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Open Educational Practices (OEP): Design-based Research on Expanded High School learning Environments, Spaces, and Experiences

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Open Educational Practices (OEP): Design-based Research on Expanded High School learning
Environments, Spaces, and Experiences

by

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A THESIS

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Abstract

In current K-12 learning contexts, there is much potential for research that examines the expansion of learning beyond formal learning environments and enquiry about how digital networks can support all learners in accessing people, content and ideas that were previously inaccessible. Using a design-based research (DBR) approach, this research examined how high school learners expanded their learning beyond formal learning environments as a result of the teacher implementing an open learning design intervention (OLDI) and designing for open educational practices (OEP). This study builds upon an analysis of existing research on developing open learning practices in K-12 learning environments, describes and evaluates OEP in an existing high school classroom and evaluates the impact of OEP in a high school learning environment to inform broader K-12 OEP design and high school open learning principles.

The research participants included 23 high school students and one teacher from the Building Futures high school program. The research occurred through three specific DBR phases with iterative cycles within each phase. Phase 1 included an examination of the current OEP landscape and two design prototypes called learning pathways. Phase 2 included the implementation of two prototype learning pathways. Finally, phase 3 examined and analyzed all data from the four prototype learning pathways which considered the perspectives of all open learning participants and the open learning process. All learning pathway prototypes were designed using the OLDI framework which was revised and updated throughout the research. The data collection included student, teacher and researcher reflections, classroom observations and the Visitor and Resident mapping tool.

The key findings from this research suggest that high school open learning is dependent upon the opportunity for learners to co-design personally relevant learning pathways. Secondly,

learners need to collaboratively and individually share their learning experiences through feedback loops and by transparently demonstrating their learning in meaningful ways that integrate curriculum and competencies. Finally, open learning occurs through stages and continuums and is a personal learning experience that transcends formal learning environments. This research expands upon current literature and distinguishes itself by emphasizing the process and pedagogical potential of high school open learning.

Keywords: open educational practice, K-12, high school, learning environments, networked learning, digital communities

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List of Symbols, Abbreviations and Nomenclature

Symbol	Definition
OEP	Open Educational Practices
OER	Open Educational Resources
DBR	Design-based research
BFA	Building Futures, Airdrie
V&Rmaps	Visitor and Resident maps
OLDI	Open learning design intervention
LP1	Learning Pathway 1 – Basic Digital Literacy: How Do I Search and Communicate Online?
LP2	Learning Pathway 2 - Considering Data & Privacy: Who is My Online Audience? How does Data Analysis work?
LP3	Learning Pathway 3 - How Do I Solve A Community Problem?
LP4	Learning Pathway 4 - Storytelling and Perspectives: What is My Story? How Does My Story Inform My Identity?

Chapter 1: Introduction and Overview of Study

Emerging research and practice demonstrate that learning expands beyond one learning environment. “A growing body of research supports adopting an asset model of education in which curricula and instructional techniques support all learners in connecting academic learning goals to the learning they do outside the school settings and through which learning experiences and opportunities are leveraged for each learner” (National Academies of Sciences, Engineering, and Medicine, 2018, p. 7). Learning does not only occur in formal learning environments which are defined as, “intentional, organized and structured, arranged by institutions with expected learning outcomes and or objectives guided by curriculum” (Organisation for the Economic Co-Operation and Development [OECD], n.d., para. 6).

Siemens (2005) suggested, “Learning now occurs in a variety of ways—through communities of practice, personal networks, and through completion of work-related tasks” (p. 3). Similarly, Greenhow and Robelia (2009) wrote, “In reality, students practice formal, informal, and non-formal learning across a wide range of contexts and exercise considerable authority over how they learn, when they learn, and with whom” (p. 122).

The importance of extended learning environments is not new. As Dewey (1916) so succinctly wrote while describing the importance of considering all learning environments, “As formal teaching and training grow in extent, there is the danger of creating an undesirable split between the experience gained in more direct associations and what is acquired in school” (p. 11).

These educators and organizations encourage open educational practice (OEP), which goes beyond previously conceived learning barriers with new learning experiences that support learners in discovering their own personal learning pathways that bridge and connect multiple

learning environments. The potential for these bridges, intersections and extensions to occur is examined through this research, that explores how OEP can support high school learners and teachers in expanding their learning beyond classroom walls.

In current K-12 learning contexts, there is much potential for research that examines the expansion of learning beyond formal learning environments and enquiry about how digital networks can support all learners in accessing people, content and ideas that were previously inaccessible. Learning networks, which include formal and informal learning environments, can afford new and emerging learning opportunities for K-12 students. Formal learning is intentional, institutional and outcomes or curriculum based, and provides academic rigour, specific domain-based content and credential for learners (Greenhow & Robelia, 2009). In comparison, informal learning is more serendipitous learning that occurs as a result of connection with family, community and peers (Ito et al., 2013). Research that considers the student learning experiences that can be afforded as a result of designing for integrated learning networks that combine formal and informal learning in K-12 contexts need to be explored more deeply.

As suggested by Siemens (2005), Greenhow and Robelia (2009) and Rusman et al. (2016), learning networks are already occurring outside of formal school environments. Students live in a technologically abundant and highly networked world full of ubiquitous learning opportunities that are connected to personalized contexts; yet when students go to school, they learn in formal learning environments which often shield them from connections outside their classroom contexts. In Daniels, Friesen, Jacobsen and Varnhagen's 2012 study of Alberta high school success and technology integration, they found that "School administrators, project leads, classroom teachers and students wanted the researchers to make it very clear in the study

findings that they were frustrated by the barriers (i.e., filters, firewalls, Internet throttling) between them and the rich, online resources that exist on the Internet” (p. 50). Their research recommendations included letting teachers and students have open and unrestricted access to the abundant resources on the Internet.

The emergence of the Internet and extant digital infrastructure offer learners access to learning networks which can provide informal learning opportunities. In a 2014 MediaSmarts survey, 99% of Canadian students grades 4-11 indicated that they have access to the Internet outside of school (Steeves, 2014). However, in a recent Canadian Teachers’ Federation survey, in which 97% of teachers indicated their school provided them with some kind of networked device at the school, only 59% reported students were allowed to use their devices in class and one in ten teachers (13%) indicated they used social networking for educational purposes (M.A. Johnson, Riel, & Froesse-Germain, 2016). There is limited research that considers the possibilities of expanding learning from formal K-12 learning environments to experiences outside of the formal classroom context in order to connect what students learn in the classroom to what is going on outside the classroom in digital learning networks.

Dewey (1916) alluded to the potential of a split between the learning inside and outside of formal institutions in terms of technical skills and real-life experiences. Authentic real-life experiences and 21st century skills and competencies are being considered globally, as described by Paniagua and Istance (2018) in the OECD’s *Teachers as Designers of Learning Environments: The Importance of Innovative Pedagogies*. According to Paniagua and Istance (2018), pedagogy integrates knowledge (ways of knowing) and action (the learning design and practice that encourage the interactions of teaching and learning in classrooms). As a result of this integration, clusters of innovative pedagogies can emerge which include (a) embodied

learning, (b) experiential learning, (c) computational thinking, (d) blended learning, (e) gamification, and (f) multiliteracies and discussion (Paniagua and Istance, 2018). Open learning provides the conditions to bridge and connect many of these innovative learning clusters in which new learning opportunities for students emerge as a result of expanding their learning environments through OEPs. Each of these integrated pedagogical approaches provides options for teachers to consider how to expand learning opportunities for their students. However, there is no specific model or pedagogical approach to guide teachers in how to expand and integrate student learning environments using innovative open pedagogical approaches beyond classroom walls.

OEP is an emerging approach to learning and teaching within K-12 learning environments. Traditionally, OEP literature and practical examples have been directly connected with the open educational resources (OER) which provide access to openly licensed digital content in higher education and K-12 contexts (Cronin, 2017; Ehler, 2011; Paskevicius 2017; Wiley et.al., 2017; Wiley & Hilton, 2018). However, this research distinguishes open learning as a historically relevant learning theory that does not require a direct association with OER. As a result, as Havemann (2016) asserts, educators who consider open learning research that focuses on the wider purpose of the OER movement, “are seen operating out of it” (p. 4). The access to openly licensed digital content is included as one of many opportunities in which to expand student learning, but this research does not limit access to openly licensed digital content. Instead this research considers how student learning environments can expand as a result of sharing within a global social commons which includes participating and collaborating with digital tools, interactions with others outside the classroom or any other examples of nodes of learning. This research focused on describing the open learning process, the people and digital tools that

support their learning and how to design for OEP in high school.

This study examines the impact of open learning based on the perspectives of the students and the teacher. It explores how expanding learning beyond formal classroom walls to outside communities and networks can expand learning opportunities, provide learners with the strategies to support lifelong learning and develop 21st century skills and competencies while still completing provincial curriculum outcomes. One of the key recommendations of Daniels et al. (2012) study on Alberta school and the use of technology is that, learning opportunities must be intentionally designed into secondary learning experiences for students to develop 21st century competencies (p. 5). OEP incorporates a learning design for expanded learning environments which encourages digital and face to face networked learning connections that can enable learners to access other learners, digital content and ideas within learning networks. OEP can also be considered as a potential practice model to support new innovative pedagogies, like combinations of OECD innovative pedagogy clusters which focus on the development of learner 21st century competencies. Using a sociocultural pedagogical design, OEP can enable access to learning for all students by supporting collaboration and interactions amongst learners by designing for a learning network that includes formal and informal learning environments that can expand a learner's potential learning environment.

Philosophical Underpinnings

Intentionally expanding learning environments has the potential to increase the interactions between learners from different cultural learning contexts. The possible interactions, collaboration and connections between learners from different cultural contexts can also influence how learning takes place. Vygotsky's (1978) sociocultural theory focuses on how a variety of people can influence learning and how cultural beliefs and attitudes impact how

learning takes place. Similarly, Dewey (1907) encouraged access to learning for all learners that occurs in learning environments that promote authentic learning experiences. Both Vygotsky and Dewey provide the foundational theoretical and practical philosophical underpinnings from which OEP can be further explored in this research.

More recent educational theorists, such as Davis, Sumara and Luce-Kapler (2015), distinguish between four historical moments, standardized education, authentic education, democratic citizenship education, and systemic sustainability education, each of which is associated with distinctive teaching practices and theories and approaches to learning; the third and fourth moments describes the potential of systemic, emerging networked learning theories in contemporary learning systems. Based on Vygotsky (1978) and Dewey's (1907) foundational premises, OEP provides a learning phenomenon that blends two of Davis et al.'s (2015) moments, democratic citizenship education and systemic sustainability education. Davis et al. (2015) described a networked learning movement that provides a current authentic educational context that integrates foundational educational philosophies and in which OEP can be examined and explored in current practice. Scardamalia and Bereiter (2014) also integrate principles of knowledge building that were also evident in the findings of this research that help to describe the connections between social interactions, connections and access to resources (content and people), participatory and collaborative learning opportunities and an emphasis on considering multiple perspectives. Although there have been multiple descriptions of open learning, the present research considers the definition of open learning that respects individual differences, is based on the individual growth as a learner in the world today, considers the indirect influence of educators and advocates for developmentally appropriate learning outcomes for every learner (Barth, 1969; Paquette, 1979). The extant body of research has yet to coalesce around the

definition of recent emerging practices in open education, nor has it found a common terminology.

Open learning is a pedagogical concept that references access to education without barriers. This research was examined through the lens of OEP in higher education proposed by Cronin (2017), who described OEPs as “collaborative practices that include the creation, use, and reuse of OER (Open Educational Resources), as well as pedagogical practices employing participatory technologies, and social networks for interaction, peer-learning, knowledge creation, and empowerment of learners” (p. 18). In order to consider a contextual description of open learning for this research, to support emerging open learning theory and OEP in high school expanded learning environments beyond those described by Cronin (2017), a more contemporary construct of open learning was used to examine OEP that integrates ideas from multiple perspectives of open and networked learning. Characteristics of this contemporary construct of open learning include the importance of education without barriers, where learners can find, consider and share knowledge for themselves, facilitated by the teacher (Barth, 1969; Couros & Hildebrandt, 2016; Paquette, 1979; Jordan, Devries, Rolfe, & Weller, 2017). In addition, a contemporary construct of open learning also extends and builds upon the connections between sociocultural and connectivist learning theories to help describe the potential for learning that can occur as a result of the expansion of a learning network that bridges formal and informal learning environments (Downes, 2012; Greenhow & Robelia, 2009; Rusman et al., 2016; Siemens, 2005; Weller, 2011; Wheeler, 2012). Most importantly, a contemporary construct of open learning in K-12 learning environments is also characterized by safe, student centered learning where an individual learner’s voice and choice is respected within a participatory networked learning culture which emphasizes collaboration and interactions between learners,

mentors and other nodes of learning (Barth, 1969; Downes, 2012; Greenhow & Askari, Ito et al., 2013; Jordan, Devries, Rolfe, & Weller, 2017, Paniagua & Istance, 2018; Siemens, 2005). This dissertation describes how educators can design for a contemporary construct of open learning networks by using the open learning design intervention (OLDI), originating from this research, to examine the impact of OEP on high school student learning.

Background

Although there are examples of innovative OEP in K-12 learning contexts around the world, the purpose of this research was to consider how OEP can be described and modelled within an Alberta school district as a specific open learning design intervention within a current high school program. This research focuses on the *Building Futures, Airdrie (BFA)* grade 10 program that is designed to provide an alternative for students who are looking for a more engaging and relevant high school learning experience. Rankin, a co-founder of the Building Futures program, noted that the program was originally designed because “kids just don’t see how school connects to the world outside of the classroom walls” (TedxTalks, 2017) and because school often does not connect to life beyond the classroom. The program is designed to be an authentic, interdisciplinary and engaging environment which supports the development of the student and learner identity and promotes self-directed learning by encouraging students to discover how to build their future. Over the last 5 years, on average, 32 students apply to be in the program each year. The program fosters an interdisciplinary sociocultural approach to learning by integrating the core grade 10 Alberta curriculum with numerous career and technology courses while providing opportunities for students to learn skills while building and finishing a house and developing cross-curricular competencies. The BFA program brings together students from multiple school cultures and connects the students with community

partners and mentors who introduce the students to authentic learning experiences from a wide variety of contexts.

The BFA program has drawn upon sociocultural constructivist theory as a basis for its foundational learning design by emphasizing connections between high schools and community partners (TedxTalks, 2017). The program currently demonstrates the integration of formal (Alberta high school accreditation courses) with informal (community partnership and experience building a house) learning experiences while developing positive learner identities.

In the fall of 2017, the program's lead teacher was looking for another way to extend the learning potential beyond community partners and the experience of building a house.

Specifically, the teacher asked this researcher how a teacher might connect high school learners to new learning networks outside the classroom walls in order to develop student identity and to build learner skills, knowledge and abilities in the context of Alberta's Program of Studies and Ministerial competencies. The researcher, who was a Technology for Learning specialist with the school district at the time, connected with the program teacher to consider and explore open, online and networked learning designs that could expand the more formalized learning environments into an open learning network.

Between Fall 2017 and Spring 2018, the specialist/researcher worked with the lead teacher to pilot the Personal Online Presence project to help students focus on their passions by connecting them with others through online networks and experts outside the classroom. The

Building Futures Lead teacher described the pilot project as an opportunity for the students to

use this online presence as a way to start networking their interests and passions so that they have a leg up on all their peers once they leave high school by developing their social reputation, online digital identity and voice. This project is also about teaching and working with your son/daughter about how to be mindful about what they are posting and how to use the power of the net for good. (personal communication, 2018)

With the participation of the BFA program learners, this present research built upon the pilot to examine the potential of an open learning design intervention (OLDI) (Roberts, 2018) to support OEP in high school. Through this design-based research (DBR), the researcher considered how an OLDI (Roberts, 2018) supported the teacher to develop learning designs that encouraged open learning in high school learning contexts based on student and teacher perceptions of open learning contexts that could expand student learning opportunities from formal to informal learning environments.

