or charities). In these contexts, a continuum of conceptual mapping may support preservice teachers as they serve in these contexts. Within the alternative practicum role, preservice teachers can use concept mapping to address design of curriculum components within the alternative practicum. Potentially alternative practica such as these can allow preservice teachers opportunities in structured environments to attend to the cognitive frames that they hold related to their placement. The practice then serves to inform their theory and expand their cognitive frames.

This curriculum design focus on alternative practica experiences highlights the need to be strategic in the selection of suitable experiences. Placement opportunities should be chosen for their potential to expand conceptual frames and for their commitment to providing support for reflection contributing to growth in the cognitive frames held by preservice teachers (see for

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example, Chambers, 2009). Opportunities like those spent working in civil society organizations such as a hospice, The Lions' Club, or Rotary Club, and alternative practica experiences linked to working for political parties or Elections Canada, can offer civic engagement opportunities and expose preservice teachers to experiences that might disrupt their current conceptions (Billing et al., 2005; Kahne & Sporte, 2008). Ideally, alternative practica with this type of growth potential should be course embedded in the preservice education program to monitor conceptual growth. The duration of experience has implications for the potential impact and effectiveness of the experience (Billing et al., 2005), so alternative practica of one to two months in length should be considered.

Curriculum Design Fuelled by Volunteering

Another strategy for a strength-based approach to teacher education is to acknowledge the prior knowledge and the values that preservice teachers hold about the importance of volunteering and extend this knowledge to explore more critical views about volunteering. By exploring concurrent issues surrounding their volunteering, preservice teachers might develop the habits of mind to foster a deeper understanding of civic engagement and also develop a deeper understanding of curriculum design approaches to support development of civic engagement as a curriculum design goal. For example, when addressing issues and types of volunteering, preservice teachers can be asked to describe any concerns that might arise regarding the rights of those who use those services (e.g., a soup kitchen patron who is denied entry because he/she has lost their driver's license due to health concerns and has no identification). Another strategy might be to discuss specific activism within their jurisdiction and have them explore some of the concerns about the political or social issues (e.g., human rights) that led to the activism (see Sherrod et al., 2010). Preservice teachers could also be invited to investigate how the charities they volunteer with use the funds they raise and to

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determine criteria for selecting such organizations. Such enriching experiences can promote deep learning in contexts where preservice teachers "take action to implement and promote policies, actions, and changes that are consistent with values such as human rights, social justice, and equality" (Banks, 2017, p. 367). Such experiences can also serve to enrich preservice teachers' potential, and perhaps their confidence, to incorporate similar experiences into their own future curriculum.

The actions that transformative citizens take might be based on supported investigations of the organizations that they select for volunteer work. They might also be encouraged to explore how organizations or individuals sometimes violate existing local, provincial, and national laws. Examples are "actions taken by transformative citizens such as Mahatma Gandhi, Martin Luther King, Jr., and Rosa Parks that violated national laws but helped actualize values such as human rights and social justice and eliminate institutionalized discrimination and racism" (Banks, 2017, p. 367). By using a hands-on strength-based approach in teacher education, teacher educators may guide preservice teachers to develop deeper cognitive frames related to civic engagement and citizenship, and to other conceptions, which in turn can support their ability to engage in rich curriculum design.

Conclusions

It is important for preservice teachers to develop a complex knowledge about curriculum-related concepts because the richness of their conceptions and beliefs can influence their instructional actions in a professional context. In order to operationalize this goal for curriculum design, and based on the findings of this study, teacher educators are encouraged to use concept mapping as an approach to create an awareness of preservice teachers' existing cognitive frames in an effort to promote greater reflection and growth. Targeted classroom dialogue can also be

used to disrupt and challenge existing cognitive frames to help support the enrichment of preservice teachers' understanding of the concepts they will be required to teach.

Finally, we argue that preservice teachers who aim to teach social studies should be given structured opportunities to participate in at least one civil society organization through an alternative practicum placement in their initial teacher education program. According to Billing et al., (2005), students who reported stronger engagement in learning placements were significantly more likely to "gain in civic knowledge, skills, and dispositions" and to "become more civically engaged in general and [to feel] greater efficacy" (p. 54). In the framework of this chapter, opportunities to enrich preservice teachers' cognitive frames are meant to be intentional because experience can enrich conceptual development, and representations of increasingly sophisticated understandings can be predictable in how they grow and evolve to reflect those experiences.

References

Åkerlind, G. (2002). Principles and practice in phenomenographic research. *International Symposium on Current Issues in Phenomenography,* Canberra, Australia.

Åkerlind, G. (2005). Learning about phenomenography: Interviewing, data analysis and the qualitative research paradigm. In J. Bowden & P. Green (Eds.), *Doing developmental phenomenography,* (pp. 63–74). RMIT University Press.

Åkerlind, G. (2008). Variation and commonality in phenomenographic research methods. *Higher Education Research & Development, 24*(4),321–334.

Alexander, P. A. (2006). What would Dewey say? Channeling Dewey on the issue of specificity of epistemic beliefs: A response to Muis, Bendixen, and Haerle (2006). *Educational Psychology Review*, *18*(1), 55–65.

Archibugi, D., & Held, D. (1995). *Cosmopolitan democracy: Paths and agents.* Cambridge University Press.

Axelrod, R. (1976). *Structure of decision*. Princeton University Press.

Babcock, H. M. (2009). Civic republicanism provides theoretical support for making individuals more environmentally responsible. *Notre Dame Journal of Law, Ethics & Public Policy*, *23*, 515-536.

Banks, J. (2004). Democratic citizenship education in multicultural societies. In J. Banks (Ed.), *Diversity and citizenship education – Global perspectives* (3–15). Jossey-Bass.

Banks, J. A. (2017). *Citizenship education and global migration: Implications for theory, research, and teaching*. American Educational Research Association.

Billing, S., Root, S., & Jesse, D. (2005). The impact of participation in service-learning on

high school students' civic engagement. CIRCLE Working Paper 33. Center for
Information and Research on Civic Learning and Engagement (CIRCLE), University of
Maryland.

Booth, S. (2008, May). Researching learning in networked learning: Phenomenography and
variation theory as empirical and theoretical approaches. In V. Hodgson, C. Jones, T.
Kargidis, D. McConnnell, S. Retalis, D. Stamatis & M. Zenios (Eds.), *Proceedings of the
6th International Conference on Networked Learning* (pp. 450–455). Halikdiki, Greece.

Bowden, J. A., & Walsh, E. (2000). *Phenomenography*. RMIT.

Case, J., & Light, G. (2011). Emerging methodologies in engineering education research.
Journal of Engineering Education, 100(1), 186–210.

Chambers, T. (2009). A continuum of approaches to service-learning within Canadian post-
secondary education. *Canadian Journal of Higher Education, 39*(2), 77–100.

Colley, L. (2017). Judging on their looks: Understanding preservice social studies teachers'
conceptions of historical agency and gender. *The Journal of Social Studies Research,
41*(2), 155–166.

Enslin, P. (2000). Education and democratic citizenship. In M. Leicester, C. Modgil & S.
Modgil (Eds.), *Politics, education and citizenship, 235-246*. Falmer Press.

Entwistle, N., & Marton, F. (1994). Knowledge objects: Understandings constituted through
intensive academic study. *British Journal of Educational Psychology*, *64*(1), 161–78.

Evans, M. (2006). Educating for citizenship: What teachers say and what teachers do. *Canadian
Journal of Education*, *29*(2), 410–435.

Eyler, J., & Giles Jr., D. E. (1999). Where's the learning in service-learning? Jossey-Bass.

Gardner, H. (1993). *Histoire de la révolution cognitive: La nouvelle science de l'esprit*.
Éditions Payot.

Geboers, E., Geijsel, F., Admiraal, W., & Ten Dam, G. (2013). Review of the effects of citizenship education. *Educational Research Review, 9*, 158–173.

Goffman, E. (1974). *Frame analysis: An essay on the organization of experience*. Harper and Row.

Goh, P. S. (2013). Conceptions of competency: A phenomenographic investigation of beginning teachers in Malaysia. *The Qualitative Report*, *18*(20), 1–16.

Gunton, L., Bruce, C., & Stoodley, I. (2013). Experiencing religious information literacy: Informed learning in church communities. *The Australian Library Journal, 61*(2), 119–132.

