

Chapter 8

Supporting Teachers' Understanding of Innovative Maker Pedagogies During a Pandemic Through the Design of Ethical and Relational Online Professional Learning

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Abstract

This qualitative research explores the challenges involved in designing online professional learning (OPL) for teachers with a focus on innovative pedagogies, specifically maker-centred practices. This OPL was designed in response to teachers' expressed need for support to the government mandated pivot to emergency remote teaching (ERT) during the 2020 pandemic. The research question addressed is: What are the many ways in which we create the conditions for meaningful, authentic, and respectful professional learning focused on innovative practices, such as making, in an online environment? In this study, the conceptual model considers human-centred design and Nodding's (2013) relational practice in the context of the Ontario College of Teachers' (OCT) four-part conception of professional ethics. Implications include that designers: (a) can enhance teacher learning by highlighting the connection between empathy, perspective-taking, and techno-pedagogical competence with making; (b) should focus the sessions on common tools, as well as transferable activities and curriculum, to support early success; and (c) design with teachers, which requires the intentional design of conditions for teacher learning, targeted supports and scaffolds for learning, awareness of resources needed, and provision of appropriate instructional guidance and expertise.

Résumé

Cette recherche fondée sur l'approche qualitative explore les défis liés à la conception d'une formation professionnelle en ligne (FPEL) pour les enseignants et les enseignantes dans le domaine du bricolage numérique et physique. Conçue pour répondre aux besoins exprimés par le personnel enseignant dans le cadre du virage obligatoire vers l'enseignement à distance au cours de la pandémie globale de 2020, notre recherche aborde la question suivante : comment peut-on créer une formation professionnelle à distance d'envergure, authentique et respectueuse afin d'aider le personnel enseignant à développer les approches pédagogiques novatrices telles que les pédagogies Bricoleur? Encadré par les normes de la déontologie pour la profession enseignante

déterminées par l'Ordre des enseignantes et des enseignants de l'Ontario, nos analyses reposent sur des principes de conception centrés sur l'humain, et sur la notion de pratique relationnelle de Noddings (2013). Nos analyses permettent d'observer que : (a) lorsque les concepteurs le rendent explicite, le lien entre l'empathie, la prise de perspective et la compétence techno-pédagogique peut appuyer l'apprentissage; (b) les concepteurs devraient miser sur les outils utilisés par tous les participants et participantes, de même que sur des activités flexibles qui s'appliquent à tous les milieux scolaires pour favoriser des succès rapides; et (c) la co-conception d'une formation professionnelle en ligne avec le personnel enseignant nécessite la mise en place intentionnelle de conditions propices à l'apprentissage, y compris le soutien ciblé, l'échafaudage des pratiques techno-pédagogiques, l'attention aux ressources nécessaires et l'accès aux conseils et à l'expertise pédagogiques adéquats.

Supporting Teachers' Understanding of Innovative Maker Pedagogies During a Pandemic Through the Design of Ethical and Relational Online Professional Learning

Designing for responsive, respectful, and caring online professional learning opportunities can be challenging. Exploring the use of hands-on physical and digital technologies in online settings adds a layer of complexity. These challenges have been exacerbated with the shift to emergency remote teaching in a global pandemic.

In this chapter, we examine and reflect on the case of an online professional learning (OPL) program for K-12 teachers that focused on the concept of making and the use of digital tools for teaching computational thinking and was designed and iterated by two of the authors during the initial stages of the pandemic in the spring of 2020. Utilizing the Ontario College of Teachers' (OCT) four standards of ethical practice, (i.e., care, respect, integrity, and trust) and the central tenets from the research on human-centred design (HCD), this study uses a retrospective approach to investigate the explicit and tacit assumptions, as well as the gaps and oversights, that limited and may have run counter to the overall goals of the online professional learning program during the first iteration.

We explore the following research question: what are the ways in which instructors can create the conditions for meaningful, authentic, and respectful professional relationships and engagements for learning about makerspaces and making when we connect, collaborate, and communicate online? We present a review of literature on makerspaces and making, human centred design, and Noddings' notion of the ethic of care to provide a context for this research.

The Concepts of Makerspaces and Making as Opportunities for Rich Learning

Makerspaces are “physical locations where youth use tangible materials to create personally meaningful projects alongside others” (Keune & Peppler, 2019, p. 281). Scholars suggest that in the creation of physical and digital artifacts, learners develop understandings

related to design, engineering, coding, and computation (Halverson & Peppler, 2018) while developing key competencies such as creativity, problem solving, innovative thinking, collaboration, and risk taking (Becker & Lock, 2021). Although learning in makerspaces is meant to be hands-on and interest driven (DiGiacomo et al., 2020), this approach was challenging during the pandemic. Educators had to consider how to address learner needs when significant features, like the physical dimensions of a learning environment and opportunities to work alongside others with varying levels of expertise, were no longer present. The pivot to online learning also created dilemmas related to equity, access, and student engagement. In addition, teaching and learning about aspects of making processes in an online setting presented challenges affiliated with the materiality and physicality of making (Kinnula et al., 2021; Lock et al., 2020).