Problem Statement

Vygotsky's (1978) theoretical sociocultural theory and Paniagua and Istance's work with thousands of educators through the OECD (2018) suggest that meaningful learning happens as a result of interactions with others. Prior to this study, the teacher and high school students in the Building Futures Airdrie program found it challenging to connect to the world outside of the classroom, especially using digital networks. For this research, it was the role of the researcher and teacher to design for open learning that provides intentional learning opportunities that integrate learning environments for all students, and to evaluate the impact of this approach to designing for open learning.

Open learning design interventions are built upon sociocultural and networked learning theories to promote collaboration between learners from different learning contexts in order to initiate interactions that communicate meaning in new, flexible and authentic ways. According to The Design-Based Research Collective (2003), design-based research affords the potential to examine interactions in emerging research, like OEP, because "the design of innovations enables us to create learning conditions that learning theory suggests are productive, but that are not commonly practiced or are not well understood" (p. 5). This design-based research considered

how open learning which is designed for expanded learning networks can increase interactions between students and learners beyond traditional classroom walls, as well as the impact of this expanded learning network on high school learning experiences.

Statement of Purpose

K-12 pedagogical practices are shifting from models based on a common model of instruction for all learners to personalized models which encourage collaboration, interactions and building knowledge together (Sawyer, 2014). There is evidence from current research on emerging practices that consider access to learning in networked learning environments that integrate multiple learning environments to support learner collaboration, interaction and knowledge building. Some of the current research includes creating and examining open educational resources (Blomgren, 2017; de los Arcos, Farrow, Pitt, Weller, & McAndrew, 2016; Greenhow & Robelia, 2009; Kimmons, 2015; Sáenz, Hernandez, & Hernández, 2017), learning in participatory culture (Jenkins, Ito & boyd, 2016) and collaborative knowledge building (Scardamalia & Bereiter, 2014). In addition, other current research has focused on clusters of innovative pedagogies (Paniagua & Istance, 2018) pedagogical practices that support collaboration with other learners through expanded informal learning environments (Ito et al., 2013), integrating social media (Greenhow & Robelia, 2009) and pedagogical learning designs that encourage designing for sharing (Conole, 2013). The emerging practices described in current research have had limited analysis and comparison in current open learning research, especially in high school. There is potential to connect the theoretical underpinnings described through practice and compare the practical examples to emerging research in OEP in high school learning contexts.

Emerging practices refer to those practices that have gone beyond being the shiny new object, and those that have exemplified an evolving ever-changing state of being, but are as yet not fully understood, defined, clarified or researched and have promising unfulfilled potential (Veletsianos, 2016). High school students' open learning occurs in the emerging learning space afforded by expanded learning environments and

pedagogy needs to make its practices visible and to design practices that take into account that a fundamental shift is needed towards a more personalized, social, open, dynamic, emergent and knowledge-pull model for learning, as opposed to the one-size fits all, centralized, static, top-down, knowledge-push models of traditional learning solutions. (Chatti, Agustawan, Jarke, & Specht, 2010, p. 4)

While innovative pedagogical practices are emerging, design-based research that examines the potential to design for high school OEP by expanding connections between current learning environments is an area that is currently underexplored and is clearly needed.

Research Questions

The research questions that frame the inquiry in this design-based research are as follows:

- What are students' and teachers' perspectives of open learning experiences?
- To what extent does OEP expand learning opportunities for high school learners?
- How does an open learning design intervention (OLDI) support teachers in designing for learning?

Research Approach

This design-based research builds from an analysis of existing research on developing open learning practice in K-12 learning environments. It then describes and examines OEP in an existing high school learning environment and evaluates the impact of OEP in expanded high school learning environments to inform broader K-12 OEP design principles. "Engaging such partnerships across multiple settings can uncover relationships between the numerous variables

that come into play in classroom contexts and help refine the key components of an intervention” (The Design-Based Research Collective, 2003, p. 6). Design-based research (DBR) supports research that is undertaken in real-life, complex and dynamic learning environments.

This DBR included the collaboration of researchers, teachers and students in examining the effects of OEP on learners and learning. By participating in an innovative learning experience as a result of their teachers’ use of OEP, high school students had the opportunity to expand their learning environments beyond the classroom by connecting, interacting and communicating with others through networks and nodes of learning, and thus built new knowledge and new learning experiences. One of the intentions of this research was to increase awareness of OEP for K-12 teachers and students by building upon and describing open learning theory through an examination of the effects of an open learning design intervention (Roberts, 2018) based on open learning practices and principles. Design-based research promotes a balance between potential problems of practice by supporting praxis with educational theory. The balance of theory and practice is the methodological goal of design-based research (DBR) which Barab and Squire (2004) described as a method “to directly impact practice while advancing theory that will be of use to others” (p. 8). The research stems from a balance of theory and practice in its philosophical underpinnings which is also demonstrated iteratively in the methodological approach of DBR. Considering the emerging nature and context of OEP in one school jurisdiction, DBR offers a research approach to promote the introduction of innovations into real world practice while examining the impact of research interventions on the learning process (Barab, Baek, Schatz, Schekler, & Moore, 2014).

The Researcher

The provocation for this research was a result of the researcher's role as a district technology learning specialist within the K-12 district. The researcher has over 20 years of experience in K-12 education and professional learning facilitation. Having completed graduate degrees in blended and online environments, the researcher is also a learner who learns in open learning networks and is actively involved in the open education movement. As a new design-based researcher, the researcher understands that she "serve(s) as an active role model of learning and a responsive guide to the student's needs" (Brown, 1992, p. 150). The researcher considers learning as demonstrating deep empathy and she believes meaningful learning happens when learners share their learning with each other. Sharing includes connecting with other learners or digital content, collaborating with other learners and/or creating an artifact that communicates learning with others.

The researcher's epistemological beliefs stem from sociocultural constructivist and connectivist learning experiences in which teachers have access to consider the abundance of nodes of learning found in various learning contexts that best support personalized and collective student learning pathways (Siemens, 2005; Vygotsky, 1978). As an educator, the researcher contends that we all learn by collaborating with others, watching others, copying others and taking the time to reflect upon one's own learning based on one's own cultural contexts. This research focus in high school open learning provides the potential for studying a learning design that integrates theory and practice to encourage learners to share and build knowledge through expanded learning environments. As an open learning advocate, the researcher is well aware of the potential for positive bias in this research. As part of her epistemological approach, the researcher emphasized pragmatism and, the need to consider different perspectives, and the need

to use research processes to encourage flexibility, iteration, participation and collaboration in practice. As such, DBR provided the researcher the requirement to be aware of her personal epistemological approach and potential for bias throughout the research by choosing a methodological process that encouraged consistent feedback and multiple perspectives to ensure that the researcher was part of, rather than overly directing, the research process.

Rationale and Significance

The Building Futures Airdrie (BFA) program has an emphasis on developing student identity by encouraging students to learn in authentic and meaningful learning contexts by extending learning opportunities outside of formal learning environments by learning while building a house. However, the co-founders and the current teachers all insist that the program is not only about building a house. According to Hooper and Rankin, the co-founders of the original program (TedxTalks, 2017), the house provides a vehicle, a thing, in which to engage the students in experiential, interdisciplinary learning. Some of the success has been attributed to the deep relationships built between the students, teachers and community partners. The program is also known for its ability to increase student engagement and provide the students with meaningful and authentic connections between curriculum and their future learning paths (Lead teacher, personal communication, 2017).

BFA teachers have been exploring multiple digital options to support the development of student digital identity and online presence while they have been experimenting with flexible digital learning spaces that can be used, like a Vygotsky pivot, to transition students between any isolated learning environment and networked learning environments. The examination of the potential of a learning pivot, which acts as bridge between learning environments, connects the theoretical and practical aspects of open learning and acts as an essential element of the open

learning design intervention (OLDI) research. The students in this study needed to feel confident and safe to pivot into other learning environments; they needed to feel personally connected to the learning in some capacity, they needed to know learning strategies in order to find the answers they were looking for and they needed access to digital tools, people, places, spaces and resources to help them solve problems. The “The Open Learning Design Intervention (OLDI) Version 1” diagram is a visual representation of the original research design that will be elaborated upon in subsequent sections throughout this dissertation (Figure 3.1).

OEP is an emerging approach to learning and teaching within K-12 learning environments that provides a connection between isolated and networked learning environments by bridging boundaries between learning environments that have previously been separated (Rusman et al., 2016). Learning networks, which include previously isolated and connected learning communities and environments, can provide high school learners the opportunity to connect with new learners by expanding their learning environments and creating individual learning pathways. Using a sociocultural pedagogical design, OEP enables access to learning for all students by encouraging interactions, collaborations and connections amongst learners in integrated learning environments which promote individual learners’ voices and choices in learning (Roberts, Blomgren, Ishmael, & Graham, 2018).

OEP practices are emerging in K-12 education; there is an increasing call for research as this area is currently underexplored in the literature, especially for research that considers how to integrate informal learning, learning with community partners or learning that is initiated from a formal classroom lens (Cronin, 2017; Greenhow & Askari, 2017; Ito et al., 2010, Siemens, 2005). Using a design-based research (DBR) methodology, this research examined the potential of OEP as a result of expanded into informal, community-based learning environments. DBR

methodology provides a balance between theory and practice which provides a flexible and iterative process to examine the innovation (McKenney & Reeves, 2012). The research occurred through three specific phases with iterative cycles within each phase.

Phase 1 research activities included an examination of the current OEP landscape in K-12 learning environments which were completed through a combination of a literature review, developing relationships and completing a district approved BFA pilot study, a dissertation proposal (which included the development of the initial OLDI design) and ethics review. Once the ethics application was approved, phase 1 also included the completion of two design prototypes. Phase 2 included the prototyping and designing of two additional prototype designs using the OLDI framework as a guide. Finally, phase 3 examined and analyzed all of the four prototypes and considered the perspectives of all open learning participants.

The six remaining chapters in this dissertation describe the research process and the findings that emerged as a result of the research that contributes to both theory and practice. Chapter 2 presents the literature review that describes the theory and practice of OEP in K-12 learning contexts that informs and provides a context for this research. Then, the methodology chapter describes the research design and provides a rationale for the choice of design-based research (DBR) for this research given the integration of theory and practice. The research findings that emerged to describe open learning in high school learning contexts are analyzed and discussed in Chapters 4 and 5. Finally, the dissertation concludes in two chapters that summarizes the research findings, the contributions to theory and practice and several recommendations for future research.

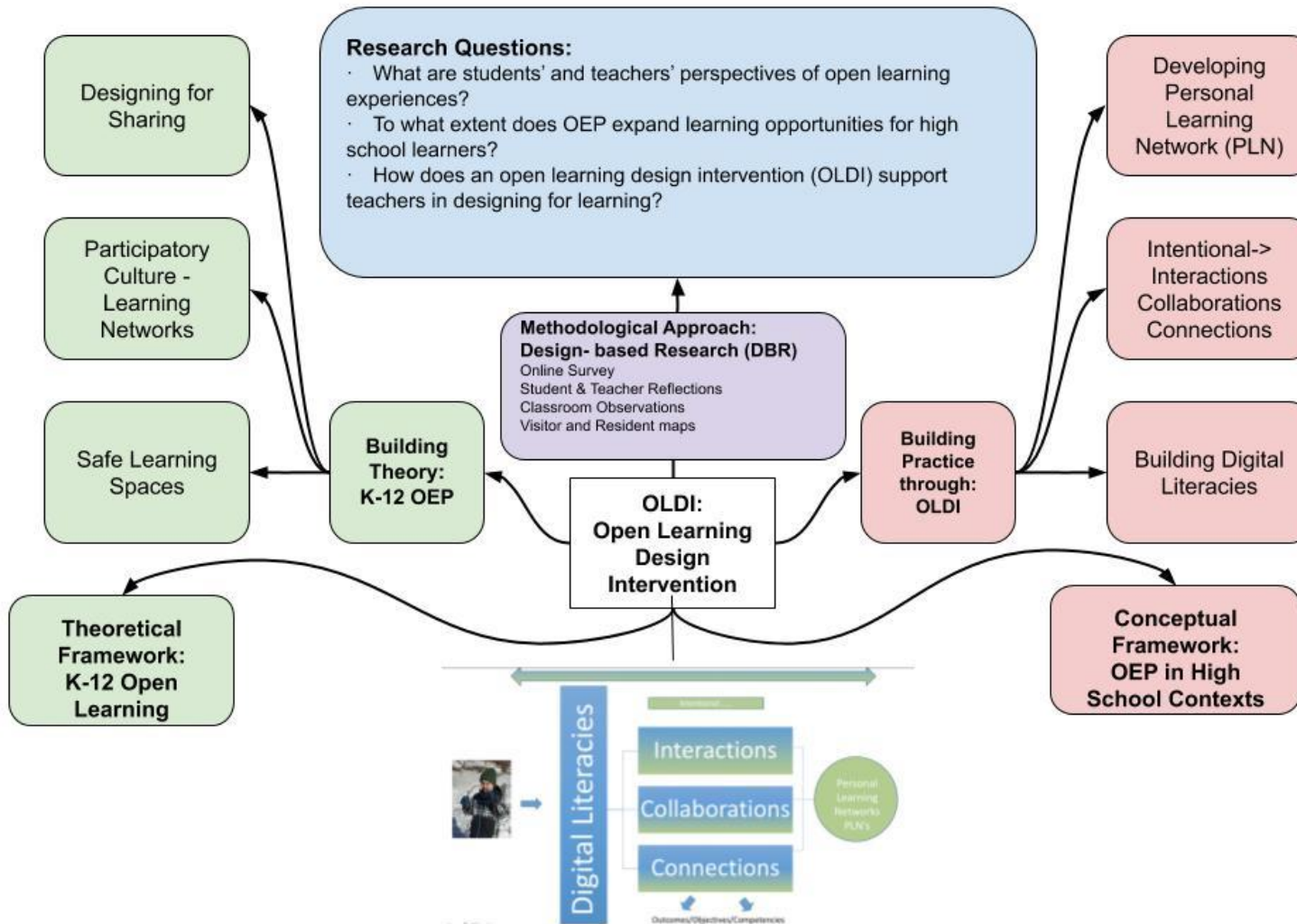


Figure 1.1: Visual representation of the research process: Bridging formal and informal learning environments, theoretical and conceptual frameworks

Operational Definitions

In this final section of chapter one, key terms and concepts that are used in this research are operationally defined.

Open educational practice, or OEP, includes “collaborative practices that include the creation, use, and reuse of Open Educational Resources (OER), as well as pedagogical practices employing participatory technologies, and social networks for interaction, peer-learning, knowledge creation, and empowerment of learners” (Cronin, 2017, p. 18).

Open learning, in K-12 learning contexts, is best described as a combination of the writing from Paquette (1979) and Barth (1969). Open learning has the following foundational characteristics: (1) it is based on the respect of individual learner differences, (2) it is based on the individual growth as a learner in the world today, (3) it is based on the indirect influence of educators and others outside formal classroom walls and (4) it is based on the developmentally appropriate learning outcomes for an individual.

Formal learning is “intentional, organized and structured, arranged by institutions with expected learning outcomes and or objectives guided by curriculum” (OECD, n.d., para. 6).