Hambrick, D. C., & Mason, P. A. (1984). Upper echelons: The organization as a reflection of its top managers. *The Academy of Management Review*, *9*(2), 193–206.

Hébert, Y. M., & Sears, A. (2001). *Citizenship education*. Canadian Education Association.

Heinbach, C., Fiedler, B. P., Mitola, R., & Pattni, E. (2019). Dismantling deficit thinking: A strengths-based inquiry into the experiences of transfer students in and out of academic libraries. *In the Library with the Lead Pipe*, 498–510.

Hella, E., & Wright, A. (2009). Learning 'about' and 'from' religion: Phenomenography, the variation theory of learning and religious education in Finland and the UK. *British Journal of Religious Education*, *31*(1), 53–64.

Hill, H. C., Rowan, B., & Ball, D. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal*, *42*(2), 371–406.

Hughes, A. S., & Sears, A. (2004). Situated learning and anchored instruction as vehicles for social education. In A. Sears & I. Wright (Eds.), *Challenges and prospects for Canadian social studies* (pp. 259–273). Pacific Educational Press.

Iguanane, J., Marchand, C., & D'Ivernois, J. F. (1999). Les cartes sémantiques, outils de

    formation. In P. Lodewick (Ed.), *Cartes et relations: Les politiques sociales* (pp. 39–59).

    Braine-le-Château.

Iverson, S., & James, J. (2010). Becoming "effective" citizens? Change-oriented service in a

    teacher education program. *Innovative Higher Education*, *35*(1), 19–35.

Johnson-Laird, P., & Shafir, E., (1993). The interaction between reasoning and decision making:

    An introduction. *Cognition*, *49*(1–2), 1–9.

Kahne, J. E., & Sporte, S. E. (2008). Developing citizens: The impact of civic learning

    opportunities on students' commitment to civic participation. *American Educational*

    Research Journal, *45*(3), 738–766.

Kinchin, I. (1998). Constructivism in the classroom: mapping your way through. Paper

    presented at the British Educational Research Association, The Queens University

    of Belfast.

Kinnunen, P., & Simon, B. (2012). Phenomenography and grounded theory as research methods

    in computing education research field. *Computer Science Education*, *22*(2), 199–218.

Kiwan, D. (2008). Citizenship education in England at the crossroads? Four models of

    citizenship and their implications for ethnic and religious diversity. *Oxford Review of*

    Education, 34(1), 39–58.

Knight-Abowitz, K., & Harnish, J. (2006). Contemporary discourses of citizenship. *Review*

    of Educational Research, *76*(4), 653–690.

Koutselini, M. (2008). Citizenship education in context: Student teacher perceptions of

    citizenship in Cyprus. *Intercultural Education*, *19*(2), 163–175.

Kozulin, A., Gindis, B., Ageyev, V., & Miller, S. (2003). Vygotsky's educational theory and

    practice in cultural context. Cambridge University Press.

Kymlicka, W. (2012). *Multiculturalism: Success, failure, and the future*. Migration Policy Institute.

Lam, H. C. (2013). On generalization and variation theory. *Scandinavian Journal of Educational Research*, *57*(4), 343–356. doi:10.1080/00313831.2012.656277

Limberg, L. (2000). Phenomenography: A relational approach to research on information needs, seeking and use. *The New Review of Information Behaviour Research, 1*(January), 51–67.

Lourdel, N., Gondran, N., Laforest, V., Debray, B., & Brodhag, C. (2007). Sustainable development cognitive map: A new method of evaluating student understanding. *International Journal of Sustainability in Higher Education*, *8*(2), 170–182.

Marchand, C. (1997), Intérêt des cartes sémantiques dans l'éducation du patient. *Le Bulletin d'éducation du patient, 19*(4), 33–36.

Marton, F. (1981). Phenomenography: Describing conceptions of the world around us. *Instructional Science*, *10*(2), 177–200.

Marton, F., & Booth, S. (1997). *Learning and awareness*. Lawrence Erlbaum.

Marton, F., & Pong, W. Y. (2005). On the unit of description in phenomenography. *Higher Education Research and Development, 24*(4), 335–348.

Marzano, R. J., Marzano, J. S., & Pickering, D. (2003). *Classroom management that works: Research-based strategies for every teacher*. ASCD.

Marzano R., Pickering, D., & Pollock, J. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement.* Association for Supervision and Curriculum Development (ASCD).

Meyer, H. (2004). Novice and expert teachers' conceptions of learners' prior knowledge. *Science Education*, *88*(6), 970–983.

Novak, J. D. (1990). Concept mapping: A useful tool for science education.

Journal of Research in Science Teaching, *27*(10), 937–949.

Ontario Ministry of Education (2018). The Ontario curriculum: Social studies grades 1 to 6 history and geography grades 7 and 8.

Ornek, F. (2008). An overview of a theoretical framework of phenomenography in qualitative education research: An example from physics education research. *Asia-Pacific Forum on Science Learning And Teaching*, *9*(2), 1–14.

Oyersman, D., Elmore, K., & Smith, G., Leary, M. R., & Tangney J.P. (2012). Self, self-concept and identity. In Leary, M. R., & Tangney, J. P. (Eds.), *Handbook of self and identity,* (2nd ed.). 69-104. Guilford Press.

Rodriguez, T. L., & Polat, N. (2012). Politicizing difference: Interpreting citizenship as a dimension of diversity in preservice teachers' narratives. *Linguistics and Education*, *23*(4), 361–372. http://dx.doi.org/10.1016/j.linged.2012.08.001

Parker, W. (Ed.). (1996). *Educating the democratic mind*. New York, NY: SUNY Press.

Parker, W. (2003). *Teaching democracy: Unity and diversity in public life*. New York, NY: Teachers College.

Parker, W. C. (2008). Knowing and doing in democratic citizenship education. In L. S. Levstik & C. A. Tyson (Eds.), *Handbook of research in social studies education* (pp. 65–80). Routledge.

Patton, M. Q. (2002). Two decades of developments in qualitative inquiry: A personal, experiential perspective. *Qualitative Social Work*, *1*(3), 261–283.

Peterson, A. (2009). Civic republicanism and contestatory deliberation: Framing pupil discourse within citizenship education. *British Journal of Educational Studies*, *57*(1), 55–69.

Prosser, M. (1994). Some experiences of using phenomenographic research methodology in the context of research in teaching and learning. In J. Bowden & E. Walsh (Eds.), *Phenomenographic research: Variations in method* (pp. 31–43). RMIT University Press.

Reid, A., & Petocz, P. (2002). Students' conceptions of statistics: A phenomenographic study. *Journal of Statistics Education, 10*(2), 1-18.

Ritter, J. K., Powell, D., Hawley, T. S., & Blasik, J. (2011). Reifying the ontology of individualism at the expense of democracy: An examination of university supervisors' written feedback to student teachers. *Teacher Education Quarterly*, *38*(1), 29–46.

Saàdani, L., & Bertrand-Gastaldy, S. (2000). La représentation dans Internet des connaissances d'un domaine. *Documentation et bibliothèques*, *46*(1), 27–42.

Saldaña, J. (2008). *The coding manual for qualitative researchers*. SAGE Publications.

Sandoval Moya, J. (2003). Ciudadanía y juventud: El dilema entre la integración social y la diversidad cultural. *Última Década*, *11*(19), 31–45.

Sears, A. (2014). *Measuring what matters: Citizenship domain*. People for Education. https://peopleforeducation.ca/wp-content/uploads/2017/06/MWM_CitizenshipPaper.pdf

Senge, P. M. (1990). *The fifth discipline: The art and practice of the learning organisation*. Doubleday.

Sherrod, L. R., Torney-Purta, J., & Flanagan, C. A. (2010). *Handbook of research on civic engagement in youth*. John Wiley & Sons.

Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, *57*(1), 1–23.

Sjöström, B., & Dahlgren, L. O. (2002). Applying phenomenography in nursing research.

Journal of Advanced Nursing, 40(3), 339–345.

Straub, J. M. (2020). *Preservice teachers' understanding of citizenship* [Doctoral dissertation].

University of New Brunswick.