Human-Centredness as Fundamental to Design

Although the meanings of design thinking and human-centred design (HCD) are often misconstrued (Baker & Moukhliiss, 2020), we concur with Buchanan (2001) who contends that HCD is fundamentally an affirmation of human dignity. HCD is defined as a process “to gain and apply knowledge about human beings and their interaction with the environment, to design products or services that meet their needs and aspirations” (van der Bijl-Brouwer & Dorst, 2017, p. 2). These needs and aspirations are attained through the pursuit of design that can bolster the human ability to interlace dignity throughout various aspects of their lives (Buchanan, 2001). An important aspect of HCD is listening to stakeholders, including empathy as a key component throughout the design process (Giacomin, 2014; Hess & Fila, 2016). For designers, empathy is achieved in multiple ways, including through observation, dialogue, and imagining oneself in the user’s position (Fila & Hess, 2015; Hess & Fila, 2016). It is through empathy that designing for dignity happens. For example, when designing neighbourhoods consideration must be given to

safety, accessibility, and inclusion as this process involves situating designers in the places of those for whom they are designing (Becker, 2021).

The OCT Ethical Standards for Teaching as “a Vision for Professional Practice”

At the heart of the OCT Ethical Standards for Teaching (2022) is “a commitment to students and their learning” (Ontario College of Teachers, p. 1) in the form of four standards: care, integrity, respect, and trust. The standards are explained in greater detail in the following sections.

Care

The OCT’s ethical standard of *Care* includes “compassion, acceptance, interest and insight for developing students’ potential. Members express their commitment to students’ well-being and learning through positive influence, professional judgement and empathy in practice” (Ontario College of Teachers, 2022, p. 1). Notably, this definition centres the teacher’s role and duty of care but makes no reference to the importance of reciprocity or relationality. Noddings (2013) writes that “the essential elements of caring are located in the relation between the one-caring and the cared-for” (p. 9). A teacher’s actions may signal an intention to facilitate care, but if the teacher seeks to design learning environments where care is experienced, then the teacher must also invite the students (the cared-for) to enter this relation on their terms. When students enter relationships on their own terms, there is a greater potential to align with their needs. Furthermore, opening space for reciprocity can disrupt a teacher’s privileged position of power in determining what care looks like; it transforms care from an object-centred activity to a human-centred one (Krippendorf, 2004). This indicates respect (another standard) for the student’s right to opt-in or opt-out. On the part of the one caring, a reciprocal, human-centred approach requires dutiful attention to the experiences and needs of every student, including those most vulnerable. This requires the teacher to identify, reflect on, and recalibrate the place of dominant ways of being by putting oneself in the place of the learner.

Integrity

Notions of care are also implicit in the OCT's standard of *integrity*, which is defined as "honesty, reliability, and moral action" achieved by "continual reflection." This framing suggests attention to core values and standards as determined by outsiders (Penuel et al., 2014; Santoro, 2017). It begs the question as to how do designers, who come with particular cultural backgrounds, consider their personal and professional integrity as well as the integrity of teaching for the diversity of learners they encounter (Santoro, 2013)? Integrity in "human-centred design views the holistic inclusion of human beings as central to the design process" (Becker, 2021). Buchanan (2001) states that in fore-fronting design as human-centred, we consider an *integration* of "how humans act out their lives in various social, economic, political, and cultural circumstances" (p. 37) with an overall focus on human dignity. This means that when designing with care, one considers the social, economic, political, and cultural *teaching* circumstances of the participants.

Respect

Care and integrity are also interwoven with respect. For the OCT,

Intrinsic to the ethical standard of *Respect* are trust and fair-mindedness. Members honour human dignity, emotional wellness and cognitive development. In their professional practice, they model respect for spiritual and cultural values, social justice, confidentiality, freedom, democracy and the environment. (Ontario College of Teachers, 2022, p. 1)

Again, the focus is on the teacher as a model. In terms of action, however, the OCT does not clarify what respect might look like in practice or how respect for human dignity, emotional wellness, and cognitive development might become intrinsic in educators' design decisions. Noddings (2012) suggests that receptive listening is a fundamental strategy. Using principles of human-centred design (Buchanan, 2001), we also see that reciprocity and criticality are the processes through which respect might be co-constructed in an online learning environment.

Trust

Trust, also interwoven with the other standards, includes “fairness, openness, and honesty” according to the Ontario Standards document (2022), with a stated expectation that teachers’ professional relationships are based in trust. Trust, however, is not a one-sided association. Building trust in online environments necessitates the need for a reciprocal, caring relationship between and among learners and the teacher (Paliszkiewicz & Skarżyńska, 2021; Wang, 2014). The derivation of the word trust springs from the Old Norse word *traustr*, meaning confident and strong (Onions et al., 1966). In trusting and caring relationships, mutual strength and flourishing are a goal. Buchanan (2001) suggests that design should “support and strengthen the dignity of human beings” (p. 37). Indeed, Krippendorf (2004) submits that the goal of HCD is to inspire all stakeholders to achieve their best. Therefore, we propose that trust, established through “fairness, openness, and honesty,” is about designing learning environments that ensure that all learners thrive.