According to Callahan, Cerventes and Loomis (2011), five major dimensions can be drawn from the literature to describe informal learning,

- (1) whether or not the focus of the activity is on deliberate teaching and learning,
- (2) how socially collaborative the activity is (including scaffolding by others who are more expert in the domain),
- (3) how much the activity is embedded in meaningful tasks with tools available, rather than abstract tasks designed for teaching,
- (4) how much initiative the learner has in choosing what and how to learn, and

(5) whether there is assessment of the learning that has important consequences for the learner

Networked learning should “allow one to individuate a learning network, avoid the use of language that is customary in formal education; emphasize technology as well as people; and mention the individual as well as the collective” (Goodyear & Carvalho, 2014, p. 45).

Learning networks are “a particular kind of online, social network that is designed to support non-formal learning [outside the context of formal, institutionalized learning] in a particular domain” (Sloep & Kester, 2009, p. 17).

Sociocultural constructivist theory states, “Every function in the child’s cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological). All the higher functions originate as actual relationships between individuals” (Vygotsky, 1978, p. 57).

Chapter 2: Literature Review

Many K-12 educators are exploring the learning possibilities that multimodal, complex and networked digital learning environments can provide for learners and learning and open educational practices (OEP) are an example of these emerging pedagogical approaches. OEP, as defined in a higher education context, are “practices which support the re (use) and production of open educational resources (OER) through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning paths” (Ehlers, 2011, p. 4). More recently, Cronin (2017) suggested that OEP definitions in higher education have expanded to include educators focusing on practice enabled by open educational resources (Wiley, Webb, Weston, & Tonks, 2017), a focus on open pedagogy (Hegarty, 2015) and an educator’s focus on power relations and inequality in learning (Czerniewicz, Deacon, Glover, & Walji, 2017). OEP in K-12 learning environments is an emerging pedagogy that has the potential to support expanded learning environments that connect learners to new sociocultural experiences that can afford shared multimodal, complex and networked learning opportunities and multiple open learning perspectives. Research that considers OEP has the potential to connect current emerging research, which includes open educational resources, open learning design, participatory culture and networked learning, using a sociocultural theoretical lens.

This chapter considers research that examines the potential of expanded learning environments that encourage a flow between learning networks which include formal and informal learning environments, as a result of OEP. The literature analysis begins with a description of the current educational context based on literature that considers online learning, blended learning and emerging networked learning. Next, a description of the interconnected and

interactive emerging educational culture illustrates the connections between networked learning ecosystems and open learning. Then, the emphasis on access to interactions between different learners and nodes of learning is delineated through an examination of foundational educational theories and educational writings from Vygotsky (1978), Dewey (1907), and Barth (1969), that are connected as underlying themes to OEP. The four underlying themes connecting the chosen theories are (a) a focus on sociocultural learning; (b) how access to multiple interactions from different cultural contexts help develop new learning opportunities; (c) the importance of student voice and choice; and (d) the importance of considering zones of proximal development to expand personal learning experiences. Next, open learning theory and its historical research contexts are related to the ideas from the foundational theorists. Once the changing educational context has been considered, the foundational theory described, the open learning connections identified and current research identified, the final component of this chapter focuses on the need for research that considers the emerging potential of OEP in K-12 learning environments.

Current Digital Learning Contexts

Online, blended, and networked learning. Although research in higher education and adult learning environments has a wide variety of research in concepts related to distance learning, blended learning and Open Educational Resources (OER) with some extension into open learning, similar and current research in K-12 learning environments is limited (Kimmons, 2015; Roberts, 2013; Roberts et al., 2018). Similarly, research on online or distance learning in the K-12 sector is limited (Barbour & Reeves, 2009; Cavanaugh, Barbour, & Clark, 2009). The recently updated *Handbook of Research in K-12 Online and Blended learning* also calls for more research in the discipline in all of its 50 chapters (Ferdig & Kennedy, 2018). Despite its attractiveness and practitioner use in many educational contexts and learning environments

(Horn, Staker, & Christensen, 2014; Mahwah, Picciano, Seaman, Shea, & Swan, 2012), research in blended learning environments lags behind its current K-12 use (Drysdale, Graham, Halverson, & Spring, 2013; Means, Toyama, Murphy, Bakia, & Jones, 2010). As Paniagua and Istance (2018) described in their recent OECD report on clusters of innovative pedagogies, blended learning is one of the primary innovative clusters to encouraging rethinking of “established routines to get more from teaching” (p. 85).

Many K-12 classrooms in both online and face to face school-based classrooms are incorporating what could be considered technology-supported OEP, therefore much of the research confuses the modes of learning. For example, teachers who are publicly blogging as individual teachers or with their students are using OEP, but they would not necessarily label global blogging experiences as blended learning or OEP. Additionally, research in blended learning may be inconsistently categorized as online learning research and it is for this reason that Picciano and Seaman (2009) emphasized the need for researchers to differentiate between distinctly online environments and distinctly blended learning environments and should classify their research accordingly.

There is support for considering a rethinking of online and blended learning in K-12. The 2014 *NMC Horizon Report: 2014 K-12 edition* (L. Johnson, Adams, Becker, Estrada, & Freeman, 2014) calls for further study to evaluate innovative learning models, as such studies have not yet been reported in terms of emerging pedagogy. The first edition of, *The Handbook of Research on K-12 Online and Blended Learning* (Ferdig & Kennedy, 2014) provides a summary of past, present and emerging research in pedagogical practice and policy in K-12 learning environments, including a section on technological innovation with a chapter on open learning in K-12 online and blended learning environments. Graham, LaBonte, Roberts, O’Byrne, and

Osterhout (2014) summarized the potential for open learning by examining student digital safety concerns, ensuring all educators are knowledgeable about open learning strategies and tools, and the design and processes for adopting open learning environments. The updated chapter is titled *Open Educational Practices in K-12 Online and Blended Learning Environments* (Roberts et al., 2018). In the updated version Roberts et al., (2018) include an initial summary of the potential for OEP that include the following indicators for K-12 OEP: open educational resources, open learning design, participatory culture, networked learning, digital learning spaces and open readiness. In Roberts et al., (2018) research findings, the theoretical, conceptual and practical elements of open learning in K-12 contexts were extended from these original indicators through an open learning design intervention which was used to guide the open learning design of this study.

Formal and informal learning. Open education practice can promote a flow of intentional learning opportunities between formal and informal learning environments. However, the definition of and distinction between formal and informal learning environments is currently unclear and complex (Greenhow & Lewin, 2016; Sefton-Green, 2004). The lack of definition is essential, especially when considering K-12 learning environments, because learning that is considered informal is often guided by district policy that restricts learning in informal learning environments (O'Neill, 2013; Robson, 2016). If the students cannot access informal learning environments, open learning opportunities would be considered against policy guidelines. As such, clear definitions which clarify informal learning spaces, resources, tools and people are essential for open learning in high school learning contexts.

For example, Eshach (2007) asserted that there are clear boundaries between formal, non-formal and informal learning environments, while Lai, Khadage, and Knezek (2013) suggested

that there is a continuum. In order to consider what distinguishes the learning environments, Sefton-Green's (2004) focus on the intentionality of the learning environment helps provide a possible means in which to consider formal and informal learning.

Considering the lack of clear definitions or seminal research, the following definitions are used for this research. Formal learning is most often described as intentional, organized and structured, arranged by institutions with expected learning outcomes and or objectives guided by curriculum (OECD, n.d.). The recognition of informal learning is an important, "means for making the lifelong learning for all agenda a reality for all and, subsequently, for reshaping the learning to better match the needs of the 21st century knowledge economies and open societies" (OECD, n.d., para. 7). Informal learning environments are often described as the opposite of schools because of their focus on free choice, limited instruction, emphasis on collaborative and meaningful learning, flexible nature and limited by externally imposed assessments (Callahan, Cervantes, & Loomis, 2011).

By considering OEP, educators will have an opportunity to expand the learning environments for all learners which could influence personalized learning pathways, whom they are able to interact with and build connections with for future learning and how learners are able to demonstrate evidence of their learning for themselves and others. There is much potential for bridging and connecting each of these learning contexts to expand the learning environments for K-12 students.

Informal Learning in Social Networks

In an examination of the influence of social networks in K-12 informal learning contexts, the following themes were considered: technology's affordances (or barriers) for validation of creative work, social support or social capital, self-organization, language learning, the

development of new literacies, self-directed, incidental or free-choice learning and civic engagement (Greenhow & Askari, 2017). Informal learning can encourage learner agency by inspiring learners to choose their own learning path guided by their own interests, goals or knowledge (Crowley, Pierroux, & Knutson, 2014). While there is some evidence of current pedagogical examples to support characteristics of networked informal learning and identity formation in online social networks in school environments as described by Greenhow and Robelia (2009), informal learning is most often apparent outside of schools in social communication settings, recreational communities and frequently in other digital environments and communities (Ito et al., 2010).

Greenhow and Lewin (2016) suggested that the examination of the potential of social media to bridge formal and informal learning has been under theorized. As a result, they proposed a model which theorizes “social media as a space for learning with varying attributes of formality and informality” (Greenhow & Lewin, 2016, p. 6). Their model considers social media as a space for learning which includes attributes of formality and informality which is based on the research of Colley, Hodkinson, and Malcolm (2003). The informal learning attributes from Colley et al. (2003), included (1) process (structure, pedagogy, support, assessment, etc.), (2) location and setting (where is the learning taking place), process (structure, pedagogy, support, assessment, etc.), (3) purposes (intentional/unintentional), and (4) content (what is being learned and the outcomes expected). Learning networks could be examined in terms of the varying balance between learning purpose, process, location and content of formal and informal learning environments.

Online informal learning environments. There is also current literature from multiple learning contexts (higher education, K-12 and work training) which examined the role of

technology integration of formal and informal environments. The literature which considered the integration of informal learning included the following themes (1) a focus on the intention behind the learning (Eraut, 2004; Scardamalia & Bereiter, 2014), (2) digital and web literacy learning opportunities (Belshaw, 2014), (3) networks and how learners are connecting with digital content and connecting and collaborating with other learners (Couros & Hildebrandt, 2016; M. Johnson, 2008; Robson, 2016; Wenger, 2009), (4) the building, creating and curation of digital knowledge, (Jenkins, Clinton, Purushotma, Robinson, & Weigel, 2008; Scardamalia & Bereiter, 2014), (5) the most effective learning environments (Bates, 2005), and (6) permeability and flexibility of learning space boundaries from educational policy and ethical points of view (O'Neill, 2013; Robson, 2016).

The research with themes that connected most closely with the ideas of OEP included the learning described by boyd (2010) and Ito et al. (2010). boyd (2010) described the potential of networked publics, which are “publics that are restructured by networked technologies. As such, they are simultaneously (1) the space constructed through networked technologies and (2) the imagined collective that emerges as a result of the intersection of people, technology, and practice” (p. 1). Networked publics include a wide variety of passion-based online communities that youth participate in and explore in order to produce and circulate culture and knowledge and represents relevant social groups that encourage youth’s learning and identity in informal learning environments (Ito et al., 2010). The described networked publics included those which focused on gaming, digital art and design, anime, social media and podcasting. Networked publics provide a possible open learning community in which students could participate.

Networked learning. As online and blended learning search for expanded definitions and contexts and research continues, emerging research has begun in the form of networked

learning, most notably in higher education contexts where networked learning has been referred to as the pedagogy of the Internet (Haughey & Anderson, 1998). Networked learning is made up of learning networks, which are “a particular kind of online, social network that is designed to support [informal] learning (outside the context of formal, institutionalized learning) in a particular domain” (Sloep & Kester, 2009, p. 17). Without boundaries, without set structures and without specific leaders, interconnected learning networks can provide all learners with expanded learning environments, multiple learning interactions and access to learning opportunities that can be personalized to their personal learning needs.

When considering serendipitous learning opportunities that occur as a result of participation and interactions, it is important to consider that networked learning cannot be designed, it can only be designed for (Gros, kinshuk, & Maina, 2016). As a result, this serendipitous open learning environment also provides outsiders access to learner data, personal information and personal connections. There are ethical considerations to consider in all open networked learning environments; however, when learners are under 18, there are laws and policies in place to better ensure safe learning environments. Emerging research in networked learning can provide the potential for deeper understanding and clarification of the practice and theory which considers expanded learning environments and networks.

Connected learning. According to M. Johnson (2008), the central notion of networked learning is in “promoting connections” (p. 1). How the learners connect and what learning occurs as a result of the connections is equally important, especially in K-12 learning environments. Another important aspect to consider in networked learning is that learners can interact with any nodes of learning which may include people, digital communities and digital resource (M. Johnson, 2008; Siemens, 2005). Although Ito et al. (2010) described the potential for networked

publics, there is still a gap in current research and practice that connects the potential for networked learning in K-12 learning environments. The opportunities for K-12 learners to learn in networked environments that are legally safe, yet still encourage intentional interactions in open learning environments, are exemplified in *Connected Learning: An Agenda for Research and Design*:

Connected learning addresses the gap between in-school and out-of-school learning, intergenerational disconnects, and new equity gaps arising from the privatization of learning. In doing so, connected learning taps the opportunities provided by digital media to more easily link home, school, community and peer contexts of learning; support peer and intergenerational connections based on shared interests; and create more connections with non-dominant youth, drawing from capacities of diverse communities. (Ito et al., 2013, pp. 4–5)

Within the agenda for research, there are examples of case studies, research data and data which represent the skills and abilities of the current American workforce. Ito et al. (2013) proposed multiple practical opportunities for future research that connects youth to informal and formal learning environments and propose an ecological and networked approach to social change. The three spheres of learning for connected learning include: peer-supported, interest-powered and academically oriented.

Connected learning is a major part of open learning, but it is not the only part. Connected learning helps describe the sociocultural lens which distinguishes K-12 open learning from other open learning contexts and helps describe the potential behind connecting formal and informal learning environments. Open learning advocates for access to learning for all and opening learning environments to support access for learning. As a result, key differences between connected learning and open learning include the ability to share digital resources, the emphasis on designing digital artifacts and learning opportunities that can be remixed for future learning opportunities, the concept of safe open learning spaces that provide scaffolded open learning

opportunities to all learners who are under 18, in K-12 learning systems and assessment for learning. There is much potential for the variety of networked learning research projects, implications and innovation. Considering open learning may provide the open learning space, leadership, vision and empowerment for open learning practice to flourish.

Learning ecosystems. From a cultural context, it is important to connect the concept of open learning with real world, practical examples of formal and informal learning environments. The challenge is for open education practitioners and communities to bring in those from outside.

Once people recognized that open knowledge can be enriched by individual academic experience they will feel more motivated to know and participate, not just as an audience member but as a protagonist. (Jordan, DeVries, Rolfe & Weller, 2017, p. 1)

The arc of life learning described by Thomas and Seely Brown (2011) has the potential to connect every facet of learning with every stage of life. The authors describe a new culture of learning that emerges from one that is a teacher based approach to education (the classroom is the primary model of a learning culture and learning about other cultures happens from the classroom where learners prove their understanding of receiving the knowledge) to a learning based approach to education (the learning culture emerges from the contextual learning environment and occurs through interaction with the world) (Thomas & Seely Brown, 2011). Learning is focused on embracing what we do not know and asking better questions to connect as a part of the world. The three principles of a new culture of learning are as follows: 1) The old ways of learning are unable to keep up with our rapidly changing world; 2) New media forms are making peer to peer learning easier and more natural; 3) Peer-to-peer learning is amplified by emerging technologies that shape the collective nature of participation with those new media. (Thomas & Seely Brown, 2011, p. 50)

Thomas and Seely Brown (2011) described a learning culture that includes fundamental shifts in how people think about learning. Their idea of culture of learning encourages the integration of the Internet, which has unlimited content that can help any learner learn anything at any time, with the safe walled garden of formal learning within a bounded and structured learning environment, with a primary focus on learner agency to play, build and experiment. Current research which explores gaming and coding also offers multiple examples of walled garden learning opportunities which promote learner agency and experiential learning opportunities (Fields, Giang, & Kafai, 2013; Ito et al., 2010). There is great potential for research that integrates Thomas and Seely Brown's ideas about play and building learning walled gardens with informal networked learning opportunities. These informal networked learning opportunities are apparent in participatory and networked culture.