Szelényi, K., & Rhoads, R. A. (2007). Citizenship in a global context: The perspectives of

international graduate students in the United States. *Comparative Education

Review*, *51*(1), 25–47.

Tonon, G. (2012). Young people's quality of life and construction of citizenship. *Applied

Research in Quality of Life*, *8*(4), 531–533.

Vosniadou, S. (1999). Conceptual change research: State of the art and future directions. In W.

Vosniadou S.,Carretero, M., & Schnotz, W. (Eds.), *New perspectives on conceptual

change* (pp. 3–13). Pergamon.

Westheimer, J., & Kahne, J. (2004). Educating the "good" citizen: Political choices and

pedagogical goals. *PSOnline, 37*(2), 241–247.

Possibilities and Challenges:
Designing for the Makerspace as an Approach to Teacher Learning

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Abstract

This chapter explores the opportunities and challenges that arose during a year-long design-based research study conducted with a grade six teacher and her class of 27 elementary students in a rural community school in western Canada. Results showed that an emphasis on designing for making promoted ontological development in disciplinary ways of being, as well as provided increased opportunities to consider unique epistemic and pedagogic frames. Engagement in this design-based research led the participating teacher to envision new ways of teaching and learning for herself and for her students. Challenges existed in the availability and form of supports needed for teacher risk-taking when designing within a different construct and pedagogical frame, as well as in considering makerspace activities with insufficient access to robust technology. In addition, outside cultural and systemic challenges related to assessment, teacher knowledge, and isolation from other school staff are also discussed. The researchers found in their study that in the midst of this complex and dynamic learning environment, collaborative engagement in enacting designs for making promoted transformational change in teacher practice.

Résumé

Ce chapitre explore les possibilités et les défis rencontrés au cours d'une étude en collaboration avec une enseignante de sixième année et ses 27 élèves, pendant une année scolaire, dans une école rurale primaire de l'Ouest canadien. Les résultats démontrent qu'une attention particulière portée au concept du « laboratoire ouvert » stimule le développement déontologique adapté aux sujets d'enseignement, tout en privilégiant l'observation d'un encadrement pédagogique et épistémique unique. La participation active de l'enseignante à cette recherche en conception scolaire l'a conduite à envisager une nouvelle approche de l'enseignement et de l'apprentissage, tant pour elle-même que pour ses élèves. De nombreux défis se sont posés à elle cependant, dont l'insuffisance de soutien dans les risques sous-jacents aux nouvelles conceptions de l'encadrement pédagogique, et les limites d'accès à un support technologique de pointe dans la création d'activités inspirées du laboratoire ouvert. Enfin, les défis externes de nature culturelle et systémique liés à l'évaluation, au niveau de connaissances de l'enseignante et de son isolement du reste du corps enseignant furent également l'objet de discussion. À l'issue de leur étude, les chercheurs estiment que l'enseignante, au cœur de cet environnement scolaire aussi complexe que dynamique, a profondément transformé son approche pédagogique grâce à la pratique du laboratoire ouvert.

Inquiry-based approaches to learning are well-researched and valid pedagogies for promoting learning that is intellectually engaging, while addressing critical and complex real world issues of relevance to students in their own lives (Jacobsen, 2011; Barron & Darling-Hammond, 2010; Willms et al., 2009). However, challenges exist in creating the conditions for inquiry-based learning in that the "pedagogies required to implement them are much more complex than the direct transmission of knowledge" (Barron & Darling-Hammond, 2010, p. 2012) approaches that many teachers often use in their classrooms.

Makerspaces are a type of designed learning environment that offers promise for enacting inquiry-based approaches to learning (Bevan et al., 2015; Fourie & Meyer, 2015). Makerspaces, intentionally designed hands-on learning environments in which physical and digital tools are used for the rapid prototyping of ideas, are being promoted as pedagogical possibilities in both informal and formal learning spaces (Bevan, 2017). In the makerspace, students can develop conceptual knowledge related to aspects of curriculum. Additionally, and some say more importantly, students who develop a maker mindset (Dougherty, 2013; Regalla, 2016) can be empowered in their ability to problem solve, persevere, and learn from failure (Becker, 2019; Becker & Jacobsen, 2019; Oxman Ryan et al., 2016; Paganelli et al., 2016).

We recently conducted a year long design-based research (DBR) study with a grade six teacher and her class of twenty-seven students to explore how the teacher might reconsider the curriculum in designing for learning in a makerspace environment. Two questions drove the research: How can teachers be supported in the development of teacher knowledge, pedagogy, and practice within an elementary school makerspace environment?; and how can teachers support the development of students' conceptual understanding of disciplinary topics in an elementary school makerspace? This paper outlines the benefits and challenges of the

collaborative work-arounds a research team developed in collaboration with the teacher in order to implement curriculum topics through making.

Harron and Hughes (2018) identified several key ways in which makerspaces support school curriculum, and that "the capabilities of the makerspace transformed curricular activities" (p. 262). In our research on makerspaces, we found transformation of practice to be the case, and also discovered that enacting curriculum in makerspaces can promote key features of inquiry-based learning, where the work is meaningful, challenging, and complex (Friesen & Jacobsen, 2011), design-focused, interest-driven, and open to natural and productive feedback leading to continuous cycles of learning through prototyping (Friesen & Jacobsen, 2011; Barron & Darling-Hammond, 2010).

Methodologically, we also found that carrying out DBR in collaboration with the teacher in the makerspace learning environment provided continuous learning scaffolds for the students' and the teacher's ontological exploration. Inherent in both DBR and the makerspace are the characteristics that embody cyclical and iterative personal inquiry and learning; the work requires a maker mindset (Dougherty, 2013). Making is hands-on, it has meaning, it is complex, and it is challenging for learners. By engaging in thoughtful design and preparation prior to making, and while supported by researchers and data on learning and design throughout the research process, teachers and students actively entered into making and readily adopted an inquiry stance (Becker, 2019).

While a body of research and documentation on the benefits of making for learning is growing, teacher training and "teacher education is not keeping pace with this development" (Kjallander et al., 2018, p. 19). Evidence suggests that both preservice and practising teachers need to be supported not only in ways they might enact the curriculum through making, but also in adopting the mindset required for designing and evaluating learning experiences through

making (Becker & Jacobsen, 2019; Harron & Hughes, 2018, Jones et al., 2017). Providing worthwhile learning opportunities for both preservice and practicing teachers is of critical importance (Jones et al., 2017) and can lead to opportunities to develop self-efficacy in relation to inquiry (Becker, 2019) and STEM (science, technology, engineering, and math) learning (Becker & Jacobsen, 2019; Blakely et al., 2017). In a recent study in which preservice teachers mentored students in the makerspace, the researchers demonstrated that "Positioning of preservice teachers as mentors is also significant as they seem to face the same attitudinal hurdles as classroom teachers and this approach enables them to develop their confidence and competence in STEM education" (Blakely et al., 2017, p. 34). A cyclical design and evaluation process consistent with making requires a teacher to consider a different design "frame" (Becker, 2019; Dorst, 2010, p. 135) and a willingness to iterate, risk-take, and learn from failure (Becker, 2019). The complex design and evaluation work involved in innovating practice is not easily accomplished, especially considering the system constraints and contexts in which many teachers work.

Challenges to sustaining innovation in education (Bereiter, 2002) can include a standardized provincial curriculum (such as, Alberta Education, 2017), teacher directed models of instruction (Davis et al., 2015), a focus on summative assessment (Volante & Ben Jaafar, 2008; Volante, 2010), a lack of well supported contextualized teacher professional learning models (Bruce et al., 2010; Friesen & Jacobsen, 2011; Fullan et al., 2006), and rigid scheduling and timetabling. The combination of designing for learning in the makerspace within the context of DBR provided a situated learning experience for the teacher, the students, and the researchers to explore innovative practice within authentic system constraints.

Context

The study took place over the course of one year in a rural school in Alberta,

Canada. Participants included a grade six teacher and her class of 27 students, one third being English language learners (ELL). The teacher, who was identified by the school principal as a potential co-partner and was previously unknown to the researchers, willingly agreed to participate in the study. A collaborative relationship developed between the teacher, Riley,[3] and one researcher, Sandra, a doctoral student, as they co-designed, co-implemented, and co-reflected on three cycles of making related to three curriculum topics: sky science, mathematical transformations, and attributes of democratic systems. The second researcher's role was that of research mentor. Together she and Sandra considered the research frame, engaged in ongoing reflection and evaluation of teaching, learning, and research engagements and cycles in the classroom; they then proceeded to analyze and synthesize the research data from each cycle, and developed design principles that can be used to inform the work of others.