A Conceptual Model for Analysis

Using the Ontario College of Teachers’ (OCT) four-part conception of Ethical Standards of the Teaching Profession (2022), the researchers developed a conceptual model to inform analysis of the design of maker-centred OPL for Ontario teachers during COVID-19. In Figure 1 we present the model situated in the overarching context of the pandemic. The model is structured around the course design in relation to the four OCT Ethical Standards of the Teaching Profession (care, integrity, trust, and respect) and informed by the construct of HCD (Buchanan, 2002) and Nodding’s (2013) notion of education as relational practice. The model is an invitation to consider the question Nodding poses:

We may start with schools as they are, identify their primary functions, and ask how they may best be organized to serve their functions. Or we may start with our picture of caring

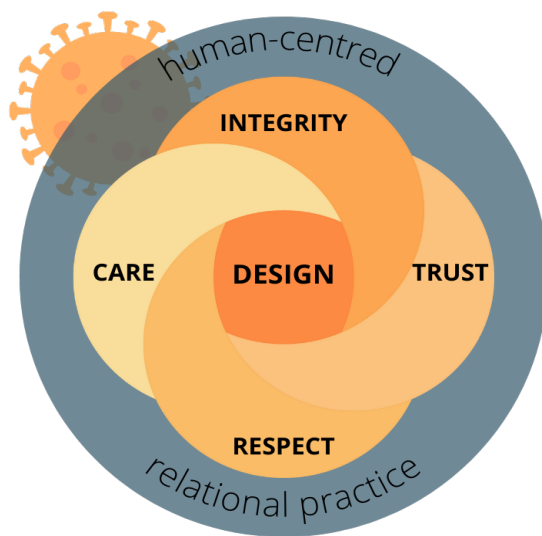
and education and ask what sort of organization might be compatible with this picture.

(p.180)

The combination of education as relational practice and HCD have enabled us to consider the essential elements of each standard component in a particular way to inform the analysis of our design.

Figure 1

Conceptual Model of Ethical, Human-Centred Relational Practice of Design During a Pandemic



Next, we outline in more detail the research and course design, followed by the findings.

Methodology and Research Design

This qualitative research draws on the secondary use of data from the research conducted during the early months of the pandemic (March to June 2020). We provide an overview of the original study (Morrison et al., 2021) and describe how these data were used to explore the ways the program aligned with the OCT standards of ethical practice and principles of care, respect, integrity, and trust in teaching as well as how the program aligned with HCD principles.

In the original Participatory Action Research (PAR) study, a team of four researchers used the “spiral of self-reflective cycles” of planning, acting, observing, and reflecting (Kemmis &

McTaggart, 2007, p. 276) to design and implement during the pandemic online maker-focused professional learning sessions for teachers. These researchers are experts in making processes and experts in online learning, but acknowledged they were emerging practitioners of this integrated form of OPL for making processes. The team turned to theory and research to guide the development of sessions and the choices made as they reflected and as the sessions progressed; however, they were equally reliant on participant feedback to determine the focus of the sessions. The primary objective was to support teachers adjusting to emergency remote teaching (ERT) in terms of technical knowledge (i.e., tips on digital tools to use for specific purposes) and to lessen their burden as time went on by co-hosting class sessions with them and their students to model promising online pedagogical practices. In the first weeks of mandated ERT, teachers in some school districts were being encouraged to upload videos of themselves delivering content asynchronously rather than use synchronous video conferencing platforms. The researchers worried that a shift away from socio-constructivist learning would lead to student disengagement and a disconnect from others that would negatively impact their mental wellness. In a meeting with teachers in one of her networks two weeks into remote learning, Hughes witnessed a Grade 2 teacher crying because she had been unable to connect with and support three of her students online, despite having reached out to their parents via email and phone. Her despair was heart-breaking. Hughes quickly mobilized the team.

The Sessions: An Overview

The researchers designed and facilitated OPL sessions for teachers with regards to online pedagogy, maker pedagogies, and STEAM (Science, Technology, Engineering, Arts and Math). Sessions included hands-on, learner-centred, inquiry-based, and subject-integrated activities (Hughes, 2017). Importantly, after each session the researchers engaged as a team in video-recorded debriefs to unpack their experiences — what worked well in each session and what could

be improved upon. Here, they engaged in cycles of planning, facilitation, reflection, revision, and preparation, which is particularly helpful in the development of theoretically grounded professional learning. The sessions took place from 25 March to 24 June 2020 (Figure 2 provides an overview of the sessions). Early sessions focused on online teaching tips and strategies to help teachers quickly pivot to ERT. Later, sessions transitioned to more in-depth online programs and topics as the teachers' needs shifted to a focus on using digital tools to support curricular goals.

The first set of sessions were developed in response to (a) informal conversations the research team had with teacher-friends and colleagues (e.g., skills- and technology-based concerns, student engagement and achievement concerns, etc.); and (b) teacher's social media posts and communications from the provincial government via news channels regarding their plans for ERT.

During registration, teachers were asked, "What do you hope to get out of this session?" so the team could tailor sessions to each unique group of attendees. Exit forms used at the conclusion of sessions gathered feedback on what worked well, what could be improved, and what kinds of future sessions teachers wanted. The goal was to make these OPL sessions as responsive to the teachers' needs as possible.