The emerging research in networked learning provides a context for the pedagogical goals for the development of open learning culture in K-12 learning contexts. Thomas and Seely Brown (2011) encouraged the connection between digital resources and safe learning spaces. Jenkins et al. (2016) advocated for the integration of participatory informal learning communities for everyone, especially those who have been marginalized from traditional learning culture. These informal networked learning communities have most often been researched in online networked learning communities. Together they propose a learning culture that includes access to learning for all.

Davis et al. (2015) described four historical moments in education that are associated with particular teaching practices and educational culture: standardized education, authentic education, democratic citizenship education and systemic sustainability education. From an educational culture perspective, open learning represents the teaching of sociocultural practices

afforded by the emerging historical moments described as systemic sustainability education (Davis et al., 2015). The values and beliefs of open learning are founded on principles which advocate for a blend of democratic principles. However, as evidenced through the philosophical views across the last 100 years, there are indicators within open learning research that technological advances can afford all learners through networked connections and interdisciplinary learning opportunities that bridge the boundaries in order to provide access to learning for all learners (Weller, 2011).

The people with whom learners are able to interact with from formal into informal learning environments will not only help learners develop an awareness of other cultures and their own culture, but also have the potential to help support sociocultural learning from a global and systemic context. Open learning focuses on the individual and the collective as a systemic learning ecology. This global and systemic transition introduces the idea of learning ecologies. According to Seely Brown (2002), a learning ecology is “an active place where the virtual and the physical seamlessly and synergistically coexist” (p. 80). OEP can flourish in those learning cultures that encourage networked learning, where formal and informal learning function as a learning ecology because they provide an opportunity for a shift between using technology to support the individual and using technology to support relationships (Seely Brown, 2002). Educational research that examines open learning in K-12 learning environments has the potential to highlight the permeable boundaries between democratic citizenship education and systemic sustainability education through formal and informal networked learning.

Participatory learning culture. Participatory culture is defined as a culture with relatively low barriers to artistic expression and civic engagement, strong support for creating and sharing one’s creations and with some type of informal mentorship whereby what is known

by the most experienced is passed along to novices. A participatory culture is also one in which members believe that their contributions matter, and feel some degree of social connection with one another (at the least they care what other people think about what they have created).

(Jenkins et al., 2016, p. 4)

The historical context of participatory culture developed from the fandom culture and gaming culture which were expanded in networked online environments. The collaborative and participatory activity in these communities includes: a) affiliations which include informal and formal memberships and communities centered around a form of social media (like SnapChat streaks), b) expressions which include producing new creative media like remixing videos and memes, c) collaborative problem-solving which include online collaboration in activities like gaming and Wikipedia site creation) and d) circulations which include creating specific media for communication like vlogging and podcasting (Jenkins et al., 2008). Cultural participatory skills (Jenkins et al., 2008) build upon the conventional skills already being developed in classrooms, describe open learning from a youth perspective and include: play, performance, simulation, appropriation, multitasking, distributed cognition, collective intelligence, judgment, transmedia navigation, networking and negotiation (p. 4). Jenkins et al.'s (2008) description of participatory culture was an attempt to advocate for the potential of the addition of media literacy to ensure the development of competency in skills that he (and his colleagues) felt were not being supported in conventional school settings. The original work on participatory culture was founded on the core values of situated learning theory which describes learning in authentic settings and situations that would normally involve knowledge where there is the opportunity for social interaction and collaboration (Lave & Wenger, 1991). These social and collaborative learning settings are known as Communities of Practice (CoPs).

In addition, Jenkins et al. (2016) were influenced by Seymour Papert whose descriptions of informal learning communities, like samba schools, described a constructivist educational paradigm that emphasized active participation and de-emphasized formal teaching. The impact of the importance of emerging participatory culture in a networked era has been extended by the recent collaborative writings by Jenkins et al. (2016). Their book describes the strengths and weaknesses of participatory culture. In their participatory culture research, they describe how informal networked learning opportunities for youth that are frequently integrated with life and communities are much more authentic learning opportunities than what the formal education system affords. “The challenge is when these different forms of learning collide” (Jenkins et al., 2016, p. 7). This tension as a result of different learning perspectives colliding has been mentioned in a variety of the literature contexts as an indicator of learning (Barth, 1969; Gros et al., 2016).

Informal learning opportunities like samba lessons, Minecraft collaboration and gaming teams give learners the opportunity to build cultural knowledge, contribute their own perspectives, interact with people from multiple backgrounds and experiences and participate at different levels with an emphasis on access for all to the learning opportunities. When formal and informal learning environments collide, exclusion and marginality becomes apparent when different perspectives clash rather than work together (boyd, 2010). A participatory culture encourages the clash between formal and informal learning environments in the hopes to include all learners, especially those who have been marginalized or excluded due to a lack of cultural understanding or connection. The connection between informal and formal learning can occur through online networks and in face to face interactions.

Participatory co-designing of learning. While Jenkins et al., (2014) emphasise the importance of learner agency and informal learning, Jacobsen et al. (2011) described participatory learning as a method to examine student levels of engagement in lessons, tasks and activities, especially in learning environments with access to technology for learning. Jacobsen et al. (2011) suggested that students will become more active participants in the learning process if there is an emphasis on learning design which supports student interests and agency through community and transparent evidence of learning to make the learning meaningful for the individual learner. The levels are: disengagement (inattention, off-topic or attending to alternative activity), ritualistic compliance (working on assigned activities without enthusiasm or personal investment, demonstrating the motions of completing tasks to avoid conflict), academic engagement (on-task behaviours by completing tasks and assignments with some enthusiasm and taking initiative) and intellectual engagement (creatively energizing focus, critical thinking and deep understanding which leads into a personal commitment to investigate and idea over a sustained amount of time) (Jacobsen et al., 2011). Learners have to be actively involved in the learning process in order to want to participate in a co-designing learning process.

Co-designing learning has traditionally been focused on how learners use technological tools in order to create a product or innovation through research (Garcia et al., 2014). Research that considers co-designing learning, is most often associated design-based research methodologies which affords participatory collaboration between teachers, researchers and developers. Roshelle, Penuel and Sheckman (2006) define co-design, “to be a highly-facilitated, team-based process in which teachers, researchers, and developers work together in defined roles to design an educational innovation, realize the design in one or more prototypes, and evaluate each prototype’s significance for addressing a concrete educational need” (p.606). Literature

which considers a similar co-design process with students, is not as prevalent. As a result, co-designing learning in high school learning contexts integrates the key concepts from the current literature which considers design-based learning processes, active and engaging learning that is learner-centric, driven by learner interest, expands from formal into informal spaces and encourages student agency and evidence of a transparent learning process.

Up to this point, the literature review has described the current literature that does not describe open learning specifically, however; the elements of each of the disciplines of the research connect with open learning principles and theory. The following sections will describe the foundational educational theory, historical context and current open learning research and then expand upon all of the reviewed research to make connections in order clarify and describe the potential for OEP in K-12 learning contexts.

Foundational Educational Theory for Open Educational Practice

Progressive education. The ideas and concepts that provide the foundational theory of OEP stem from the ideas of John Dewey and Les Vygotsky. In 1907, John Dewey, often described as the most influential educational philosopher of our time, argued for the opening up of public school systems and this argument is highly relevant in understanding the foundational context of OEP:

From the standpoint of the child, the great waste in the school comes from his inability to utilize the experiences he gets outside the school in any complete and free way within the school itself; while, on the other hand, he is unable to apply in daily life what he is learning in school. That is the isolation of the school --its isolation from life. (p. 52)

Although Dewey did not use the words open learning or integration of formal and informal learning in his description of what learning should look like, he described an open and collaborative learning environment. Dewey clearly articulated that creating barriers around school learning opportunities from outside of school learning experiences will isolate the learner

from real learning opportunities. In *Democracy and Education: An Introduction to the Philosophy of Education* (1916), Dewey extended his emphasis on the importance of connecting school and out of school experiences when he describes education as a social function based on the learning environment:

It is the office of the school environment to balance the various elements in the social environment, and to see to it that each individual gets an opportunity to escape from the limitations of the social group in which he was born, and to come into living contact with a broader environment. Such words as “society” and “community” are likely to be misleading, for they have a tendency to make us think there is a single thing corresponding to the single word. As a matter of fact, a modern society is many societies more or less loosely connected. (p. 25)

In the previous quote, Dewey highlighted the importance of learners being able to connect with multiple learners in multiple learning environments. Vygotsky (1978) also emphasized the importance of connecting with other learners, from different learning contexts.

Sociocultural theory. Learning environments have been shaped by sociocultural factors that were introduced by Vygotsky in the 1920s and-1930s in Russia, but not widely known by other countries until 1978. Many “sociocultural and sociohistorical scholars have drawn connections between Vygotsky and Dewey’s emphasis on the social features of learning” (Moll, 1990; Wong, Pugh, & the Dewey Ideas Group at Michigan State University, 2001). Vygotsky’s early death in 1934 and limited access to his writing prevented many researchers from extending and adding to his theoretical insights around how learners initially learn by watching others in cultural contexts, then applying their observations to their own learning with scaffolded support. Sociocultural theory posits that intentional mediated interactions are designed to connect learners between different cultural learning experiences and opportunities. Vygotsky’s sociocultural theory builds upon the emphasis of shared learning experiences between multiple societies and

the flexibility to consider all learning environments, even those outside of formal learning institutions.

OEP uses sociocultural theory to support the premise that learning happens as a result of intentional interactions between learners, teachers with and without the support of tools to communicate meaning. Intentional interactions are designed to connect learners between different cultural learning experiences and opportunities. Gee (2015) referred to these different experiences as figured worlds. Figured worlds are simplified, often unconscious, and taken-for-granted theories or stories about how the world works with our daily lives. OEP can support teachers in developing a deeper understanding about a learner's cultural context, experience or figured world. The bridge that connects the formal and informal learning experiences can act as a cultural border crossing.

Zone of proximal development. Vygotsky focused on how the cultural interactions between individuals shaped and described meaning and how the communication of meaning between individuals is instrumental to learning (Kozulin, 1990). Vygotsky (1978) described a zone of proximal development (ZPD), which is the “distance between the actual development as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (p. 38). Vygotsky's ZPD theory was focused on the process and progress of each learner as opposed to the idea of learners being developmentally behind or expectation to be at set stages. Lave and Wenger (1991) distinguished the interpretation of ZPD as a scaffolding (focus on the sequencing of support for initial performance then progress towards no support), a cultural (distinction between scientific and everyday concepts) or a collectivist and/or societal interpretation (the learning beyond the context of the learning environment).

Of the three interpretations, the collectivist/societal interpretation connects with OEP and the concepts of networks and expanding learning beyond the prescribed classroom settings (Roberts et al., 2018). Tharp (1993) used the ZPD as a unit of analysis to examine how to develop an independent learner capacity through assistance through dialogue. He posted seven means to assist and facilitate within a ZPD (a) modelling (behaviour to be imitated); (b) feedback (providing information as it compares to a benchmark); (c) contingency management (check-ins, planning and organizing learning); (d) instructing (providing clarity, describing specific tasks; (e) questioning (requesting verbal response); (f) cognitive structuring (explanations); and (g) task structuring (chunking, grouping, sequencing specific information in specific order). When considering how to examine the process of learning in terms of mediation in openly networked learning environments, Tharp's seven suggestions provide possible direction for designing for OEP in ZPD's.

There are examples of research that examine educational practices which encourage intentional interactions to support scaffolded learning in proximal zones of development (Kozulin, 2003). This research focused on how an open learning design intervention practice can scaffold and describe intentional interactions between different cultural learning experiences that occur by expanding K-12 learning environments and learning networks. The historical foundations and theoretical connections of open learning and the shaping of the emerging concept of OEP can provide opportunities from which proximal zones of development can expand in K-12 learning environments. Les Vygotsky's (1978) sociocultural theory is based on the premise that learning is a unique experience for every learner based on his or her historical experiences, culture and interaction with others.

OEP has the potential to support learning through intentional interactions that can expand the zone of proximal development to include and integrate formal and informal learning experiences in networked spaces for K-12 learners. OEP represents the potential for considering a learning pedagogy that occurs as a result of learners choosing the learning space in which they want to learn. These experiences could provide learners with unlimited “what if” learning opportunities that could promote reflection about context, culture and pedagogical choices as all learning participants design for their own learning.

Criticism of sociocultural theory. There is much criticism of the concept of zones of proximal development for a variety of reasons. The description of the zone of proximal development was never fully completed due to Vygotsky’s early death in 1934. The political climate in Stalinist Russia at the time of Vygotsky’s death mandated that Vygotsky’s writing and work was censored. Vygotsky had supportive and loyal colleagues and followers, and his original work was hidden and translated. However, western educators were not really introduced to his theories until 50 years after his death. There was no way for Vygotsky to clarify his original theories or give feedback on the translations from Russian to English. Vygotsky has been compared and contrasted to other influential developmental psychologists like Jean Piaget and most research emphasizes the differences between their theories (Lourenco, 2012). Vygotskian researchers have suggested that due to the emphasis on instructional and behaviour focused educational pedagogy frameworks, educational systems have not been ready for Vygotskian theory (Kozulin, 2003). In many cases, researchers were unable to make the connections to the Vygotskian potential for learners because in general, the researchers did not know what questions to ask (Kozulin, 2003). Considering the limited time span Vygotsky was able to write and connect with an active audience, and the attempts to hide and change his

original ideas, his theories have connected with educators and his concepts and ideas have credibility that can be compared to other influential educational theorists.

Open Learning and Open Pedagogy

To create a context to describe the concept of K-12 OEP, where open learning provides space for all learners, a historical pedagogical and theoretical perspective of open learning, must be considered. A recent citation network analysis of historical open and distance education research (Jordan et al., 2017) provides a networked overview of the historical context of open learning. K-12 open schooling is considered at the beginning of the analysis as a key influence in open learning values, beliefs and ideals (Barth, 1969; Illich, 1970; Resnick, 1972; Traub, Weiss, Fisher, & Musella, 1972; Walberg & Thomas, 1972). Although Jordan et al.'s (2017) research focused on a historical narrative based on a higher education context, it is extremely useful in order to explore the K-12 open learning perspective which considers a blend of contexts.