Prior to the study, Riley (in her third year of teaching) had shown leadership in the school by setting up a makerspace adjacent to the library, gathering and organizing materials, and creating maker activities for herself and other teachers to use. Riley was interested in learning more about making as an approach to learning, but had not yet considered making as a way to engage in design thinking with curriculum. She enthusiastically agreed to participate in a "co-learning agreement" (McKenny and Reeves, 2019, p. 17) incorporated in the design-based research relationship throughout the school year.

As part of a divisional initiative, Riley had also participated in a long term professional development strategy focused on "nurturing instructional excellence" through the use of the Teaching Effectiveness Framework (TEF) (Friesen, 2009). The TEF presents five core principles of teaching excellence, and a detailed rubric for use in self-assessing effective teaching practice. The principles include (a) designing purposefully thoughtful tasks for learning that meet

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[3] Pseudonym.

students' intellectual and academic needs; (b) asking students to undertake work that is worthwhile, of interest to them, and personally meaningful; (c) assessing student work with a focus on improving learning; (d) creating a classroom learning culture that is enhanced by building multiple interdependent connections; and (e) improving one's practice with colleagues (Friesen, 2009). Because the principles of the TEF intersected with learning practices in the makerspace, the researchers recognized the importance of remaining true to maker pedagogy when creating provocations and learning tasks, even though at times this adherence presented challenges. The learning interconnections happened quite naturally in the makerspace and enabled a focus on continual feedback and iteration. Together, Riley and Sandra engaged collegially in purposeful design for learning through making. Where possible, giving students choice in use of tool and topic was also made a salient feature of learning through making.

A significant part of each design involved preparing students by engaging them in pre-making tasks prior to entering the makerspace. The early work included determining the background knowledge students would need to engage in the curriculum topic, inviting students to develop design plans for making, and providing structured opportunities for feedback on those design plans prior to entering the makerspace.

Methodology

A key consideration in the study was the selection of DBR as a methodological frame for studying innovation in education (Jacobsen, 2014). A participatory educational research methodology, DBR acknowledges that all participants have knowledge and experiences that can inform the research (Brydon-Miller et al., 2011). It was also considered important to focus on sustainable changes in practice, such that Riley would develop confidence and competence in implementing making practices on her own after the research was completed. Therefore, Riley's input on design, implementation, and reflection on practice was a critical aspect of the co-

learning agreement and collaborative work. Intentionally chosen because of its collaborative

design focus, the expectation was that the DBR research approach would yield usable knowledge

to inform and influence teacher practice, as well as yield theoretical insights that would advance

research (McKenney & Reeves, 2019). In addition, it was important that knowledge about

making practices be co-constructed with a teacher and her students in order that the iterative

designs and accompanying solutions could provide principles upon which future designs might

be considered in other classroom contexts.

McKenney and Reeves (2019) delineate three orientations in DBR: research for

intervention, research on interventions, and research through interventions (p. 23). Our focus was

on exploring curriculum *through* making; thus, from our design-based research through

intervention, we were able to observe how Riley and her students developed as learners through

the enactment and outcomes of maker pedagogy. However, there was significant challenge in the

research design: In order to provide the teacher with multiple opportunities to consider a wide

range of curricular outcomes through making, the designed topics of study (in science,

mathematics, and social studies) added breadth, but not always depth in terms of developing

students' deeper knowledge of the discipline. The consideration of breadth versus depth of

disciplinary engagement became a tradeoff. With the cornerstone of the research on discrete

topics in different disciplines over three cycles of making, the teacher and her students were also

able to experience and play with maker pedagogy in different ways. However, emphasizing

maker pedagogy meant that attention to discipline knowledge and the study of how students

learned specific conceptual ideas was not the entire focus of an inquiry project. The purpose in

conducting the maker research in this way was not that the study be replicated, but rather that it

could "lay open and problematize the completed design[s] and resultant implementation in a way

that provided insight into local dynamics" (Barab & Squire, 2004, p. 8) through a maker

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orientation. Our initial prediction was that this study could furnish a skeleton blueprint for thinking about curriculum implementation with a maker lens. We also anticipated that outcomes of this design-based research could serve to enhance our understanding of local impact and inform the development of initial design principles that could be useful in other contexts.

No matter the teacher's eagerness and commitment to the notion of makerspace as learning environment, the emphasis on coverage of curriculum, heeding to standard learning outcomes, and summative reporting on student progress, served to continually challenge implementation of making in the complex authenticity of an elementary school. This tension was particularly amplified in this case because all grade six students in Alberta must participate in provincial achievement testing (PATs) in science, mathematics, language arts, and social studies. Therefore, the attention invested in curriculum and assessment within this DBR served to support the teacher in traversing traditional and maker pedagogies. The cyclical, iterative, prototypical approach to research central to DBR, in collaboration with a researcher, also served to nurture risk-taking and enabled the teacher to test curriculum and assessment ideas that were outside of her comfort zone. In addition, by considering curriculum as immersed in historical, cultural, and political circumstances (McKenney & Reeves, 2019), the researcher was able to promote a reflective and critical posture toward implementation and evaluation with the teacher.

In order to get a sense of the pre, during, and post making design process, semi-structured interviews were conducted with the teacher prior to, and following each making cycle. Additional data included researcher notes, teacher planning documents, and student artifacts, comprised of their design plans, objects made either digitally or physically, and written and oral reflections.

Multiple coding sessions were used to interpret the data, including (a) first cycle coding to identify key moments of learning for the teacher, followed by second cycle coding linking

possible causes; (b) descriptive coding related to design practice; and (c) versus coding (Saldana, 2013) to compare processes and phenomena that took place in both the makerspace and the classroom. In this case, the goal of coding was to ascertain opportunities and challenges that arose for the teacher within the context of designing for making. Once the opportunities and challenges were determined, a second cycle of coding took place linking the data as coming to know pedagogically, ontologically, or epistemically.

Findings

In this description and presentation of findings, we first consider several curricular possibilities inherent in making, which we have summarized as: (a) ontologic opportunities to explore and learn about disciplines and disciplinary ways of being; (b) epistemic opportunities to consider, explore, and think about curriculum in diverse and interesting ways; (c) creative opportunities to engage in pedagogy; and (d) opportunities to consider teaching practice differently. Second, we explore some of the possibilities and challenges encountered in making and developing a maker pedagogy, such as: (a) supporting novice maker teachers ontologically in risk-taking; (b) supporting novice maker teachers pedagogically in adopting a new design frame; (c) lack of, or limited access to robust technology along with limited opportunities to learn about and use technology; and (d) external pressures. Interwoven with each of these possibilities and challenges, we also refer to the possibilities and challenges involved in carrying out design-based research.

Possibilities

Ontologic Opportunities to Explore and Learn About Disciplines and Disciplinary Ways of Being

Initial discussions in cycle one focused on students creating models on a sky science topic of interest to them. As the teacher and researcher (hereafter referred to as Riley and Sandra)

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problematized ways in which students might take up this challenge in the makerspace, there was

significant dialogue between them related to astronomers in history, sky science theories that had

been proven or debunked, and the historical, social, and cultural ramifications of conducting

scientific inquiry (Becker & Jacobsen, 2019). These discussions led to a decision to have the

students select and research one early astronomer, even though this was not explicitly stated in

the curriculum. In learning about early sky scientists themselves, Riley and Sandra came to see

how this background informed their own scientific inquiry of sky science. They felt it was

important, therefore, for the students to also develop this background knowledge. Riley created a

shared Google doc with a table where students inserted information about a selected astronomer,

what country they were from, when they lived, the key theories they espoused and were known

for, and if those theories had been confirmed or disproven. Students were also encouraged to find

interesting facts. They were fascinated to discover that some astronomers were persecuted for

putting forth highly contested scientific ideas. Students also found it interesting to uncover that

scientific theorizing about the sky took place in many cultures, as they researched astronomers

from China, India, Arabia, and Europe.