In May 2020, the researchers shared an informal survey with teachers regarding their online challenges, successes, and concerns; types of online support they have received; and their perceptions of student engagement in online environments. The goal was to develop a robust picture of the teachers' experiences to inform the design of future sessions. May 2020 also marked the lab's pivot away from emergency tech-focused OPL and toward individualized and embedded OPL that was human-centred and relational by design. At this stage, the team engaged individual teachers to co-plan and co-facilitate maker/STEAM classroom sessions related to their curricular goals.

Figure 2

Timeline of Sessions and Information Gathering for Planning Purposes

THE SESSIONS

MARCH, 2020

- **20th** - Online Teaching Tips & Strategies
- **23rd** - Online Teaching Tips & Strategies
- **25th** - Online Maker Modules [central feature: **block coding**]
- **31st** - Gr. 7-12 e-Learning Teaching Tips & Strategies

APRIL, 2020

- **2nd** - **Block Coding** with Scratch
- **7th** - Gr. K-6 e-Learning Teaching Tips & Strategies
- **9th** - Intro to **MakeCode Block Coding**
- **14th** - Google Classroom & Multimodal Tools
- **16th** - Math & TinkerCad
- **28th** - Maker Modules

MAY, 2020

- **4th** - STEM Webinar
- **12th** - Maker Modules

*Most of May was devoted to working with teachers co-developing & co-facilitating online sessions for their students. Sessions focused on math and **block coding**, primarily.

JUNE, 2020

- **10th** - Math & **Block Coding**
- **16th** - Math & Bloxels
- **17th** - Math & **Block Coding**
- **24th** - Interactive Whiteboards & Presentations

THE INFORMATION GATHERING

MARCH + APRIL 2020

- Informal conversations with teacher-friends
- Posts by teachers on social media
- Watching/listening to news updates from the Ontario government
- Question on session registration form: "What do you hope to get out of this session?"
- Debrief feedback form:
 - What worked well in the session?
 - What are some improvements that could be made?
 - What future sessions might you be interested in attending?

MAY, 2020

- See above
- Online Teaching & Learning Survey

How Sessions Were Determined and Planned

Data Collection and Analysis

The research team met after each synchronous virtual professional learning session to reflect. Verbal reflections were collected via Google Meet and stored in a password-protected university Google Drive account (i.e., a cloud-based storage account); they were later transcribed and housed in the same account. Informal pre-and post-session feedback forms (completed by session attendees) were also included in the data analysis as was the informal online teaching and learning survey shared on social media in May 2020.

For the purposes of the present analysis, two members of the original research team (Morrison and Hughes) collaborated with three colleagues who were interested in investigating the ways the program aligned with the OCT standards of ethical practice and principles of care, respect, integrity, and trust and the principles of HCD. Data were analyzed through several rounds of coding using a combination of first-level, a priori codes, and second-level emergent codes (Miles et al., 2020). The four first-level codes were derived from the OCT ethics framework and included trust, respect, integrity, and care.

As the OCT definitions were mapped onto concepts from HCD (Buchanan, 2001) and relational practice (Noddings, 2012; 2013) for the purposes of this study, it was necessary to create condensed versions of these definitions for easy reference in the coding process. Keywords found in condensed definitions helped the five researchers home in on the subtle differences between terms. The second-level emergent codes included terms like learner considerations, virtual PL challenges, and virtual PL planning. These were used to further define and add nuance to the four primary a priori codes. Initial coding was conducted by Morrison and followed by several rounds of discussion and analysis with the research team to determine trustworthiness.

Findings

Observed in the actions of the original researchers were design decisions that reflected the intersection of the OCT Standards of Care and key elements from HCD and relational practice (Buchanan, 2001; Noddings, 2013). Within the context of each decision, the present research team identified how the design practices were shifted in the OPL sessions according to participant needs, thus highlighting the iterative nature of the design process (Scheer et al., 2016). Findings are presented in three parts. Part one provides examples of the major design decisions undertaken by the original team of researchers. In part two we unpack how the OCT Standards of Care were embedded in design decisions. In part three, we explore the major challenges encountered in the design and the enactment of the workshops.

Part 1: Design Decisions

Decision 1: Support Teachers in Learning to Work/Learn/Make Online. Our first design decision was to immediately provide support to teachers to help them in their sudden (and disorienting) shift to fully online teaching and learning. In response to the Ontario Premier's initial announcement regarding the plan for ERT after March 2020, Hughes suggested to the team in a recorded debrief:

What do you think about doing a session next week on teaching online? . . . So, teachers are going to be panicked about how to teach online. So, maybe something to give them tips. Tips and tricks for teaching your students online K-8 or K-12.

Teachers' expressed needs included: the basics of how to get online, how to set up a virtual classroom, and how to use digital tools in their teaching. As a result, the early phase OPL design centred on logistics, as teachers shared with the team the lack of support received from schools and boards.