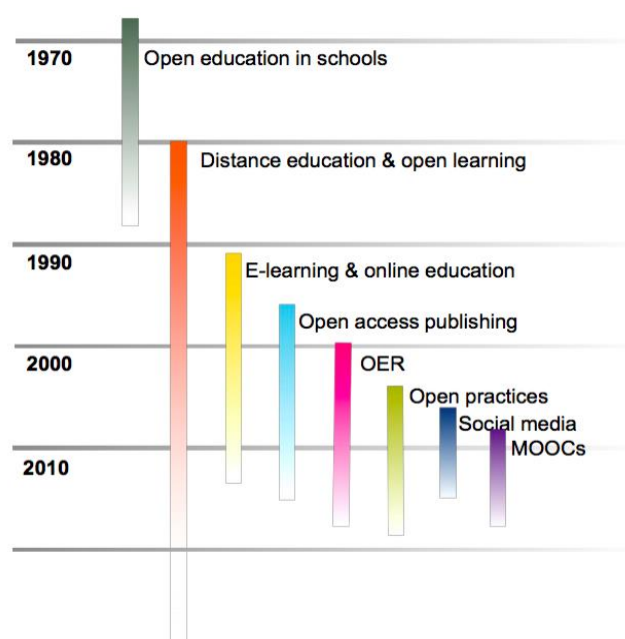


Figure 2.1: A historical timeline of the themes of open learning. From “Openness and Education: A beginner’s guide,” by Jordan and Weller, 2017, Global OER Graduate Network. CC-BY

From a K-12 Canadian perspective, the concept of open learning can be examined in more detail with a further examination of the seminal descriptions of K-12 open education. Barth's (1969) description of open education included a focus on the nature of learning which can connect to Dewey's democratic education beliefs and Vygotsky's sociocultural theory with an emphasis on interactions in learner development. Barth's first key assumptions about a child's learning included a child's innate curiosity that leads to exploratory behaviour that is self-perpetuating. According to Barth, a child's curiosity includes the idea of self-directed learning, the need for trust in building relationships between learners and educators and the possibilities of increased capacity for learning as a result of learning outside of oneself and connecting to others and the possibly world through interactions:

In contrast to the thinking of many educators and psychologists, open educators do not see adults as the unique suppliers of the elements of the external world which will release the child's potential for motivation... It remains for open educators to clarify the place of the adult in releasing or activating the child's inner motivation and of differentiating the control which is the child's from that which is the adult's. (1969, p. 31)

Barth's (1969) description of open educators in 1969 could also describe informal learning experiences in current K-12 digital environments. Barth's second assumption was that the child will display natural exploratory behaviour if he or she does not feel threatened. By threatened, Barth described the connection between learners' self-confidence with their ability to make responsible learning choices for themselves. The third assumption was that play is not separated from learning in early childhood. The fourth assumption was that children have the ability and competency to make their own learning decisions and choices. The fifth assumption was that children choose to collaborate when learning and they share their learning when it is important to them. The sixth assumption considers the timing of intellectual development for every learner based on specific guidelines. As an alternative to specific timing, he suggests that

every child develops at a different pace and in different ways. The seventh assumption considered a learner's choice of materials. Learning can be verified and assessed based on the materials the learner chooses to use and the choice of materials is not mediated by external educators, but by the learners themselves. The eighth assumption considered how learners deal with errors and he encouraged mistakes in order to develop and learn. Finally, the ninth assumption examined the focus on marks as a primary measure of learning. Barth advocated that learning takes place in a wide variety of ways that cannot and should not be measured in the moment. Learning takes place over an extended period of time and the best measurement of learning is learning that is fun, engaging and based on a variety of learning opportunities and experiences. Considering Barth's assumptions were written in 1969, and there is no attribution to Vygotsky, whose works were primarily translated in 1978, there are multiple similarities between their ideas and concepts.

Illich's (1970) seminal work *Deschooling Society* built on Barth's ideas that consider self-directed learning and the necessity of educator intervention and interaction. Illich described a kind of networked learning when he identified learning webs made up of different learning pathways including television, reading, peers, and relationships: "We can provide the learning with new links to the world instead of continuing to funnel all educational programs through the teacher" (1970, p. 73). Illich identified the importance of social interactions, collaboration and learner agency by describing the potential for deeper learning beyond formal institutionalized learning opportunities. Walberg and Thomas's (1972) research also focused on the differences between traditional and open classrooms. These differences were in respect to provisioning, humaneness, diagnosis, instruction and evaluation. Similarly, Resnick's (1972) research attempted to connect the aspects of educational technology that could support and assist

open learning including, choosing educational objectives, organization and sequencing materials, displaying alternatives, providing learner control, enhancing motivation, and evaluating competence. The way in which to measure and describe open education was also examined by Traub et al. (1972), who attempted to describe and quantify open education. Their research results focused on the development of a survey which attempted to quantify and specify open learning data and characteristics. Traub et al.'s research tried to quantify an educational philosophy that could have benefited from more qualitative research. Based on Barth's (1969) assumption that learners learn at their own pace and in their own way, that the materials they choose to learn with can help measure their learning, that learners need to make choices and demonstrate perseverance through failure, and that interactions and collaborations are a key to development and learning, it would be difficult to quantify the original key concepts and foundations of open learning.

With researchers attempting to examine the potential of open learning, it is no surprise that the United Nations Educational, Scientific and Cultural Organization (UNESCO) summarized the concept of open learning by suggesting that "Open Learning is an impressive phrase to which a range of meanings can be, and is attached. It eludes definition. But as an inscription to be carried in procession on a banner, gathering adherents and enthusiasm, it has great potential" (MacKenzie, Postgate, & Scupham, 1975, p. 15). This early support for the concept of open learning follows similar views in the theoretical concepts of Vygotsky, Dewey and assumptions of Barth. However, a clear definition of open learning is evasive because it is culturally and systemically contextual. As a result, this research considered multiple perspectives of research which contextualize open learning, in the hopes of describing open learning in K-12 contexts.

One of the earliest definitions of open pedagogy comes from Canada. It is translated as the interrelation between three key learning environments; the physical layout of the classroom, the learning activities and the teacher interventions (Paquette, 1979). According to Paquette (1979), open pedagogy has the following foundational characteristics: open pedagogy is based on the respect of individual differences, open pedagogy is based on the individual growth as a learner in the world today, open pedagogy is based on the indirect influence of educators and open pedagogy is based on the developmentally appropriate learning outcomes for an individual. In 2005, Paquette revised his description of open pedagogy by positing that “open and interactive pedagogy is based on three pairs of explicit values: autonomy and interdependence, freedom and accountability, and democracy and participation” (para. 4). Paquette was a Canadian from the province of Quebec and his views on open pedagogy could have been influenced by the October Crisis in 1970 and the rise of power and influence of the sovereigntist Parti Quebecois. Many learning philosophies, ideas and concepts developed as a result of political and societal conditions of the times including privilege, access, freedom, liberty, voice and choice. Another influential open learning advocate was American, Karl Rogers. In an early reference to openness, in 1969 Rogers (as cited in Rogers & Freiberg, 1994), wrote, “In persons who are moving towards greater openness to their experiencing, there is an organismic commonality of value directions. These common value directions are of such kinds as to enhance the development of the individual himself, of others in his community, and to contribute to the survival and evaluation of the species” (p. 49).

In the United Kingdom, open pedagogy was described as a process originally coined as opening learning, and not open learning (Coffey, 1988). Open learning described a process as a means to give learners what they want, when they want it and how they want it which has

connections to the open learning assumptions posited by Barth (1969). Paquette's (1979) and Rogers's (1969, as cited in Rogers & Freiberg, 1994) descriptions of open learning also promote the key assumptions of open learning previously posited by Barth and as such can be directly connected as a key historical influence in terms of the development of the concept of open learning in K-12 Canadian learning environments.

However, there is also evidence within the literature that suggested that the interpretation of open learning expressed by Barth (1969), Rogers (1969, as cited in Rogers & Freiberg, 1994), and Paquette (2005) was a lost paradigm of learning by 1986. By 1986, the concept of a values-based philosophy that advocated for humanism and equity within educational contexts transitioned to a different pedagogical educational domain focus. The term open learning was perceived as flexible learning, asynchronous learning and the basis for distance or online learning (Boot & Hodgson, 1989). Perhaps the research of Traub et al. (1972), which examined the way in which to measure and describe open education in an attempt to describe and quantify open education, was a clue to the demise of pedagogical importance of open learning. Their research results focused on the development of a survey which attempted to quantify and specify open learning data and characteristics. The discrepancy between the more philosophical perspectives and pedagogical perspectives of open learning were examined by Boot and Hodgson; for example, in 1989 they compared the educational philosophies of Barth (1969) and Rogers (1969), as cited in Rogers & Freiberg (1994) and Paquette (1979), to the practical expediency of open learning of Coffey (1988). The unfortunate effect, however, is that it is possible for discussions about open learning to take place with some or even all of the participants unaware that they are discussing different things. This in turn means that, "far from

being a single consistent educational philosophy, open learning becomes a mechanism which blurs philosophical differences” (Boot & Hodgson, 1988, p. 198).

The dichotomy between philosophical (open pedagogy) and practical contexts (measured quantifiable assessment and characteristics that can be utilized in any learning environment) continues to this day. However, open learning in K-12 still maintains its philosophical values and many educators advocate for open learning pedagogy and the potential to improve the quality and access to learning for all (Butcher & Wilson-Strydom, 2008; Conole, 2013; Cronin, 2017; Havemann, 2016; Hegarty, 2015; Weller, de los Arcos, Farrow, Pitt, & McAndrew, 2015).

Current research in K-12 open learning environments.

As described in Figure 2.1, there is historical context and variation to open learning literature. While current research in open learning extends from the focus areas emphasized in the figure 2, in K-12 contexts, the emphasis on research in open learning has primarily been on OER.

Open Educational resources. Open Educational Resources (OERs) are teaching, learning and research materials in any medium – digital or otherwise – that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions. (UNESCO, 2018, p. 2) According to Wiley (2014), to be considered an open resource, an Open Educational Resource should include the following 5Rs of Openness to ensure open licensing:

- Reuse: the right to use the content in a wide range of ways (e.g., in a class, in a study group, on a website, in a video);
- Revise: the right to adapt, adjust, modify, or alter the content itself (e.g., translate the content into another language);

- Remix: the right to combine the original or revised content with other open content to create something new (e.g., incorporate the content into a mashup);
- Redistribute: the right to share copies of the original content, your revisions, or your remixes with others (e.g., give a copy of the content to a friend);
- Retain: the right to make, own, and control copies of the content. (para. 12)

These characteristics of openness for OER promote a collaborative learning culture that encourages the building and sharing of knowledge (Conole, 2013). The 5Rs of openness can be afforded to K-12 teachers by using public domain content and Creative Commons copyright licensing, instead of a copyright license. OERs are distinguished by being found in the public domain (free content to be used without any restriction, ownership and not under any copyright law) or they will have a Creative Commons copyright license. Creative Commons copyright licensing was developed in 2002. “Every Creative Commons license works around the world and lasts as long as applicable copyright lasts (because they are built on copyright).” (Creative Commons, n.d., para 2). Creative Commons copyright licensing has supported K-12 learning environments by ensuring global access to educational resources for learners all over the world who would have previously had no access.

Current research which examines OER in K-12 learning environments is still emerging, which can be due, in part, to the limited awareness around OER in K-12 learning environments in Canada. “The reality in Canada is that, although there are significant initiatives in OER at the post-secondary level, there is little if any activity in the primary and secondary levels (K12) other than ad hoc implementations by individual teachers” (McGreal, 2017, para. 19). It appears that any focus on the development of awareness around OER in K-12 learning environments in Canada appears to be limited to higher education supported initiatives such as the Multiplying

OER project (Blomgren, 2017). The William and Flora Hewlett Foundation has supported and invested in the opportunities that OER affords K-12 educators which includes access to OER for all learners, OER awareness, and use of OER by educators since 2002 (Roberts et al., 2018). This foundation continues to sponsor research projects linking K-12 OER which specifically target access to learning opportunities for all learners; however, there is still much potential in terms of specific research which examines OER in K-12 learning contexts (William and Flora Hewlett Foundation, 2013).

When considering the historical and current OER research landscape, the majority of the research has considered OER from Higher Educational contexts (Kimmons, 2015) which again suggests future potential in domain specific research that examines OER in K-12 learning environments. As such, much of the K-12 OER research has focused on topics that can relate to or connect with OER research in Higher Education. For example, current K-12 OER literature has considered descriptions of the landscape of OER use and awareness in K-12 learning environments (Tonks, Weston, Wiley, & Barbour, 2013) and the cost effectiveness and potential of substituting open textbooks for publisher-restricted textbooks and the relationship to students' successful standardized test scores (Wiley, Hilton, Ellington, & Hall, 2012).

Current research exploring OER and teacher practice. There is limited but important research that considers the connection between OER and teacher practice. "OER can also be used to raise the quality of education, not only of the teaching content but also of the teaching itself by supporting the transformation of the educator's learning environment" (McGreal, 2017, para. 33). Teacher practice research as focus area not only connects to higher education contexts, but also connects well with K-12 domain specific research. Some K-12 OER research has emphasized the connection between OER and practice which includes Kelly's (2014)

examinations of K-12 teachers' perception of OER. Her research findings included teacher support of the use of OER and that the ease of use and design of the OER as a primary reason for teachers to consider changing their practice (Roberts et al., 2018). In an extensive global research project, further investigation into K-12 teacher perception of OER (de los Arcos et al., 2016) found that teachers adapt rather than just adopt OER. As a result of their adaptation of OER, teachers describe personalized and authentic learning opportunities for teachers and students (Roberts et al., 2018).

Open educational resources can also activate teacher collaborations and discussions regarding new practices and support various forms of innovation in teaching and rethinking resource development according to Petrides, Jimes, Middleton-Detzner, and Howell (2010). As McGreal (2017) suggested, teachers demonstrated pedagogical transformation by describing how “OER, as digital and dynamic resources, have the potential to enhance teaching and learning practices by facilitating communities of teachers who collaborate, share, discuss, critique, use, reuse and continuously improve educational content and practice” (p. 2). Similarly, Tonks et al. (2013) described an increase in student empowerment as a result of the teacher's ability to personalize course content in an OER based school, which could also be compared to the findings of de los Arcos et al. (2016). Teacher digital literacy and instructional design skills also improve because of the consideration and application of the 5Rs of openness (Wiley, 2014) in order to create or repurpose existing OER (Conole, 2013; Tonks et al., 2013). Open educational resources have the potential to provide equitable access to high-quality, openly licensed content as well as encourage school districts to share their resources, collaborate with other districts to avoid re-creating the wheel, support educators as creative professionals and students as creative learners (Roberts et al., 2018).

Limitations of open learning literature. By examining research that only focuses on OER rather than on open learning, the philosophical and contextual underpinnings of the literature can be misconstrued and confused. This research expands upon the process of open learning, and as such, even though the previous research has connected OER with open learning, the need to connect OER with open learning in every context is still open for debate.

Open learning and the integration of digital teaching and learning opportunities can provide challenges for educators who want to bring these concepts into their classroom. There are also very cautious perceptions in K-12 on the concept of sharing. There is a reluctance on the part of K-12 learners, educators and administrators to use and share open learning resources because their learning will be displayed openly or not cited at all (de los Arcos et al., 2016; Roberts et al., 2018). However, Cerne, Nerstad, Dysvik and Kerlavaj's (2014) research, which considered the impact of hiding knowledge and ideas, also described as a distrust loop, suggests that sharing can have positive consequences. Their research was conducted in a workplace and with undergraduate students, and the researchers discovered that when a person chooses to limit what they share, their creativity and motivation is impacted. The more a person shares, the better they feel about themselves, their work and others, "the need for self-protection seems to decrease in such environments" (p. 34). Literature on the use of open learning in K-12 settings is still focused on defining and detailing the affordances of open learning and OER. In addition, given data and information privacy laws, K-12 school district policies and ethical considerations when working with vulnerable populations, there are additional concerns when considering open learning that have yet to be explored in current K-12 literature (Roberts et al., 2018). Students sharing their learning with others, and being given the opportunity and choice to share in K-12, is an important consideration in open learning contexts.

In summary, current research has focused primarily on the connection of OER to open learning, rather than the potential benefits of learning as a result of using OEP to expand the learning environments. The potential for sharing learning opportunities and contexts and describing the open learning design process in which learners experience open learning, has yet to be fully explored in K-12. The following section connects the ideas described throughout this literature review in order to describe the potential for OEP in high school learning environments.

Open educational practices in networked learning environments. There are multiple examples of current research which consider OEP, this literature review attempts to connect the research in order to clarify OEP in K-12 learning contexts.