Early on in the pre-maker phase, there was more focus on how scientists conducted their

work, and less attention to curricular outcomes in conversations between Sandra and Riley.

Sandra's researcher notes indicate this:

> I wondered about working with a couple of students to take all the data and put it into a
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> timeline for the class to see . . . this would give students a sense of how the sky has
>
> always fascinated humans, that some theories "stuck" for thousands of years before being
>
> disputed, and that technologies have allowed scientists to make more accurate
>
> predictions.

Discussions and notetaking during the planning phase allowed us to make sense ourselves of the most important scientific ideas while considering what it might mean to *be* a scientist. This led to the development of four scientist characteristics (Becker & Jacobsen, 2019) that we shared with students, with the intention of asking them to embody those characteristics in their work in the makerspace. The use of the scientist characteristics ended up being of significant importance in Riley's development, not just as a maker teacher but as a teacher in general. In asking her students to embody the work of scientists, Riley came to the realization that it was not specifically how scientists work, but how *learners* conduct inquiry (Becker & Jacobsen, 2019). This comprehension became a cornerstone of Riley's practice moving forward. In preparing the students to "think, act and engage with ideas and core concepts in the same way as [scientists]" (Friesen, 2009, p. 7), Riley was able to observe an ontological shift in her students in that they began to see themselves as scientists. Through the sky science maker experience, Riley began to consider curriculum differently, not as a set of outcomes to be checked off a list, but as a way to embody learning differently (Becker, 2019). While we observed a shift was underway, we also noticed that her embedded habits of teaching as curriculum coverage did not disappear, particularly given the impending PATs. However, in this first making cycle, Riley began to envision ways to address curricular outcomes through a constructivist lens focused on design, instead of curriculum as content to be covered.

Epistemic Opportunities to Consider, Explore, and Think About Curriculum in Diverse and Interesting Ways

By the time Riley and her students engaged in making cycle three, they were becoming confident and focused in their maker abilities. In this cycle, Riley and Sandra asked students to design and make a physical metaphor that personified an element of democracy (Becker, 2019; Becker & Jacobsen, 2020). Ideas portrayed metaphorically included notions of truth, freedom,

equity, identity, and equality. Given the time of year (May) and the external pressures at the time (curriculum areas that had not yet been addressed as well as students participating in PATs), Riley was only able to allow four afternoons for this work. This maker task also involved the introduction of new digital software, Tinkercad and Easel, which the students had the choice of using to express their metaphors. Though many students did choose to go digital with this making cycle, there were some who selected to construct physically their metaphors instead. Even with the constraints of limited time and working with new technologies, both the teacher and the researcher were impressed with the ways in which students engaged in making as learning. Researcher notes indicate Sandra's observations of students epistemic sensemaking related to democratic concepts:

> "In making the symbols the students grappled with notions of what these big ideas really mean. Case in point: John's[4] use of an anchor to hold down the balloon. Was he subtly suggesting that along with freedom comes responsibility? And Maia's[5] [an ELL student] struggle to show different identities (what's on her inside and what's on her outside).

Sandra's observation was confirmed by the teacher: "I think at the end they actually hit the outcomes. … I was able to see that they understood their word that they picked, relating it back to our social curriculum." Riley also stated that students came to understand clearly what a metaphor is.

Given the external pressures Riley was experiencing during the third cycle (e.g., provincial testing, end-of-year activities, report cards, etc.), Sandra could not help but think this anxiety may be conveyed to the students and the making may consequently falter. However, the

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[4] Pseudonym.
[5] Pseudonym.

ways in which the students persisted and engaged in the maker work surprised both Riley and Sandra. Researcher notes captured the range of emotions: "The overall feel during this work was rushed, get it done [on the part of the teacher]. Even so, I think Riley was amazed with the student metaphors and overall designs." Riley corroborated this comment when she stated, "they loved it . … They were very rarely off task. I don't think I noticed anybody." She added, "At the beginning of this, I was really worried that the students were going to have a hard time coming up with a metaphor. … I was really surprised at the metaphors, and the rationale behind them."

To gain more insight into Riley's thinking about student work, Sandra asked, "I thought that students made sense of the social studies vocabulary through making because it was very personal to them. Do you have any insights on that?" Riley responded, "I think giving them that choice. So when we gave them the list and said they could pick a word, I think that helped a lot." But Riley articulated that giving students choice was only a part of the picture. By cycle three she was coming to understand and feel more confident about enacting curriculum so that students could wrestle with big ideas in a maker context. Initially, she vacillated between the notion of maker as complete freedom and choice in materials and topics, and the notion of maker as structured and teacher planned activities and STEM challenges.

Riley stated, "You know at the beginning I had a hard time visualizing, 'Go, let's see what you build.' How's that gonna look, and giving them the choice for absolutely everything. Now realizing it's okay to give them a couple of areas of boundaries and then see what they do." Setting "boundaries" consisted of the intentional instructional design choices that we considered and implemented prior to, during, and following making. By cycle three, Sandra and Riley saw evidence that their designs could lead to epistemic growth on the part of the students. Through this cyclical process of designing for making, we suggest that Riley entered the "zone of proximal development" (Vygotsky, 1978, p. 79) herself. In a culture of collaborative problem

solving, and over time, she came to understand more deeply the possibilities for learning that existed in making within the context of scaffolding provided via the co-learning agreement with Sandra.

Creative Opportunities to Engage in Pedagogy

Initially when Riley and Sandra designed for constructivist approaches to learning in the makerspace, a separation existed between the learning environments of classroom and makerspace (Becker, 2019). For example, the classroom became the place where pre-making happened, so that when students entered the makerspace they immediately engaged in building and prototyping (Becker & Jacobsen, 2019). In the third cycle, without prior discussion between Riley and Sandra, the students stayed in the classroom for making. Part of this might have been related to the fact that most of the students were creating designs and prototypes digitally, so there was no need for additional materials and relocation. Sandra also wondered if Riley might have subconsciously not wanted to take the time to move to a different location, given the time constraints in cycle three. However, upon reflection, Sandra was not sure that Riley would have opted to stay in the classroom in cycle one. By the time we entered cycle three of making, a transformation had occurred: Riley had brought maker pedagogy back to the classroom with her, as she realized that the makerspace was not simply a physical space but a mindset (Dougherty 2013; Regalla, 2016), and making could occur anywhere.

Opportunities to Consider Teaching Practice Differently

Engaging in multiple cycles of making offered Riley time and opportunity to consider making as a pedagogical structure that assisted her in changing her teaching practice from instructor driven, content delivery to a more constructivist stance with knowledge building. Riley reflected throughout the study about past practices and how making was changing her and her students as learners. When comparing student outcomes in the sky science unit from previous

years, Riley could see that engaging in the design and making of scientific models led her students to become scientists (Becker & Jacobsen, 2019). She observed that through the digital and physical design and creation of metaphors in social studies, students were able to engage meaningfully with, and deeply understand, concepts in social studies and in language arts (Becker, 2019).

Sandra interviewed Riley in the early part of the subsequent school year, several months after data collection for the school-based component of the study had concluded, in an attempt to explore whether her experiences with making had resulted in sustained changes in her teaching practice. Sandra's notes upon reflecting on the interview state:

It is interesting how in this interview, Riley does most of the talking. I am thinking that part of it was she could not wait to share with me what she has been doing, but I am also wondering if it speaks to her growing agency as a maker teacher.

One of multiple examples Riley shared during the interview indicated how she believed she was growing as maker teacher and as a curriculum implementer. She recounted how she, and her more experienced partner teacher, reconsidered the math curriculum:

Instead of starting in one unit … we started with measurement, which is a little bit more concrete for the kids we found. Cause typically I just did it [determined which topics to study] because my partner teacher did it. We started with number patterns and algebra which is tricky for some kids. So we kind of rearranged everything. And the way the textbook… sometimes it has concepts that don't flow.

Riley described the provocation she had introduced to her students who were exploring angles, measurement, area, perimeter, and volume, in the context of digitally redesigning their bedroom. Rather than relying on the textbook or her more experienced partner teacher as authorities, she

was growing in her capacity and confidence to consider new possibilities for constructivist inquiry driven learning activities.