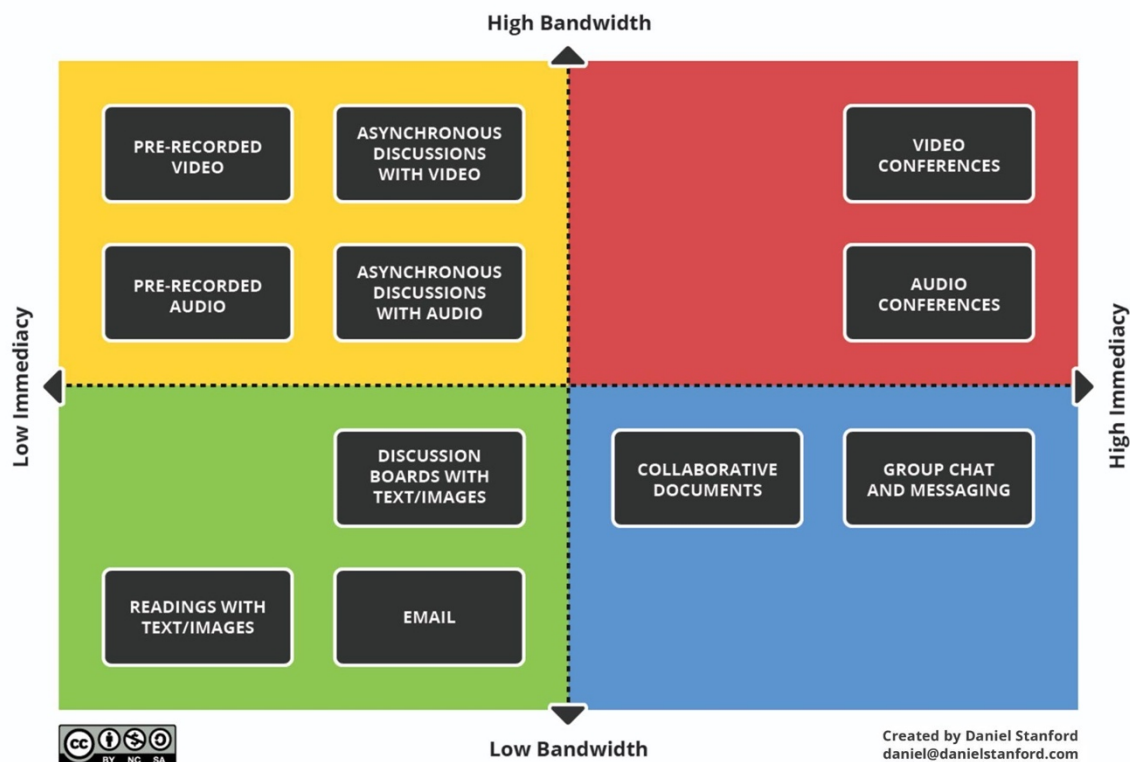
Early OPL sessions focused primarily on responding to teachers' requests for assistance in making the transition online (March/April). Once teachers developed some comfort teaching online, in later sessions (May/June) the team responded to requests from teachers for more nuanced pedagogical help. Many of these later sessions materialized as embedded classroom-based OPL, where the team co-planned and co-facilitated online lessons with teachers and their students.

Decision 2: Design for Equity and Access. The team designed the OPL with equity and access in mind. For example, in terms of technology, the research team made it a priority to stay up-to-date on approved school technology tools and they offered sessions based on these tools, so that the learning was relevant and immediately applicable in teachers' contexts. This OPL project focussed on tools that were free, easy to use, flexible, and adaptable in relation to learners' needs. Resnick and colleagues (2009) described this approach metaphorically as designing activities that have low floors (easy entry points), high ceilings (many levels of complexity to accommodate experience levels and growth), and wide walls (multiple entry points for different learners and their interests). It was important that the tools be applicable to different grades, experience, interest, and ability levels.

In planning sessions, Hughes suggested both teachers and students would have a range of internet connectivity and access to technological devices. Therefore, teachers would need a range of remote teaching and learning ideas to choose from. Figure 3 was shared with teachers to get them thinking about the various teaching tools and methods they could take up, depending on their own and their students' devices and internet connectivity.

Figure 3

Daniel Stanford's Bandwidth/Immediacy Matrix



Note. Used with permission.

The team's intention was to demonstrate what could work for teachers' ERT, while keeping varying bandwidth issues in mind. Equipped with this knowledge, teachers could make informed choices at the intersection of technological devices, internet connectivity, and learning activities to help students continue to thrive and achieve in their learning.

Another example of designing for access was a particularly effective online coding activity that had a low-floor (i.e., easy entry point) for those new to coding in Scratch, and a high-ceiling, for those with more experience. In a recorded debrief on 2 April 2020, one of the researchers shared:

[Blake] created code and we had to then access the code, “look inside,” from our own accounts and then hack it to fix it. ... It was an interesting way of everybody being able to do the challenge, to instantly have access to the code and for it to be a “oh, look, this didn’t work, let’s problem solve.” And then you see the outcome with the animation. And then ... when somebody figured out one solution, they shared it. And then [Adam] not only fixed the code, because he’s got more skill, [he] created something even above and beyond that and showed us how he did it, so it kind of snowballed.