Social media in the K-12 classroom. Greenhow and Askari's (2017) examination of emerging research on learning and teaching with social network sites describes the potential for educators to consider networked learning opportunities. Greenhow and Askari compared research that examined how interaction with social networks increased a constructivist, community-centered pedagogical approach which "increased interaction and networking between teachers, students and parents and the co-creation of content both within and outside of the classroom" (2017, p. 624). Their research was focused on collecting and analyzing current research which described student and teacher perceptions on the impact of social media use by students and teachers. Their findings included that there are advantages and disadvantages to learning with social networks; however, for students, the most perceived and actual learning with social networks is happening outside of the classroom in collaborative, self-directed learning contexts and online communities.

Like the current research on connected learning and participatory culture, the advantages of the learning were more often described outside of the classroom in informal learning contexts

given that, in general, educators were not integrating informal learning opportunities into their classrooms. Similar to Ito et al. (2013), Greenhow and Askari suggest that “currently this vision remains under-theorized and under-examined as a field of education” (2017, p. 624) and therefore there is much potential for emerging research that examines why social networks are a critical part of K-12 OEP.

Personal learning environments. Developing a personal learning network (or PLN) is another emerging context in which OEP can be examined in global networked learning contexts because it exemplifies a way in which learners can develop their personal digital identity and social reputation while also sharing and contributing to a networked knowledge ecosystem. PLNs provide learners with increased control over what they learn and how they learn it, which is very different from a more traditional and structured learning approach. The concept of a PLN promotes control of the student to customize learning objectives, content, method, and pace (Drexler, 2014) to connect with others (Downes, 2012) and to have a choice about whom they connect with, how they connect with them and how they describe their learning in their own (Wilson et al., 2006). “PLNs manifest in an infinite number of ways because the student selects the tools and communities that will best meet his or her learning objectives” (Drexler, 2014, p. 449). For example, students could complete curriculum- mapping projects, or inquiry projects that use specific platforms and tools like WordPress, Symbaloo, wikis, Skype (video conferencing) and ScoopIt (a URL Bookmarking and curation tool). “PLNs require a significant shift in control from the teacher to the student. As such, the day-to-day behavior and activities of the teacher change from traditional teacher focused learning to student centered learning” (Drexler, 2014, p. 457).

As the teachers transition from an emphasis on giving students specific resources like textbooks to encourage students to find, analyze and ensure credibility of multiple resources, the role of the teacher changes within networked learning contexts. In their research which examined the role of teachers in PLE's, Shaikh and Khoja (2012) suggest that teachers need to develop new digital competencies including, the competency to be able to change their pedagogical approach based on emerging needs of students who need to develop their own PLE's. OEP can be integrated into all types of learning environments; however, learning environments which offer fluidity from formal and into informal learning environments, afford learners the opportunity to experience equity, diversity and discover their own learning paths.

The potential to expand into networked learning is slowly emerging from all formal learning environments as educational systems consider how to meet the needs of all learners. A personal learning network is created as a result of a personal learning environment. Students and teachers need to have access to nodes of learning, based on their own personal learning needs, in order to build reputations and connections in online communities and networks. A personal learning network (PLN) is "a set of connections to people and resources both offline and online who enrich our learning" (Richardson & Mancabelli, 2011, p.2). Richardson and Mancabelli describe networked learning which has a basis of connecting teachers with like-minded global teachers from around the world. Networked learning is a process that follows four steps: (1) developing an awareness of the power of PLNs, (2) becoming a networked learner (as a teacher), (3) implementing a networked classroom and (4) becoming a networked school.

The concept of connecting and interacting with others is similar between networked and open learning, however; open learning goes beyond just connecting with other classrooms from around the world. Some of the main differences include who is in control of the learning, how

the learning happens, and where the learning happens. In open learning contexts, the learner is encouraged access and choice in co-designing their personal learning pathways in order to integrate formal and informal learning environments. How they have access to these learning environments is based on their individual skills, abilities, competencies and readiness. The teacher's use of OEP affords greater opportunity for the student to expand into open learning environments and opportunities.

Open pedagogy and open learning. From a pedagogical participatory approach, Hegarty's (2015) attributes of open pedagogy and Conole's (2013) learning design describes the characteristics of the new technologies in which K-12 learners are experiencing and interacting with every day, which are peer critiquing, creating user-generated content, collective aggregation, community formation, digital personas and blurring boundaries. Hegarty's (2015) description of open pedagogy connects back to the original open learning ideals from Barth (1969), Rogers (1969, as cited in Rogers & Freiberg, 1994)Rogers and Freiberg (1994), Paquette (1979), Thomas and Seely Brown (2011), Davis et al. (2015), and Jenkins, Ito and Boyd (2016). Hegarty described open learning as an arc in life learning, which is a "seamless process that occurs throughout life when participants engage in open and collaborative networks, communities, and openly shared repositories of information in a structured way to create their own culture of learning" (p. 3). Hegarty's description of open learning is distinguished by eight attributes associated with open pedagogy which include: participatory technologies, working openly with people, innovation and creativity, sharing ideas and resources, connected community, learner generated, reflective practice and peer review.

An emerging distinction between open learning and open pedagogy is OEP. The philosophical and theoretical underpinnings of OEPs in K-12 is a combination of Barth's (1969)

open learning assumptions, Rogers' (1969, as cited in Rogers & Freiberg, 1994) open learning vision, Paquette's (1979) open learning values, Thomas and Seely Brown's (2011) new culture of learning, Jenkins et al.'s (2016) participatory culture in networks, Jacobsen et al.'s (2011) technology supported learner engagement and Hegarty's (2015) attributes of open pedagogy.

A more common definition of open learning has not been established in part due to the division between open as a practice and open as a reference to early forms of distance learning. Ehlers's (2011) definition of OEP is based on the Open Education Quality project which was an initiative designed to create a framework of OER practices to help innovate and improve educational practice. Ehlers' definition is widely used as the original definition for OEP. He defined OEP as, "the practices which support the (re)use and production of OER through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning paths" (Ehlers, 2011, p. 4). In the final Open Education Quality report, the OER enabled version of the definition of OEP transitioned to "OEP are defined as practices which support the (re)use and production of OER through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning path" (Ehlers, 2011, p. 12). The OER enabled definition of the potential of OEP was alluded to in other K-12 OER focused research by Wiley et al. (2017), Sáenz et al. (2017), and de los Arcos et al. (2016). More recently, Paskevicius (2017) defined OEP which includes OER and open learning design:

Teaching and learning practices where openness is enacted within all aspects of instructional practice; including the design of learning outcomes, the selection of teaching resources, and the planning of activities and assessment. OEP engage both faculty and students with the use and creation of OER, draw attention to the potential afforded by open licenses, facilitate open peer review, and support participatory student-directed projects. (p. 127)

Paskevicius's definition has a focus on open learning design with the intention to integrate the design of learning outcomes, selection of resources, planning of teaching activities, and design of assessment.

Open learning research that emphasizes the human aspect to learning and the opportunity to focus on the process of learning over the product is beginning to emerge. Current research in open learning and OEP suggests that "Openness in education is not a movement for the emancipation of resources, but of people and practice" (Havemann, 2016, p. 6). Recent literature that expands upon open the definitions of OEP that consider pedagogy beyond digital content. There is evidence of research which considers how openness can support innovation and change in teacher practice (Karunanayake, Naidu, Rajendra, & Ratnayake, 2015; Kimmons, 2015).

For example, Couros and Hildebrandt (2016) describe open teaching based on teaching a higher education course in an open and socially networked manner. The course was offered to K-12 teachers, so as a result of their inclusion and open access, the course design could be modeled and remixed to support K-12 learning contexts. Couros and Hildebrandt (2016) described

open teaching as the facilitation of learning experiences that are open, transparent, collaborative, and social. Open teachers are advocates of a free and open knowledge society, and support their students in the critical consumption, production, connection, and synthesis of knowledge through the shared development of learning networks. (p. 148)

Couros and Hildebrandt provided a description of a more learner focused OEP. They expanded upon the idea of student created content to support OEP (Wiley et al., 2017) by describing the aspects of participatory culture, personal learning networks, and professional learning through social networks. Couros and Hildebrandt also challenged the OER enabled description of OEP by suggesting the importance of a focus on social reputation and digital identity and how learners and educators can participate and engage in open networks in order to learn.

Cronin (2017) mentioned the potential of personal learning networks and OEP in her research findings of OEP and higher education educators. Examining the relationship between openness and praxis by university educators, Cronin identified four OEP use levels that determine the extent and manner of OEP praxis:

Macro - global level (Will I share openly?)

Meso - community/network level (Who will I share with?)

Micro - individual level (Who will I share as?)

Nano - interaction level (Will I share this?). (2017, pp. 25–26)

Going beyond a focus on OER, Cronin (2017) defined OEP “as collaborative practices that include the creation, use, and reuse of OER, as well as pedagogical practices employing participatory technologies, and social networks for interaction, peer-learning, knowledge creation, and empowerment of learners” (p. 18). Cronin’s OEP and praxis research encourages future research which could examine K-12 teachers and learner’s attitudes toward the traits of openness as part of OEP. However, because of the age of the learners in K-12, the decisions regarding the manner, and amount of sharing would rest with teachers, school-based administrators, and district decision makers.

OEP for K-12 contexts. More expansive definitions of OEP include not only those which include open content, but those that also consider the pedagogical implications and considerations for learning that is accessible for all learners with some or limited mention of equity and social justice. The Cape Town Open Education Declaration (2007) described a more expansive approach to the concept of open education where

open education is not limited to just open educational resources. It also draws upon open technologies that facilitate collaborative, flexible learning and the open sharing of teaching practices that empower educators to benefit from the best ideas of their colleagues. It may also grow to include new approaches to assessment, accreditation and collaborative learning. (para. 4)

This description of OEP provides the potential for research in educational change which could stem from the domain of open learning. More recently, UNESCO (2019) updated the aims and objectives in order to connect OEP

the application of open licenses to educational materials in combination with OEP introduce a broad range of innovative pedagogical options to engage both educators and learners to become more active participants in educational processes and creators of content as members of an inclusive knowledge society. (p. 3)

The term OEP is not prominently used in K-12 research although K-12 scholars have described similar practices to OEP as networked publics (boyd, 2010; Ito et al., 2010), connected learning (Ito et al., 2013), participatory culture (Jenkins et al., 2008), and open learning (Barth, 1969; O’Byrne, Roberts, LaBonte, & Graham, 2014; Roberts, 2013; Roberts et al., 2018).

Although the International Council for Open and Distance Education describes OEP within higher education, the definition can also be considered in a K-12 context. In-service and pre-service teacher education programs are working with varying success with the use of educational technologies to address the pedagogical implications of ongoing technological innovations. However, much professional development has placed an emphasis on the tools of technology integration and has thus limited the broader acceptance of a pedagogical shift which could be represented by OEP in networked learning environments (Roberts et al., 2018). The changing educational culture in which emerging pedagogy has a constructivist rather than instructivist focus has the potential to support and promote emerging characteristics in K-12 OEP.

The lack of specific definition for K-12 OEP may continue without a concerted research-based effort to connect the current emerging practices that connected open learning with formal and informal networked learning environments. Despite the relative lack of a commonly accepted definition, when considering equity and access for all learners, teacher practice within

blended and online learning environments continues to emerge as a set of beliefs that could be described as an OEP. This execution of a variety of knowledge, skills and abilities occur in a shared and transparent manner in which teachers and students, through digital platforms, can Retain, Reuse, Revise, Remix, or Redistribute the evidence and artifacts of learning with others (Wiley, 2014) while considering a collaborative learning design in safe openly networked learning environments.

Taken together these 5Rs and OEP mark a substantial shift in the age of digital teaching and learning encouraging collaboration, connections, networked learning, and interdependence among educators and learners. As the work of Wiley and other scholars suggest, because of this digital and pedagogical shift, sustainable open learning ecosystems become possible, in part through promoting trust, sharing, and interdependence among educators, learners, and the broader participants of public education (Roberts et al., 2018). There are multiple domains researching perspectives of the integration of formal and informal networked learning environments. OEP provides a theoretical and philosophical framework that could interconnect the emerging pedagogical shift.

Conceptualizations of OEP. OEP is not a learning theory, but instead a teaching and learning approach in which, through intentional teacher interaction, learners identify and locate learning opportunities for themselves as well as create learning opportunities for others (Butcher & Wilson-Strydom, 2008; Coffey, 1988). OEP has an equity basis premised on the belief that every learner deserves access to learning choices regarding time, place, medium, and content (Lewis, 1990). OEP in K-12 continues to develop as some educators advocate for open pedagogy and the potential to improve the quality and access to learning for all (Butcher, & Wilson-Strydom, 2008; Conole, 2013; Cronin, 2017; Havemann, 2016; Hegarty, 2015; Weller et al.,

2015). There is potential for research that considers the description and conceptualization of OEP which integrates formal and informal learning in K-12 learning environments.

Daniels, Friesen, Jacobsen, and Varnhagen (2012) documented the potential for emerging pedagogy to support meaningful integration of technology that supports Alberta high school students learning in their two-year research study of Alberta high school classrooms,

High schools need to be asking how to change the way that teachers design learning experiences for students and how leaders and the profession can better support teachers and students in making best use of modern technological resources and open connectivity. High schools need to become spaces in which learners with diverse strengths, interests, abilities and skills are brought together around collective interests to work collaboratively on shared goals and tasks, to create and share ideas, and to build and cultivate knowledge in a community. A challenge for high school is to reconcile impoverished technological infrastructures and locked down networks, and teacher-driven content delivery approaches with the collaborative knowledge building and participatory learning approaches and expectations of today's high school students. (p. 92-93)

Daniels, Friesen, Jacobsen, and Varnhagen's (2012) research is one example of how to describe the need and potential for open learning in high school learning environments connected to community and networks. Learning that supports individual learners by focusing on learning pathways that lead to lifelong learning opportunities. Access to the resources and people to support individuals in collaborating and building knowledge by being an active participant in the learning process.

There has been some research, within a higher education context, that explores the conceptualizations of OEP. Three conceptualizations of open practices are those by Beetham, Falconer, McGill, and Littlejohn (2012), Hodgkinson-Williams (2014), and Czerniewicz et al. (2017). Beetham et al. considered extensive empirical work to identify key features of paradigmatic open practices. Their six features of paradigmatic open practices are: opening up content to students not formally enrolled; sharing and collaborating on content with practitioners;

reusing content in teaching contexts; using or encouraging others to use open content; making knowledge publicly accessible; teaching learning in open networks.

After synthesizing the current open learning literature, Hodgkinson-Williams (2014) developed a framework for describing practices changing towards greater openness. Hodgkinson-Williams's dimensions of openness relate to the ease or difficulty of the process of adopting open education. These dimensions are: technical openness (e.g., interoperability and open formats, technical skill and resources, availability and discoverability); legal openness (e.g., open licensing knowledge and advice); cultural openness (e.g., knowledge on a continuum between homogenous and diverse) and curriculum (on a continuum between institutionalized and autonomous); pedagogical openness (e.g., student demographics and types of engagement) and financial openness (e.g., whether OER should be free or not, funding arrangements).

In addition, Czerniewicz et al. (2017) described four aspects of OEP: legal openness; pedagogic openness and learning in open networks; encouraging others to teach and learn in open networks and reusing content in teaching/other contexts. Although each of these research conceptualizations support the potential for K-12 OEP in terms of access to learning for all learners, there are still key sociocultural aspects missing especially those that consider participatory culture, collaborative learning design and safe learning spaces.