When asked how she was now able to ideate so many connections to curriculum through making, Riley replied,

> I feel after everything that we've done … last year it was kind of, I don't know, how we're going to make a project about this? How are we going to do it in social? How are we going to do it in LA (language arts)? Science, easy. But this year things come to me where I'm not even really thinking hard about it.

As Sandra listened to Riley regale of the myriad ways she was incorporating making into all aspects of curriculum, from community building activities to science, to social studies, Sandra noted to herself that Riley has also become a maker. We purport that participating in an embedded holistic learning and research experience in this design-based research led to the sustainable development of Riley's self-efficacy and agency as a maker and maker teacher (Barton & Dexter, 2019; Becker, 2019).

Challenges

Though there were inspirational learning moments observed and experienced in the making work with Riley and the students, and in documenting the transformations in pedagogical designs and practices, the challenges that arose must also be mentioned.

Supporting Novice Maker Teachers Ontologically in Risk-taking

Riley indicated on several occasions that this work would not have been possible without the support of a researcher working alongside her. We determined that the collaborative approach to co-learning through the design-based research was not just the researcher supporting Riley in the envisioning and enacting of maker activities. Rather, a key element was the researcher working alongside the teacher to support her in the risk-taking required to enact

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pedagogical changes to her practice, with the potential that they might possibly fail. It also meant that Riley had a colleague to work alongside to nudge her to places in her practice she had either not considered, or felt anxious to try on her own. Riley, though very skilled in many aspects of her teaching practice, had only accrued two full years of experience in the classroom and still considered herself to be a novice compared with many of the more experienced teachers on staff.

The district and school administrators stated that they were keen and supportive for Riley to participate in the research work, but there were complexities and dynamics within the school and division culture which did not always reinforce innovative practice. Working with a research team gave Riley the agency, authority, and support required to step out of her comfort zone. The co-learning relationship meant that Sandra also had to model risk-taking with Riley. Engaging in this work together created a support system, where both teacher and researcher could honestly discuss what aspects of each cycle were productive and which were not, both from epistemic and ontologic perspectives.

DBR became the methodological vehicle for Riley to test, assess, and enact changes to her teaching practice. However, most teachers, whether novice or experienced, do not have the opportunity to work alongside a researcher and engage in reflexive, systematic inquiry into their practice. We contend that for practicing and preservice teachers, and for emerging researchers, it is the by-the-elbow mentorship, curricular and emotional support, and cooperative documentation and reflection on practice, that encourages teachers and researchers through voice and action to risk-take and learn. Systematic changes are called for to appropriately resource collaborations between researchers and classroom teachers, such as design-based research in classrooms and schools that focus on changes in practice, and put structured supports in place to make such collaborative research practice partnerships happen (Brown & Egizii, 2019; Penuel et al., 2015).

Supporting Novice Maker Teachers Pedagogically in Adopting a New Design Frame

Though Riley was enthusiastic about innovating her practice, the design frame she held, which was both embedded in her personal experience and imposed from within the system structures in which she taught, made it difficult for her to consider ways to recast episodes for teaching and learning. Key factors that we noticed limited her ability included the curriculum, provincial exams, and lack of time. The curriculum document itself consisted of front matter, written in paragraphs, followed by a series of skills to be enacted, and ending with an inventory of content objectives to be "covered." Riley's teaching frame focused on the content outcomes, which served as a checklist of items for not only the design of activities, but also assessments. Riley's approach to curriculum as content to be covered was reinforced because she was preparing her students for provincial exams, which required students to "know" certain things in order to be able to answer questions on the exams. Looming exam pressures limited Riley's perceived ability to consider inquiry as a viable option for her students. Finally, both the curriculum and the provincial exams played into the third factor, Riley's persistent feeling that she lacked enough time to cover everything, and that she had to keep to the structured syllabus in order to prepare her students. This combination of standardized curriculum, provincial testing, and time as scarce resource, tended to diminish Riley's sense of agency as a teacher. She deferred to a higher authority (e.g., the curriculum and the testing schedule) and forces outside the classroom (e.g., administrative and parental expectations) to frame her designs for learning.

Time also figured prominently in collaboratively envisioning, iterating, and testing new designs for making. Ideating, prototyping, adopting, and reflecting on the design and enactments of making required a huge investment in time on Riley's part. She also remarked on the time that she was saved by the researchers in terms of ongoing research related to design possibilities and gathering of materials. Though collaborating in the maker research gave Riley license to take

the time to reconsider and shift her design frame within a supportive, shared work environment, it came with a significant investment in co-learning and engagement with the researcher.

Another key factor was a significant change in Riley's mindset that happened over the course of the research study (Regalla, 2016). Riley spoke of becoming more comfortable with the students at times knowing more than she does—about a topic or a technology. "And that I really, really like. I think the kids grow a lot more when you have that, and that's definitely how I've changed. … Giving them the power." Riley even spoke of the fear of appearing to not know when in the company of other teachers at professional gatherings. "Cause for me that's a sign of weakness and a sign of you know, she's not a good teacher because she doesn't know what we're talking about. Or she's never done this." Some of Riley's fears can be attributed to concerns that many teachers who are new to the profession tend to experience. Other factors, more real and visceral, also played into this tension for Riley.

In a reflective conversation, Sandra commented, "I get where you would be feeling like, 'I can't really let them know'." Riley replied,

> And especially without a permanent contract. … You know because I don't want that
> rumour to get out where I'm openly telling the kids, I don't know what we're doing. So
> that's been really powerful for me to learn that and be okay with that.

Riley's lack of confidence combined with imposter syndrome, a fear of not knowing *enough*, a desire to be seen as a competent teacher, and one who has the ability to articulate the pedagogical choices she/we were making to stakeholders and people in positions of authority, is a challenge that needs to be acknowledged, validated, and considered, when engaging in design based research and collaborative research practice partnerships with teachers that focus on studying change and innovations in teaching and learning.

Lack of/Limited Access to Robust Technology Along with Limited Opportunities to Learn

About and Use Technology

Riley's school was not well equipped with regards to robust technology and networking. She had access part-time to a cart of Chromebooks, and there was also a shared crate of ten four-year-old mini iPads. A few students brought devices from home, but this was not a frequent occurrence. Booking Chromebooks for use could be problematic when multiple classrooms were trying to access them. At times there was limited bandwidth and if students were working on online research or with online tools, access to the internet could be an issue. The lack of reliable technological infrastructure meant that the teacher and researcher were limited in the ways we could envision digital making. This limitation became a key aspect of our methodological choice as researchers. We wanted Riley to consider making within the authentic constraints in which she worked, and we did not wish her to see the lack of access to technology as a limiting factor in her pedagogical choices as a maker teacher. In that way, Sandra and Riley also became designers and makers alongside the students, because they had to prototype solutions creatively given the realities and constraints they faced. For that reason, this challenge also became an opportunity. Though frustrating at times, the lack of ready and reliable access to technology and network issues did not stop Riley: She and Sandra found work-arounds.

In cycle one, students were offered the choice to use Minecraft to model a question they had about space, but most students chose and seemed to want to work with low tech materials. In cycle two, students worked in groups or alone to create stop animations. Some made flip books, while others created digital animations using a variety of materials (e.g., Lego, materials found in the makerspace, and their own bodies). Because we wanted Riley and her students to experience digital making, as mentioned earlier, in cycle three, we offered students the choice of working with Tinkercad for 3D printing, or Easel for CNC milling, or low tech materials. We arranged to

have objects milled and printed at the university library. Given time constraints, and although they were able to design and prototype multiple *ideas* digitally, students were able to make only one physical object. Interestingly there were still some students who wished to design and make strictly with physical materials (e.g., beads and rocks), but many opted this time for the digital design route. Both Riley and Sandra had limited experience with the digital programs Tinkercad and Easel. This was an important but risky and intentional aspect of the research design. The researchers wanted to determine how Riley would take up making, given these obstacles. Though Riley indicated anxiety about this cycle, she could see how entering making as a learner as opposed to the "expert," created a positive dynamic with the students. We were often unable to help them, which meant they sought out and relied on each other for assistance. This developed their "maker mindset" (Dougherty, 2013; Regalla, 2016), a willingness to embrace personal learning and failure as opportunity, which is considered to be critical to making (Davee et al., 2015; Lynn et al., 2015; Martin, 2015).