This activity was inclusive because those participants less familiar with coding could manipulate existing code as an entry point. Everyone was given access to the same faulty code and everyone had the challenge of attempting to debug it. Participants could work together, or alone, and there was no limit to what could have been added to the code. Adaptability was reflected in the work from the participant with more Scratch experience who not only debugged the code, but also added to the code to create something new.

The two examples demonstrate how equity and access were considered in both the technology tools and activities that the team chose to include in the OPL. The team considered the teachers’ access to technology and their varying skills levels, while simultaneously considering the same for their students.

Decision 3: Design for Learning Transfer. The OPL learning experiences were designed to optimize transfer; both the transfer of knowledge and skills across different digital platforms and the transfer (or use) of these digital tools in different curriculum subjects (from math to art to English).

In terms of knowledge and skills transfer, the sessions primarily included the use of block coding (see Figure 2), which meant that teachers could build on their expertise in this area from one interface to another. This decision was critical in building teacher confidence and supporting

experiences that would demonstrate the transferability of knowledge across digital platforms. Part of the focus required teachers to “play” with the technologies to make those connections. One of the graduate students helping to facilitate these sessions stated in a recorded debrief on 7 April 2020:

And for these people who maybe haven’t used it [MakeCode block coding program] before, sometimes just playing and messing with stuff is what’s needed. Like I just learned functions, for instance. I’ve done functions in other coding platforms but I’ve never done it in here. So sometimes I think free playtime is good for sure.

The notion of transferability was not limited to technology. In the same recorded debrief as above, Morrison reflected that some of the attendees might have required a different content entry point for engagement and might have needed to see demonstrated how the different tools could be applied to different disciplines such as English Language Arts. She explained:

to offer another entry point, I said “if you don’t want to go the route of making the math-art connection and trying to have that as the entry point” I said “you can also go from a storytelling/humour perspective ... speaking from experience, figuring out patterns and math, and [creating] art that comes from math is not my bag.” The only thing that motivates me ... to engage is something that’s humorous or in some sort of story form. So I showed them that [story] example and I think that gave them another idea for an entry point.

In designing multiple entry points, the researchers modelled options for block-coding integration in the teaching and learning process.

Designing for transfer meant that teachers could envision various ways in which the block-coding programs could be integrated across disciplines, and in the process, it also meant that

teachers could see how the skills required for one block-coding program transferred to many others.

Part Two: The OCT Standards of Care as Embedded in the Design Practice

All four aspects of the OCT standards (integrity, respect, trust, and care) as mapped onto HCD were found to be evident in the design, iteration, and implementation of the OLP activities analyzed in this study. Although the standards were selected a priori as a theoretical tool for analysis, and therefore applied separately in our analyses, we found the codes difficult to tease apart in the data as they were interrelated and co-dependent. For example, responsiveness to learners' needs featured predominantly in all four codes, and reciprocity was a central feature in the trust and care codes. We contend that interrelationships among codes speaks to the human-centred, interwoven nature of design in general (Becker, 2021; Hess & Fila, 2016); they also reveal the intersection between HCD and the OCT standards, the goal of the standards being “to uphold the honour and dignity of the teaching profession” (Ontario College of Teachers, 2022). Although the practice of design for education is indeed relational, and always multifaceted, we unpack the standards one by one to articulate specific instances of each standard that were manifested clearly.

Integrity. The keywords and ideas we focused on in regard to “integrity” included human dignity and responsiveness to learners' holistic needs. Integrity was the most common element present in all three design decisions. There were numerous instances where the team demonstrated a responsiveness to learners' holistic needs and we noted this particularly in the session debriefs, where team members practised perspective-taking. Perspective-taking was practised to conceptualize how we might respond to learner needs in future sessions — especially those “people who maybe haven't used” the technology before. The iterations of design decisions

intentionally addressed the teachers' affective, pedagogical, and technological needs when considering how they might learn and teach in an online environment.

Respect. The keywords and ideas we focused on for “respect” included reduction of barriers for learners. Respect encompassed keeping learners' diverse needs in mind and reducing barriers to encourage engagement. Participants were provided with multiple entry points into materials and tools with the team mindful of various infrastructure challenges that many teachers and their students could be facing. The goal was to respect the diversity of teachers' interests, backgrounds, technology access, and learning motivations in the classroom.

Trust. For the purposes of coding, “trust” keywords and ideas included reciprocity, caring relationships, flourishing, and thriving. The team created an online learning environment where learners could thrive, which required flexible planning and facilitation. One of the team members offered this advice during a planning session on 2 April 2020:

if you do a more high-level “what is coding, how does it apply to the classroom” kind of thing, then I transition into “this is micro:bit,” lead them through some intro activities, and then if the group is diverse enough, we break it up so that those [who] want more in-depth coding experiences or just-in-time facilitation, they go with you, and everybody else stays with ... me.

The team was committed to responding to participants' needs in two ways: (a) through surveys, in advance of sessions, asking teachers to identify areas where they needed support; and (b) through responsiveness, during sessions, to ensure teachers had support for individualized learning.

Care. The keywords and ideas we focused on included empathy in practice, reciprocity, and responding to learners' needs as determined and indicated by them. A particular focus in applying the “care” code was capturing the ways the team made space for learners to express how they needed to be supported.