In the Multiply K-12 OER media project, Blomgren (2017) adapted Hegarty's eight principles of open pedagogy for a K-12 context. The project included the production of videos and podcasts where beginning and expert educators in OER implicitly discussed Hegarty's principles. Many of the experts in the podcasts noted that K-12 open learners are still maturing and are considered minors under the law. Unlike post-secondary and high education students, K-12 school students are held under a different microscope when considering open learning.

Instead of ignoring the need to integrate OEP, policymakers, researchers, and the K-12 profession is encouraged to research and implement OEP, knowing that it will be different from higher education contexts (Roberts et al., 2018).

Blomgren's (2017) project exemplified the potential for expanding the definition of OEP beyond OER enabled OEP and it provided a context in which to consider how participatory culture and design distinguishes K-12 open learning from other open learning contexts. Through the potential of the expansive learning opportunities that openly networked learning affords, OEP could catalyze institutional change and invoke a critical review of current K-12 pedagogical approaches. The next chapter describes how design-based research (DBR), the educational research methodology used in this study, provides a balance between open learning theory and the potential for researchers and teachers to design and evaluate for openness in OEP learning environments.

Chapter 3: Methodology

Overview

This chapter describes the design-based research (DBR) methodological process that was chosen for this study in order to ensure a balance between theory and practice, to provide a participatory research opportunity for a K-12 district, and to examine an emerging innovation. The chapter begins with an overview of design-based research and why it was chosen for this study. An overview of the design-based research process for this project is provided, which includes the research cycles and context, the collection methods, the data analysis and synthesis, the learning pathways data collection process and the meso cycles of evaluation. The chapter concludes with a summary of the ethical considerations, anticipated benefits, issues of trustworthiness and delimitations of the study. This chapter is essential in order to explain how the research processes occurred. Chapters four and five present an examination and analysis of the data and information that was collected in this research project.

Design-Based Research Methodology

Open Educational Practices (OEP) is an emerging topic that can benefit from design-based research (DBR) that encourages robust data collection and multiple data analysis approaches, and brings researchers and practitioners together to lead and examine innovations in practice and contribute to the development of theory. Although a great deal of DBR research uses mixed methods (Anderson & Shattuck, 2012), this research focused primarily on a qualitative research process and approach to data collection. In general, qualitative research is suited for research in which the research problem has unknown variables and the current literature yields the potential for more examination and a central phenomenon or key concept, or idea is underexplored (Creswell, 2015).

The intention in using DBR in this study was to ensure that participant voice was amplified in the research and that there were opportunities for professional learning and development for practitioners and researchers as they built knowledge about emerging practices together. This study focused on qualitative methods to explore how open learning impacts learners. DBR provided an iterative research process in which to promote change in practice and flexibility in the research method process (McKenney & Reeves, 2012). The researcher used DBR as the main approach to data analysis because of the iterative, emergent, formative, cyclical and responsive research process that DBR affords. In order to examine how participants described open learning experiences through the open learning design process, participant perceptions of open learning and participant digital artifacts created as a result of open learning, were collected. DBR provided a flexible, yet rigorous methodological approach using multiple data sources over time while encouraging active research participation and collaboration.

The researcher adopted a design-based research (DBR) approach because this research methodology provides an opportunity to blend practice and theory when illustrating and applying emerging research findings in practice in K-12 learning environments. DBR developed as a methodological approach from a need to consider dynamic learning contexts and innovation in authentic educational settings (Brown, 1992). DBR provides the opportunity for researchers, educators and teams to collaboratively examine practice and theory while studying the daily-life of classrooms and provide authentic and relevant data that includes multiple perspectives on learning. Barab et al. (2014) described the collaborative examination of practice and theory by suggesting that

this type of research involves examining the design team, interactions amongst the designers and the members of the communities being researched, and the everyday practices of the users of the innovation as they use the current iteration of the design. (p. 321)

DBR's collaborative approach to research can ensure a pragmatic learning opportunity to change practice with the research participants while affording researchers an authentic learning context in which to examine and build upon current theory.

To provide the conditions for a collaborative research environment, design-based research tends to progress through iterative phases guided by the intention to support and examine a specific intervention that impacts educational theory and practice (Kennedy-Clarke, 2013). The three phases described by McKenney and Reeves's (2012) generic model for conducting DBR are the Analysis and Exploration phase, the Designing and Construction phase and the Evaluation and Reflection phase. The Analysis and Exploration phase focuses on problem identification and shaping the understanding of the context and problem. This early phase includes research activities like a literature review and the collaboration and building of relationships with educators and other stakeholders. The Designing and Construction phase encourages creativity by focusing on the design of a potential solution to the problem by exploring and considering multiple options that could be introduced within the specific learning context. The Evaluation and Reflection phase considers different aspects of the design research process based on the timing of the research process. For example, the evaluation phase can be used to evaluate an intervention by studying the "soundness, feasibility, local viability, broader institutionalization, immediate effectiveness, and/or long-term impact." (McKenney & Reeves, 2012, p. 80). Reflection is a combination of analysis of the empirical evidence and theoretical observations from the local context. The combination of evaluation and reflection provides information for redesign and changes to the research process which can then provide an opportunity for another research cycle.

Another key aspect to DBR are the connections between phases and cycles within DBR research. The three main phases can be described in terms of cycles (macro-, meso- and micro-cycles) that are sized differently based on the research completed in each phase. The DBR model for this research project was completed as one macro cycle with multiple meso and micro cycles within three phases. The model for this research project is explained in detail later in this chapter.

Rationale for DBR

Design-based research progresses through iterative phases with the intention to support and examine a specific intervention that impacts educational theory and practice. In this study, the intervention involved a series of lessons and activities that were designed to guide and support grade ten learners as they expanded their learning from formal learning environments and into open learning networks. There is evidence of other current research that has considered DBR in order to support similar examples to open learning design interventions like those with the design and development of collaborative online communities (Barab et al., 2014) and the development of the design of online courses (Conole, 2013). Barab et. al. (2014) conducted a multiple year DBR study that focused on the creation of an online community of educators to share, improve and create and/or improve upon inquiry practices in math and science learning contexts in digital community learning environments. This research team also considered and offered theoretical insights on how DBR as a methodological approach could influence future design research. “It was our challenge, and, we would argue, a challenge of design-based research more generally, that the braids be both methodologically sound and theoretically useful” (Barab et al., 2014, p. 329). From a methodological lens, their research goal was to capture and present the identified

braids of change (core issues or major turning points within the research design) as theoretical constructs that potentially could prove useful for others engaged in similar design work.

There is also evidence from open learning research that has used DBR in order to support examples to open learning design interventions. Conole (2013) used DBR to develop an open learning design with an emphasis on visual representations that could communicate meaning and encourage interpreted meanings through collaborative learner interactions. Conole (2013) also encouraged multiple layers of design to support flexible learning iterations for individual learners that promote higher level thinking and problem solving which contributed to the concept of designing for learning in an open world.

Conole (2013) described her DBR methodological process as one which (a) developed conceptual tools to guide the design process and provided the means to share and represent designs, (b) the development of visual tools to support the conceptual tools and enable educators to manipulate and share them digitally with others and (c) the development of collaborative tools to foster communication and sharing. Conole's (2013) multiple studies contributed to the concept of designing for learning in an open world. The present research in a grade ten learning context built upon the DBR process described by Conole (2013) given her focus on collaborative research, the emphasis on flexibility and iteration, the development of tools to provide the ability to communicate meaning and learning, the emphasis on sharing of ideas, and the connection between practice and theory.

The way in which an open learning design intervention provided an ontological innovation for the high school program, was by promoting a learning design that bridges formal learning environments with informal learning opportunities for every learner. Reigeluth and An (2009) proposed a set a DBR characteristics based on a variety of studies completed by DBR

researchers. The way in which the this DBR methodology maps to these characteristics is described below:

- DBR is driven by theory and prior research. The study brought together current research that considered expanded learning environments and networks in high school contexts as a result of OEP. It is sociocultural in nature, with a focus on extending learning environments beyond traditional formal digital environments and encouraging new consideration, reflection and perspectives about open learning theory and emerging OEP.
- DBR is pragmatic. The purpose of this research considered how OEP bridges formal and informal networked learning in order to extend and expand learning environments by increasing the opportunity for learners to interact with other learners and nodes of learning in real and authentic ways. Although the research is theoretically driven, it recognizes and supports the complexity involved in current teaching practices and is only successful with a balance of focus on theory and on practice.
- DBR is collaborative. This research study encouraged close relationships between the researcher, the teacher and the student participants throughout all DBR phases. The high school learners actively participated in the design and direction as collective OEP afforded the potential for the development of open learners. The needs of the researcher, teacher and students were met as a result of an emphasis on communication and clarification of shared understandings and expectations.
- DBR is contextual. The intention of the research was to exemplify the possibilities and potential of connecting formal and informal learning spaces; in order to achieve this potential, the intervention needed to occur in an authentic learning environment which was the program garage, online spaces and other learning spaces including field trips.

- DBR uses multiple dependent variables. The research included multiple variables by examining and analyzing different learning pathways using OLDI as a framework.
- DBR is integrative. The research included a variety of research methods and was open and flexible to changes as needed as the research evolved and the practices emerged.
- DBR entails systematic and comprehensive documentation. This study drew upon and triangulated multiple sources of data to ensure adequate data that supported an extensive analysis of the effects of and potential of OEP and open learning.
- DBR is iterative. There were multiple iterations of potential connections from the classroom into outside networks which encouraged learner interactions and provided opportunities for a bridge that expands from formal into informal networked learning environments.
- DBR is adaptive and flexible. The research design was revised throughout the four learning pathways in order to respond to emerging practice and research contexts. The learning designs consistently aligned with sociocultural principles of learning by using the OLDI framework.
- DBR seeks generalization. The opportunity to connect this research to other K-12 learning contexts was a consideration when the opportunities arose, especially towards the end of the research project. The examination of key principles of OEP in K-12 contexts has unlimited potential to be explored, and therefore, was considered as the research progressed.

The iterative, flexible and collaborative nature of DBR provided the opportunity to study practice and contribute to theory using the open learning design intervention (OLDI) framework. Wang and Hannafin (2005), suggest that,

Design-based research is a research methodology aimed to improve educational practices through systematic, flexible, and iterative review, analysis, design, development, and implementation, based upon collaboration among researchers and practitioners in real-world settings, and leading to design principles or theories (p. 6).

Due to the emerging nature of the research problem and context, this research project needed a flexible methodological approach that used a process (as described by Wang & Hannafin, 2005) to iteratively examine, analyze, change and develop an open learning design intervention. After considering the DBR characteristics, a DBR methodological approach proved to be the correct choice for supporting a flexible process to examine a problem in practice while still emphasising theoretical foundational pedagogical approaches to open learning. DBR provided the balance between research about designing an intervention to support open learning and research that considered the impact of the intervention on teachers and high school learners.

DBR Study Overview

According to Jacobsen (2014), “Increasingly, educators are demanding that educational research addresses the theory-practice gap by producing knowledge that directly informs or arises from complex problems of practice” (p. 22). Using a design-based research methodology, this research considered the theory-practice gap by examining the learning that occurs when the OLDI framework was used as a design intervention into the high school program learning design. OLDI is based on the indicators of OEP that connect the current and emerging research from the review of the literature that bridged formal and informal learning in K-12 learning environments as demonstrated in Figure 3.1.

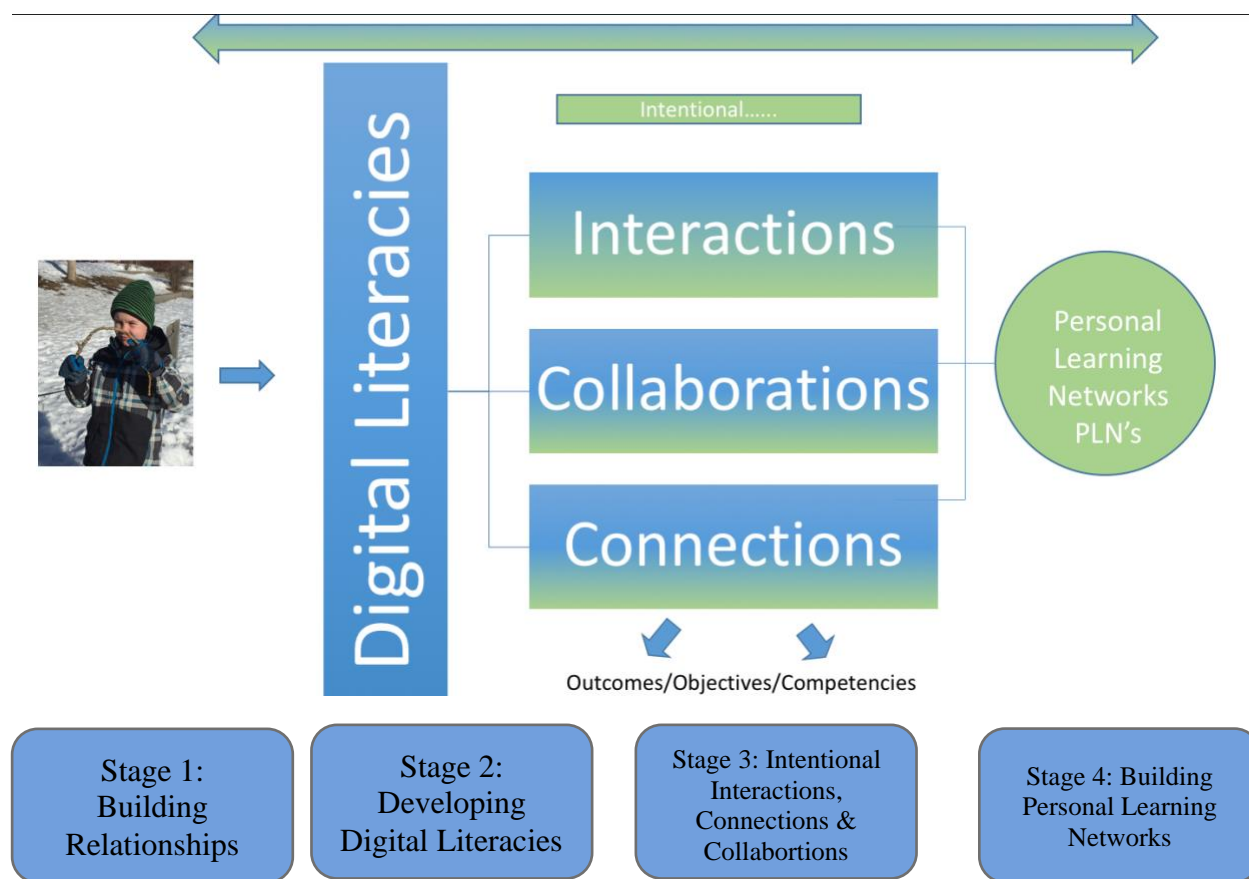


Figure 3.1. The Open Learning Design Intervention (OLDI) Version 1

The OLDI framework is a prototype that is based on the indicators of OEP that connect the current and emerging research from the first micro cycle within the first phase of the DBR which included a literature review and an open learning pilot that bridged formal and informal learning in K-12 learning environments. OLDI is based on indicators of OEP and includes Roberts's (2018) conceptual stages of open learning based on a continuum of learning: Stage 1: Focus on Learner Context – Building Relationships, Stage 2: Development of Digital Literacies, Stage 3: Expanding Learner Environments through Intentional and Interactive Learning by Connecting with Others; and Stage 4: Building a Personal Learning Network. More information about the original four stages can be found in Appendix A.

As will be described in Chapter 6, one of the outcomes of the study was that the OLDI model was redesigned in response to four iterative cycles of design and implementation,

participant feedback and researcher observations. The following figure describes the DBR process used for this research project and was adapted from Kennedy-Clark (2013) and McKenney and Reeves (2012).