Riley did not have easy access to a 3-D printer or CNC milling machine, but the researchers felt it was important that she see the enhanced possibilities for rich and authentic student and teacher learning with digital making tools. This meant Sandra carried out the milling and some of the tweaking of 3D printing designs herself, which took considerable time. It is acknowledged that had Riley had to manage this herself, the time constraints involved in 3D milling and printing would have made it unfeasible. In this case, the researchers prioritized teacher and student learning about digital making in order to continue to evolve and grow their maker mindset.

From the beginning, Riley indicated a desire to use technology, even though she described herself as "not very techy." For example, while we were working with Riley's class, the district technology coordinator lent her a Makey Makey kit to test out. It is an invention tool

that uses codeable circuits. She accepted the kit, but rather than design a way to use it in classroom teaching, she gave it to some students to play with and experiment. As researchers, we considered that part of the challenge for Riley was taking the time to learn about different technologies, but prior to the research study, it was also a challenge for her to envision how she might use technology in a meaningful way. In a follow-up interview that took place the year after the study, Riley told us she had attended a Makey Makey workshop and immediately conceptualized a learning design and prototyped it with her students, using Makey Makey as a tool. Participating in the research study did appear to change Riley's mindset about the many learning possibilities she could introduce to students using technology. She also indicated that she did not feel she had to "know everything" to enact the design. Implementing cycle three with the support of a researcher meant that not only did the students have an opportunity to prototype ideas and learn about and through technology, but also did Riley (Regalla, 2016).

External pressures

Throughout the research in the school, additional challenges presented themselves. Summative evaluation and assessment, including provincial exams, were a stress that Riley referred to often. She also discussed frustration at the dynamics that arose within the school related to how her practice was changing within the research context, and the apparent lack of interest in making on the part of her colleagues.

In addition, Riley had taken the lead on setting up and organizing the makerspace in her school. Because other staff members were not as invested in it, it often fell to her to manage materials. She expressed frustration when the area was not well looked after or materials went missing. She also conveyed dismay that her colleagues on staff were not engaging in maker activities with more enthusiasm. It was a delicate balancing act for Riley. As a newer teacher she did not wish to sound haughty about what she was learning. Rather, she was a supportive

colleague, excited to share what she was learning and experiencing. However, as the study progressed, Riley determined that she would continue to work on maker activities on her own. We see this as a challenge in determining ways to connect teachers in supportive ways when they are innovating their practice (Holdsworth & Maynes, 2017). In Riley's school, her frustration was in seeing teachers silo themselves to remain within the safe and the known. She viewed herself as a resource for other colleagues that they chose not to utilize. If this challenge is not creatively addressed, the rich opportunities for innovation can be squashed, particularly after the researchers, and ultimately the teacher, have left the school.

Discussion

Engaging in research focused on makerspaces and designing for making as an approach to interdisciplinary learning did result in a transformative and sustained change in this teacher's practice. But, as confirmed by her throughout the study and in our ongoing reflections after the three cycles concluded, the research design and methodological choice were key components in supporting the change. Co-designing, co-enacting, and co-reflecting on curriculum, design, and making, supported co-learning for the teacher and the researcher. Working with a research partner gave Riley permission to risk-take and sometimes fail (Holdsworth & Maynes, 2017). The cyclical structure for enactment (pre-making, making, and post-making) scaffolded the students', the teacher's, and the researcher's learning. Multiple cycles allowed for both Riley and her students to consider what they had learned, and where they wanted to go next, enabling their continuous growth as makers. Over time, both the students and the teacher showed improvement in pre, during, and post making processes, which led them to take on new challenges, thereby enhancing their ability to risk-take and grow.

For preservice teachers, it is the authors' contention that it would be a challenge to prepare them for the risk-taking required to engage in making with students—given the shorter

durations of time they spend in classrooms, the high stakes assessment context for preservice

teachers in practicum, and especially if their partner teachers are not already on board. However,

a preservice teaching program could establish the conditions for student teachers to experience

first-hand what robust maker practice feels like as learners themselves. This approach would

require investment in building capacity among faculty members, particularly in demonstrating

their own willingness to risk take, providing opportunities for preservice teachers to experience

maker activities as part of their teacher education program, and student teachers being scaffolded

and supported in carrying out well designed maker activities in their field experiences (Brown,

2017). In addition, establishing makerspace microcredentialling programs (Rodriguez et al.,

2018) and mentoring opportunities with small groups of students as part of preservice

coursework may help student teachers to build self-efficacy (Blackly et al., 2017) in maker

pedagogy.

Based on this research, we recommend that preservice, novice, and experienced teachers

who want to shift their practice can start by selecting an aspect of curriculum they feel

comfortable with, and consider a design task that involves making within a well thought out

structure. The following table, based on the work conducted in the study, might serve to guide

both preservice and practising teachers as beginner maker teachers:

Table 1

Considerations and Guiding Questions When First Implementing Making

Cyclical Elements	Considerations	Guiding Questions
Pre-making	Research	What do students need to know about a discipline topic and a technology prior to making? How will they learn about it?
	Design	What design process (eg., drawing, storyboarding, choice of material) will students engage in prior to making?
	Assess	What formal structures will be put in place to create opportunities for the giving and receiving of feedback?
Making	Make	What structures will be put in place for students to reflect and further ideate within the context of making?
Post-making	Share	What provisions (physically or virtually) have been considered for sharing maker prototypes?
	Assess	What areas of student growth will be the focus and how will they be determined and reported on?

Riley commented that in cycle one,

when we got to the maker lab, it was pretty seamless. We didn't have to instruct for the most part, what the students should be doing. I was able to take a step back a couple of days and listen and you could just hear the conversations, actually hear the building process. That was more than I thought it was going to be.

The "seamless" aspect of the first making cycle was made possible because of the extensive design work Riley and Sandra engaged in prior to starting the project with the students.

This is not to say, however, that teachers cannot be open to design possibilities throughout the process of working with students in the makerspace. Riley and Sandra decided to create a virtual museum with student artifacts *as* the students were designing their democratic metaphors in cycle three. Remaining open to possibilities is a critical aspect of being a maker.

Conclusion

In this chapter, we have explored the possibilities and challenges involved in enacting curriculum in an elementary school makerspace using a design-based research approach. Findings indicate there is promise in implementing curriculum through making in that it encourages ontologic, epistemic, and pedagogic discourses between makers and other makers,

between makers and themselves, and between makers and materials. These discourses ushered in a shift in how learning was approached by all who were involved in the makerspace and in the design-based research. However, the opportunities must be weighed against the systemic challenges that the teacher, in particular, faced, including the constraining aspects of curriculum, the influence of high stakes testing, and the limitations of technology for innovative learning designs.

The two research questions that inspired the study were: How can teachers be supported in the development of teacher knowledge, pedagogy, and practice within an elementary school makerspace environment?; and how can teachers support the development of students' conceptual understanding of disciplinary topics in an elementary school makerspace? We suggest that structuring the research with the intentional implementation of a participatory methodology such as DBR created a scaffold in which the teacher could explore, risk-take, and test ideas related to learning in the makerspace in collaboration with researchers.

DBR, however, can be a double-edged sword. Conducting research collaboratively can inspire, but it can isolate research participants from their peers. In this case it promoted innovation and change in teacher practice, but we also found it to be extremely labour intensive, particularly in relation to the time spent (a) co-planning, co-teaching, and co-reflecting; (b) collecting and analyzing extensive data; and (c) researching multiple curriculum topics and technologies. The research context is rife with opportunities and challenges. Nevertheless, we argue, and the teacher participant confirmed, that design-based research has value as an authentic way to promote and sustain innovation and change in education.

References

Alberta Education. (2017). Curriculum development: Why change curriculum.

https://education.alberta.ca/curriculum-development/why-change-curriculum/everyone

/why-change-curriculum/

Barab, S., & Squire, K. (2004). Design-based research: Putting a stake in the ground. *The*

Journal of the Learning Sciences, 13(1), 1–14.