Care was reflected in the data through the ways the teachers were engaged in the PL *they* needed for *their* ERT. In the 25 March 2020 debrief session, Hughes asked the team if they could “do some digging and see how it’s [ERT’s] playing out. Maybe we could ask teachers ‘what have you heard?’ Like on our Facebook page or whatever. ‘What have you heard about the platform you’ll be using?’” The goal was to determine which LMS platforms the teachers in different boards would be using to organize their classes (e.g., Google classroom), so the team could assist the teachers in becoming more familiar with these platforms.

The team polled teachers during OPL sessions to ask “what sort of software they have access to ... [so] we can cater future sessions to that,” and they also reached out to teacher friends to ask “what information has been sent.”

The team was also responsive to teacher feedback. In one of the first OPL sessions on March 25, participants were asked to provide the team with insight into the types of future sessions they would find meaningful. One response included focusing on one technology and doing a deep dive, and the team applied the feedback into their subsequent designs. For example, different participants suggested a focus on micro:bit, Scratch, and CoSpaces. As a result, the team offered sessions on these tools, allowing participants to understand better how to use them.

All four aspects of the OCT standards (integrity, respect, trust, and care) as mapped onto HCD were evident in the OPL. In our analysis, we found evidence that aspects of each standard overlapped, which made for a truly interdependent and holistic framework.

Part Three: Challenges in Enacting Design Decisions

In the design and implementation of the OPL, the team encountered a few challenges. For example, although the team invited feedback from teachers on their needs, there was limited engagement. A survey shared on social media only elicited two responses. It is possible that teachers were simply overwhelmed by the demands brought on by the pandemic and, more

specifically, by the immediate demands of ERT. While the team prioritized listening to teachers' needs — respecting this reciprocal balance in what it means to care — it appeared as though the teachers did not have the time to add another “to-do” item to their list. It is also possible that some teachers did not know how to articulate what they needed or wanted — especially early on in the transition.

Another challenge the team encountered in the sessions was the range of general technological skill-level and prior experience with certain tools, which made group learning in the online environment and responding to learners' individualized needs (found in integrity, trust, care, and respect) particularly challenging. In one debrief, one team member articulated how the range of ability levels and experiences challenged the environment of trust. In this case, the online learning environment did not necessarily set the stage for the learners to flourish and succeed. In a recorded debrief on 25 March 2020, one of the researchers explained:

That's hard not being able to have those side bars [conversations] because as [Crissy] and I are sitting here talking, I'm feeling bad for this poor other woman in case it's distracting to her or what have you. So, it was challenging having that spread of expertise and not being able to segment them off somehow into other rooms if the group had been bigger.

In this case, learning was constrained by the digital platform. It was difficult to have a one-on-one conversation with a participant without interrupting the learning process of others present in the same breakout room (Lock et al., 2020).

Another consistent challenge throughout the OPL was the disproportionate need to rely on verbal or written communication for participant feedback. Lacking the embodied or gestural communication common in a face-to-face (F2F) setting, it was onerous to quickly “read the classroom” when it came to gauging the efficacy of the pedagogical strategies and activities we were using. In one of the recorded debriefs on 21 April 2020, Hughes shared:

and you know part of the problem with the crickets, the dead air, is because ... you can't see people's expressions. Whereas when you're in a face-to-face situation you can read the classroom. You can read the mood or whether they're engaged or not. But you can't so much online.

This challenge in effectively "reading the room" impacted the team's ability to respond to learners' needs in the moment. Periodically, the team stopped everything for a check-in or poll to gauge attendees' progress and/or understanding. These check-ins required attendees to communicate in the chatbox or on mic and relied on attendees feeling comfortable to communicate openly. In a new context with strangers, there may not be the necessary trust built for participants to feel comfortable articulating what they understand or not.

Although there were challenges to overcome in the OPL, the iterative and reflective design of the program enabled the team to empathize and to respond to teachers' needs at each stage of the pivot to ERT, and in ways aligned with the OCT Standards of Care and human-centred, relational practice.

Discussion

In the present analysis, we note empathy figured prominently in the design process. Empathy is considered a key aspect of HCD (Heylighen & Don, 2019; Ideo.org, 2009) and we observed that the team empathized with the teachers often as, for example, when they provided multiple entry points for teachers to learn different coding platforms.

What also emerged when analyzing and interpreting the data, was an appreciation of the layers of complexity involved in demonstrating the empathy required when designing innovative online learning. In our case, the innovative online learning focus was teacher professional learning centred on maker pedagogies and their tools. Prior to and during the online sessions, and while they were still attending to the OCT standards, the research team/workshop designers needed to be

responsive to the learners from several different perspectives: (a) the pedagogy perspective; (b) the technology perspective; (c) the maker perspective; and (d) the multi-modal perspective. These four perspectives are explained in more detail below.

Pedagogically, we note that empathy led to important design decisions such as offering learners choice through careful listening, building on teachers' prior knowledge, and scaffolding the learning in inclusive ways (Husbands & Pierce, 2012). Technologically, empathy was demonstrated in considering the range of technologies and infrastructure that may be supported in schools, and in suggesting options for teachers in line with Stanford's Matrix (2020) (Figure 3). In addition, teachers' prior experience with technology was diverse; therefore, an intentional design element in the OPL was helping the teachers develop transferable digital skills by using multiple, yet similar, interfaces over a period of time. This focus on learning a particular technology, along with practice and sustained follow-up, is crucial to learning transfer (Brion, 2020).