Barron, B., & Darling-Hammond, L. (2010). Prospects and challenges for inquiry-based

approaches to learning. In H. Dumont, D. Istance & F. Benavides (Eds.), *The nature of*

learning: Using research to inspire practice (pp. 199–216). OECD Publishing.

https://read.oecd-ilibrary.org/education/the-nature-of-learning_9789264086487-en

Barton, E. A., & Dexter, S. (2020). Sources of teachers' self-efficacy for technology integration

from formal, informal, and independent professional learning. *Educational Technology*

Research and Development, 68(1), 89–108. doi:10.1007/s11423-019-09671-6

Becker, S. (2019). *Becoming makers: A design based research study investigating curriculum*

implementation through making [Doctoral dissertation, University of Calgary].

https://prism.ucalgary.ca/bitstream/handle/1880/110614/ucalgary

_2019_becker_sandra.pdf?sequence=2&isAllowed=y

Becker, S., & Jacobsen, M. (2019). "How can I build a model if I don't know the answer to the

question?": Developing student and teacher sky scientist ontologies through making.

International Journal of Science and Mathematics Education, 17(1), 31–48.

doi:10.1007/s10763-019-09953-8

Becker, S. & Jacobsen, M. (2020) Becoming a maker teacher: Designing making curricula that

promotes pedagogical change. *Frontiers in Education*, *5*(83). doi:

10.3389/feduc.2020.00083

Bereiter, C. (2002). Design research for sustained innovation. *Cognitive Studies*, *9*(3), 321–327.

Bevan, B. (2017). The promise and the promises of making in science education. *Studies in Science Education, 53*(1), 75–103. doi:10.1080/03057267.2016.1275380

Bevan, B., Gutwill, J. P., Petrich, M., & Wilkinson, K. (2015). Learning through STEM-rich tinkering: Findings from a jointly negotiated research project taken up in practice. *Science Education, 99*(1), 98–120. doi:10.1002/sce.21151

Blackley, S., Sheffield, R., Maynard, N., Koul, R., & Walker, R. (2017). Makerspace and reflective practice: Advancing pre-service teachers in STEM education. *Australian Journal of Teacher Education (Online), 42*(3), 22. doi:10.14221/ajte.2017v42n3.2

Brown, B., & Egizii, R. (2019). Practice partnerships in Alberta: Research brief. Calgary, AB: Werklund School of Education. https://prism.ucalgary.ca/bitstream/ handle/1880/110743/RPP_Research%20Brief_FinalV2.pdf?sequence=3

Brown, E. (2017). *Exploring the design of technology enabled learning experiences in teacher education that translate into classroom practice* [Doctoral dissertation, University of Calgary].
https://prism.ucalgary.ca/bitstream/handle/
11023/4025/ucalgary_2017_brown_eva.pdf?sequence=1&isAllowed=y

Bruce, C. D., Esmonde, I., Ross, J., Dookie, L., & Beatty, R. (2010). The effects of sustained classroom-embedded teacher professional learning on teacher efficacy and related student achievement. *Teaching and Teacher Education, 26*(8), 1598–1608.

Brydon-Miller, M., Kral, M., Maguire, P., Noffke, S., & Sabhlok, A. (2011). Jazz and the banyan tree: Roots and riffs on participatory action research. In N. K. Denzin & Y. S. Lincoln (Eds.), *The SAGE handbook of qualitative research* (4th ed., pp. 387–400). SAGE Publications.

Chu, S. L., Quek, F., Bhangaonkar, S., Ging, A. B., & Sridharamurthy, K. (2015). Making the

    maker: A means-to-an-ends approach to nurturing the maker mindset in elementary-aged

    children. *International Journal of Child-Computer Interaction, 5*, 11–19.

Davee, S., Regalla, L., & Chang, S. (2015). Makerspaces: Highlights of select literature.

    http://makered.org/wp-content/uploads/2015/08/Makerspace-Lit-Review-5B.pdf.

Davis, B., Sumara, D., & Luce-Kapler, R. (2015). Engaging minds: Cultures of education and

    practices of teaching (3rd ed.). Routledge.

Dorst, K. (2010). The nature of design thinking.

    https://opus.lib.uts.edu.au/bitstream/10453/16590/1/2010000367OK.pdf

Dougherty, D. (2013). The maker mindset. In M. Honey & D. E. Kanter (Eds.). *Design, make,*

    play: Growing the next generation of STEM innovators (pp. 7–11). Routledge.

Fourie, I., & Meyer, A. (2015). What to make of makerspaces: Tools and DIY only or is there an

    interconnected information resources space? *Library Hi Tech, 33*(4), 519–525.

Friesen, S. (2009). *What did you do in school today? Teaching effectiveness: A framework and*

    rubric. Canadian Education Association.

Fullan, M., Hill, P., & Crevola, C. (2006). *Breakthrough*. Corwin Press.

Harron, J. R., & Hughes, J. E. (2018). Spacemakers: A leadership perspective on curriculum and

    the purpose of K-12 educational makerspaces. *Journal of Research on Technology in*

    Education, 50(3), 253–270. doi:10.1080/15391523.2018.1461038

Holdsworth, S., & Maynes, N. (2017). "But what if I fail?" A meta-synthetic study of the

    conditions supporting teacher innovation. *Canadian Journal of Education/Revue*

    canadienne de l'éducation, 40(4), 665–703.

Friesen, S, & Jacobsen, M. (2011). Hands on vs. hands up: Technology-enabled knowledge

    building in high school. *Education Canada, 53*(1). http://www.cea-ace.ca/education-

canada/article/web-exclusive-hands-vs-hands-technology-enabled-knowledge-building-high-sch

Jacobsen, M. (2014). Design based research: Sponsoring innovation in Education. *Education Canada, 54*(5), 22–24. https://www.edcan.ca/articles/design-based-research/

Jones, W. M., Smith, S., & Cohen, J. (2017). Preservice teachers' beliefs about using maker activities in formal K-12 educational settings: A multi-institutional study. *Journal of Research on Technology in Education, 49*(3–4), 134–148. doi:10.1080/15391523.2017.1318097

Kjällander, S., Åkerfeldt, A., Mannila, L., & Parnes, P. (2018). Makerspaces across settings: Didactic design for programming in formal and informal teacher education in the Nordic countries. *Journal of Digital Learning in Teacher Education, 34*(1), 18–30.

McKenney, S., & Reeves, T. C. (2012). *Conducting educational design research*. Taylor and Francis.

Martin, L. (2015). The promise of the maker movement for education. *Journal of Pre-College Engineering Education Research (J-PEER), 5*(1), 4. doi:10.7771/2157-9288.1099

Oxman Ryan, R., Clapp, E. Ross, J., & Tishman, S. (2016). Making, thinking, and understanding: A dispositional approach to maker-centred learning. In K. Peppler, E. R. Halverson & Y. Kafai (Eds.), *Makeology: Makers as learners* (Vol. 2, pp. 29–   44). Routledge.

Paganelli, A., Cribbs, J. D., Huang, X. S., Pereira, N., Huss, J., Chandler, W., & Paganelli, A. (2016). The makerspace experience and teacher professional development. *Professional Development in Education, 43*(2), 232–235. doi:10.1080/19415257.2016.1166448

Penuel, W. R., Allen, A. R., Coburn, C. E., & Farrell, C. (2015). Conceptualizing research–practice partnerships as joint work at boundaries. *Journal of Education for Students Placed at Risk (JESPAR), 20*(1–2), 182–197.

Regalla, L. (2016). Developing a maker mindset. In K. Peppler, E. R. Halverson, & Y. Kafai (Eds.), *Makeology: Makerspaces as learning environments* (Vol. 1, pp. 257–272). Routledge.

Shelly R. Rodriguez, Jason R. Harron, & Michael W. DeGraff (2018). UTeach Maker: A Micro-Credentialing Program for Preservice Teachers, *Journal of Digital Learning in Teacher Education*, 34(1), 6–17, doi:10.1080/21532974.2017.1387830

Volante, L. (2010). Assessment of, for, and as learning within schools: Implications for transforming classroom practice. *Action in Teacher Education*, *31*(4), 66–75. doi:10.1080/01626620.2010.10463536

Volante, L., & Ben Jaafar, S. (2008). Educational assessment in Canada. *Assessment in Education: Principles, Policy & Practice*, *15*(2), 201–210.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Willms, J. D., Friesen, S., & Milton, P. (2009). *What did you do in school today?: Transforming classrooms through social, academic, and intellectual engagement (First National Report)*. Canadian Education Association.