In terms of empathy toward the teachers as makers, the designers had to consider the intricacy of making processes. The team considered: (a) challenges related to teachers' readiness for making and tinkering (Hughes et al., 2022) and the risk-taking inherent in a maker mindset (Becker & Jacobsen, 2020; 2021; Hughes et al., 2022); (b) challenges related to materiality (Lemieux, 2021; Lock et al., 2020; Mehto et al., 2020); (c) cognitive and disciplinary challenges arising from participants' background knowledge (Becker & Jacobsen, 2019; Lock et al., 2020; Stohlman et al., 2012); and (d) collaborative challenges in professional learning exacerbated by the modality of presentation (Francis & Jacobsen, 2013), such as conducting one-on-one conversations about the making work during a large group presentation (Lock et al., 2020).

The multiple modalities necessary for making-focused OPL also required empathy. Online learning presented challenges in relation to the technological and maker skill-level of individual

teachers, and the reliance on written and verbal modes of communication (Lock et al., 2020) as opposed to gestural movements.

Though important, we questioned whether the notion of empathy was enough. Design scholars have pushed back on the wholehearted embracing of empathy as a key step in the design process, in part because it raises an ethical dilemma (Heylighen & Dong, 2019; Spiel et al., 2017). Can designers really know the experiences of users? Ultimately, the “designer’s own values during the process of gaining empathy will determine trade-offs” (Heyleighen & Dong. 2019, p. 118).

Spiel et al. (2017) recommend four key actions important for going beyond empathy: (a) considering multiple viewpoints; (b) flexibility in data acquisition; (c) openness to contradictory statements; and (d) constancy of critical reflection. The OPL designers were attentive to these key actions and demonstrated integrity in their use of empathy by considering learners holistically, especially given the extra layers of complexity with technology modality, pedagogy, and materials. Challenges outside the team’s control, such as the pandemic, technological infrastructure, and individualized learning needs in an online setting meant that designers had to be constantly attentive and willing to shift gears. The human-centred and relational approach (Scheer et al., 2016) taken up by the designers meant that, over time, the iterative nature of the work did lead to learning, both for the designers and the teachers. The learning went through gradations and stages, from just getting online and getting started with technologies; later, it evolved to practices and supports that were tailored to individual teachers, and then into co-created practices with teachers. Our analysis suggests that as the human needs evolved, the practices matured to the stage of co-design of OPL for making.

Based on our findings, we offer several recommendations to inform OPL related to making processes. First, in the design of OPL, the designers can enhance teacher learning by highlighting the connection between empathy, perspective-taking, and techno-pedagogical competence with

making processes. We observed in the data that stages of need evolved over time, from online teaching basics to sophisticated applications of various online programs for learning, and that the designers' responses to teachers' immediate needs helped to develop trust. Then, as teachers' comfort and skill developed, they wanted to deepen their practice, and the designers could place more emphasis on the maker approach, maker ethos, and making culture (i.e., with connections to real-world circumstances and authentic problems).

Every school district had different restrictions, different technological infrastructure, and different supports and affordances for learning and learners. Our second recommendation is that OPL designers select and focus sessions on transferable tools and activities to create the necessary conditions for teachers to experience early success. This approach builds comfort and skills with technology, with multiple modalities, and with making processes that would enable transfer to teachers' classroom practice. OPL designers can build upon an early focus on accommodative learning to enable teachers to develop understanding that can be flexibly applied in their broad range of contexts. From this foundation, OPL designers could seize opportunities to tailor sessions and eventually engage in co-design with teachers to facilitate broader learning transfer.

Finally, OPL design with teachers does require the intentional design of conditions for teacher learning, targeted supports and scaffolds for learning, awareness of resources needed, and provision of appropriate instructional guidance and expertise. While attending to OCT standards of integrity, care, trust and respect, designers of OPL must consider and be responsive, simultaneously from pedagogical, technological, maker, and online perspectives, to the diverse needs of teachers as learners.

Conclusions

As we slowly emerge from waves of pandemic crisis in education at every level in Canada, our critical, human-centred conceptual framework is offered not just as a discrete methodological or analytical heuristic for our qualitative case study data. We also offer it as the principled articulation of elements that, if prioritised and taken-up systemically, could inform the design of schooling centred on students' and educators' social and emotional needs after a time of unprecedented vulnerability, loss, and hardship. OPL has provided a lifeline to many teachers during this pandemic and, given the many benefits that have been realized, OPL is likely here to stay. Our theorization is meant to advance broader professional understandings of care, integrity, respect, and trust using critical considerations of power, human dignity, and reciprocity in effective OPL related to making processes. As we do in this chapter, we invite designers of OPL for teachers to question how a commitment to professional learning requires not just the enactment of dominant perspectives, but also an active questioning of who decides what counts as care, respect, trust, and integrity, and whether and how teachers' needs, voices, agency, and capabilities as learners are present in the overall design process.

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