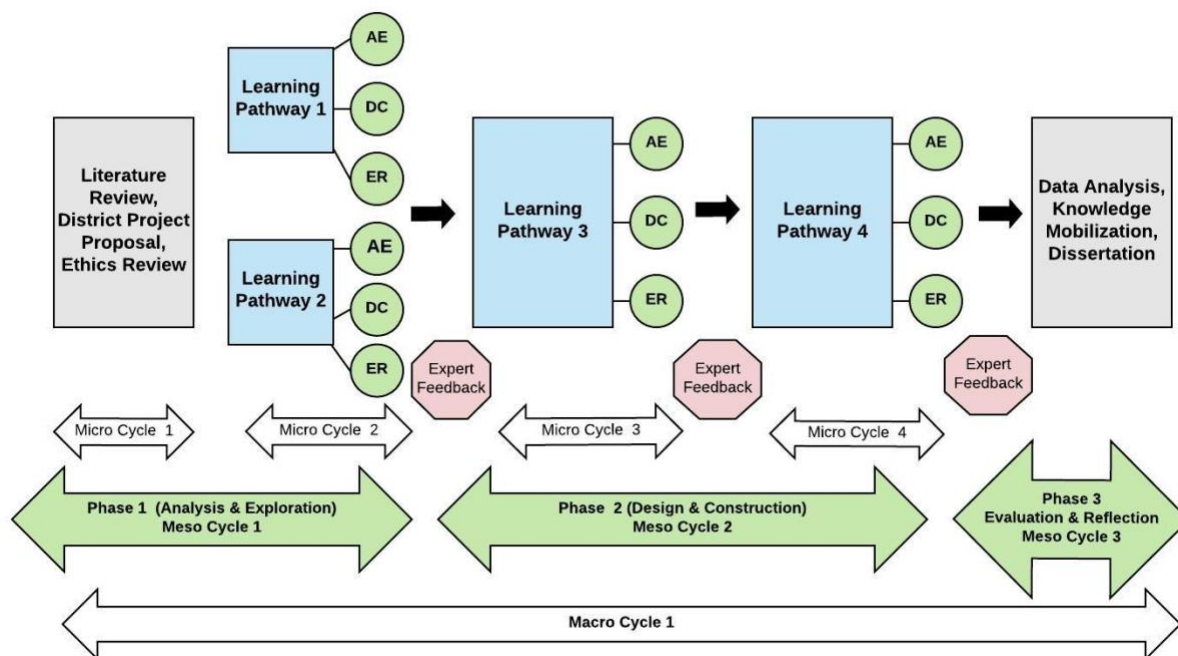


Figure 3.2. Roberts's DBR Methodological Approach Model.

As described in the Figure 3.2 above, the researcher, teacher and students decided to use the term learning pathways to describe each project micro cycle (rather than prototype or meso cycle). Four learning pathways (shortened to LP1, LP2, LP3 and LP4) were completed during the research project, which will be elaborated upon later in this chapter (see Figure 3.6). The teacher and researcher designed for student learning by using the OLDI framework as a guide to design for expanded learning opportunities. The expansion of student learning was examined and analyzed as each learning pathway was completed. The OLDI framework provided a point of convergence from which the teacher and researcher could focus on expanding the students' learning experiences from the regular classroom to a networked learning environment by

encouraging interactions, connections and collaborations with experts and others outside the classroom network of learners and nodes of learning. The iterative process of data collection and analysis allowed the teacher and researcher to examine the learning that resulted from the expansion of learning from the perspective of the BFA program students. Findings that emerged from the cycles of analysis describe how the student learning expanded from the classroom into other learning contexts, based on their personal choices and timing, and what the students learned as a result of the perceived and experienced expansion. A learning design which connected formal learning (classroom-based learning experiences) and informal learning (like community partnerships, open online community projects and social media) was demonstrated through OEP.

DBR Research Cycles

Analysis and exploration of the context and the problem of practice began before the initial open learning design intervention framework was created. Figure 6 is an adaptation of McKenney and Reeve's (2012) generic model for design research and provides an overview of the micro, meso and macro cycles of this study. As mentioned previously, within each cycle, the research process tends to progress through three phases, including the Analysis and Exploration phase, the Designing and Construction phase and the Evaluation and Reflection phase; however, the process is not linear. Due to the responsive nature of DBR, the findings from each of the research cycles informed the next research and design cycle. As a result, the data analysis was amplified through a responsive and iterative approach. The constant and iterative nature of DBR provided multiple benefits to the research team, including: timely feedback and responsive changes to the research design process in order to meet learning outcomes and answer the research questions effectively, multiple means to collect data, multiple people participating in the

data collection and the research process, a mass of data and finally, multiple opportunities to member check, validate and triangulate data for accuracy. Most importantly, using an iterative and responsive data analysis approach throughout and at the end of each cycle, kept the data moving forward and ensured that the participants were engaged and understood the research process and the learning design. Drawing upon the theoretical framework, the researcher brought her own personal sociocultural perspectives of the analysis and data, and she was able to ask the participants if they had similar perceptions or agreed or disagreed with the data analysis in a responsive manner. This feedback loop with participants during the research was essential to ensure that the research was not biased and based only on the researcher's perspective. This DBR macro cycle of research included three phases, phase 1 analysis and exploration, phase 2, design and construction and phase 3 evaluation and reflection.

Phase 1: Analysis and exploration. During phase one, there were two micro cycles of research. Micro cycle one ended with an accepted ethics review, as such all activities are described as prior to data collection. Micro cycle one included the initial explorations of possible research projects across the district, the POP (Positive Online Presence) project with Building Futures in the 2018-2019 school year, the literature review, the project proposal, the candidacy exam and the formal Ethics review. Once all of these activities were completed the data collection began.

Due to the individualized nature of the student projects, and focus on personal learning identity, the micro cycles prototype projects were named Learning Pathways. Each learning pathway was abbreviated to LP1: Searching Online, LP2: Data & Privacy, LP3: Community Problem and LP4: Storytelling & Perspectives.

Micro cycle two included two learning pathways (LP1: Searching Online and LP2: Data & Privacy). Within each learning pathway, the researcher completed mini phases of analysis and exploration, design and construction and evaluation and reflection. These phases ensured iterative data collection and responsive changes to the learning design to support open learning opportunities for high school students. Throughout the micro cycles, the researcher connected with her supervisor and supervisory committee as well as presented preliminary findings at academic conferences.

Phase 2: Design and construction. During phase two, there were two micro cycles of research (LP3: Community Problems and LP4: Storytelling & Perspective). Using the same DBR research methods approach, the researcher completed mini phases of analysis and exploration, design and construction and evaluation and reflection and connected with experts for feedback throughout the research phase.

The following figure describes what was included in each of the DBR cycles in more detail including the timing of the DBR phases. In the figure, phase three includes an image which describes the collaborative co-presentations and presentations the researcher used in order to focus the data analysis. Throughout the rest of this paper, the learning pathways will only be referred to in shortened form, LP1: Searching Online will be LP1, LP2: Data & Privacy will be LP2, LP3: Community Problem will be LP3 and LP4: Storytelling & Perspectives will be LP4.


Phase of DBR	Micro Cycles	Duration
Phase 1: Analysis and Exploration (Meso Cycle 1)	Micro Cycle 1: Literature Review District Pilot Studies (No data collection) Project Proposal Ethics Review Micro Cycle 2: LP1: Searching Online LP2: Data & Privacy	10 months prior to data collection LP1: Searching Online - 2 weeks LP2: Data & Privacy - 3 weeks
Phase 2: Design and Construction (Meso Cycle 2)	Micro Cycle 3: LP3: Community Problem Micro Cycle 4: LP4: Storytelling & Perspectives	LP3: Community Problem - 5 weeks LP4: Storytelling & Perspectives - 8 weeks
Phase 3: Evaluation and Reflection (Meso Cycle 3)	Micro Cycle 5: Data Analysis Co-presentations 	Data Collection Completed

Figure 3.3 Meso and Micro Cycle Descriptions of DBR Research

Phase 3: Evaluation and reflection. During phase three, the researcher and participants completed final collaborative co-presentations and continued to share the research through professional learning opportunities and researcher preliminary research presentations. The researcher integrated the collaborative co-presentations to inform the final data analysis (as described in the sections below). The researcher completed the data analysis, data synthesis, report writing and presented her final dissertation to her supervisory committee.

Research Context

The research was guided by the following sampling parameters: settings, participants, events and processes (Miles, Huberman, & Saldaña, 2014). The primary participants in this research were the Building Futures Airdrie (BFA) program students and the BFA teacher, and the researcher. The settings included the BFA learning environment which included the classroom garage, the work site, and a variety of field trip locations. The research processes included specific activities which focused on student reflection of learning about how OEP expands student learning opportunities, how the (OLDI) scaffolds and supports the learners in open learning opportunities while focusing on the students' and teachers' perspectives of learning that expands from formal and into informal learning environments.

Data Collection Methods

Data was collected over the three macro cycles using an iterative and flexible process, as summarized in Table 3.1

Table 3.1

Summary of Data Collection Methods Within Each Micro-Cycle of the Project

Micro-cycles	Type of data collection
LP1–LP4	Student, teacher, and researcher reflections Researcher classroom observations Visitor and resident maps (V&R maps)

The data collection methods are described in more detail in the sections that follow.

Student reflections. Personal reflections were collected from students to gather descriptions of each participant's context, to capture the meaning of the experience through the learners' perceptions of the impact of OLDI, and to explore evidence of student learning. For

LP1 and LP2, the reflections were based on a common reflective feedback template (see Appendix K) and used the following model: (1) what we learned (2) what we struggled with (3) a question we thought of, or something we need clarification about. Due to the DBR cyclical phases of research, the analysis of the reflections and classroom observations from LP1 and LP2 demonstrated that the researcher needed to change the reflection questions to provide the opportunity for contextualized and personalized student responses based on their immediate experiences and to focus questions on the OLDI stages to ensure alignment with the learning design. The students also provided the feedback that they preferred Google Forms as a means to answer questions, and not the cut and paste template format.

As such, for LP3, the researcher expanded the reflection template into 2 parts (see Appendix L) and for LP4, the students asked for a Google form for ease of use for their final reflections (see Appendix M). These reflections were analyzed as evidence of student learning and learning perspectives given that the students were asked to describe their learning processes and make direct connections to the learning activity. The students had access to their reflections throughout the project and could change and make additions to their reflections up to the final reflection due date (assigned by the teacher). The reflections were read by the researcher at the end of each learning pathway in order to inform and support any design changes to OLDI. All learner reflections from LP1-LP4 were used for the final data analysis.

The reflections guided the analysis of the learner perceptions because they presented examples and descriptions about how the participants were feeling and why they chose to react in certain ways. The reflections were compared and contrasted to classroom observations and in some cases the V&Rmaps to provide context for the learning outcomes, and more insights into the emphasis on the open learning scaffolding. The student reflections helped to describe

perceptions of open learning in high school learning contexts and how high school students demonstrate evidence of learning in open learning environments.

Teacher reflections. The teacher was invited to describe his perceptions of the student learning and the learning context with reflections on how and why the designs expanded the learning environments. The teacher reflections were recorded using zoom video recordings in a .mp3 file format. All of the videos had voice recordings which were transcribed and shared with the teacher for validation and further comment. The teacher also reflected on his perspectives of the student learning outcomes by communicating with the researcher during weekly digital (texting, emailing and phone calls) and face to face communications. The researcher wrote summaries of the teacher-researcher communications in her reflections and in the classroom observations.

Researcher reflections. As a new educational researcher, the researcher started her reflections as she designed the research proposal and continued throughout the research project. Her goal for reflection was to consider, “the stress, the deep personal involvement, the role conflicts, the physical and mental effort, the drudgery and discomfort – and even the danger – of observational studies for the researcher” (Punch, 1998, p. 85). In addition, the researcher used the reflections as an opportunity to reflect upon her own personal bias about open learning, to ensure that the research process was inclusive and guided by participant experiences. She used the personal researcher reflections to reflect on how she could improve as a researcher, as a form of personal project management to document and track the research project and as a means to consider the multiple roles that DBR affords a researcher. DBR provided her the opportunity to authentically participate and engage in classroom-based research. The reflections provided her with a means to consider how theory connects and interrelates in balance with participatory,

field-based research. The researcher reflections were particularly helpful as an additional data source that was used for clarification for some of the student reflections, and to triangulate with classroom observations and teacher reflections, and to reflect upon in context of the existing research literature.

Visitors and resident mapping continuum tool (V&Rmap). To capture the perceptions of students to describe where they learn and what digital tools they learn with in digital spaces, the Visitor and Resident continuum mapping tool (V&Rmaps) was used. The V&Rmap was selected as contextual tool for analysis because it is highly appropriate in dynamic and emerging learning environments such as those considered in DBR research. The V&R maps were used as reference points because they were personalized and contextual. Student reflections and classroom observations were used to clarify or compare and contrast the individual V&Rmaps. The researcher was hoping to provide some kind of short-term comparison of student perceptions of where they learn and what technology and nodes the students are using to learn with.

V&Rmaps were included as a means to consider the student's perceptions of expanded learning in high school learning contexts. White and LeCornu's (2011) Visitor and resident continuum was originally conceived as a typology to replace Prensky's (2001) descriptions of Digital Natives and Digital Immigrants. The V&Rmaps provide a means to examine learner engagement in the online spaces, places and with whom learners connect and develop a new typology of engagement with online technology. The Visitor and Resident (V&R) mapping tool is made up of four quadrants founded upon continuums. The first continuum, as evidenced in Figure 8, split between two quadrants, asks the participants to draw or label any digital spaces in which they visit (like a Google search) versus digital spaces in which they leave a footprint (like social media).



Figure 3.4: Visitor and Resident Online Mapping Continuum. From “Using ‘visitors and residents’ to visualise digital practices,” by White, D. & LeCornu, A., 2017, First Monday, 22(8). CC-Public Domain.

The second part of the V&R mapping tool asks participants to draw or label any digital tools they use when in institutional learning spaces (like Google Classrooms, Moodle or district email) as opposed to personal learning spaces (like Instagram or personal email). “This matrix therefore evolved into a useful tool that allowed [them] to capture the different ways in which individuals engaged with the Web in their institutions as well as outside their institutions. The horizontal axis became the mode of engagement; the vertical, context” (White & LeCornu, 2017, para. 8). The V&R mapping tool that was used in White and LeCornu’s (2017) more recent research, includes a matrix made up of two continuums and four quadrants which is described in Figure 3.5 .

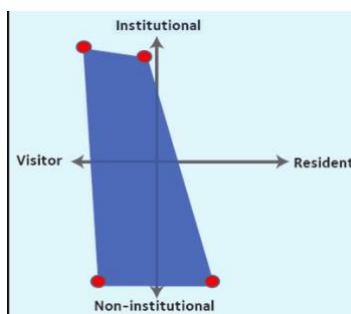


Figure 3.5 Map of how mature distance learners engaged with the Web. From “Using ‘visitors and residents’ to visualise digital practices,” by White, D. & LeCornu, A., 2017, First Monday, 22(8). CC-Public Domain.

In the study, the student research participants used the OCLC Digital Resident and Visitors Mapping App to reflect about their online learning spaces, places and tools at the beginning and end of each learning pathway. The students’ V&R mapping tool artifacts were collected and analyzed throughout the research study to consider where the students were

learning online, including different nodes of learning such as work in digital platforms, choice of digital tools, social media presence, other people, other online spaces, student digital artifacts and student presentations which may support the expansion of their learning environments. In some cases, the students' V&Rmaps provided specific descriptions and details about the digital media and mediums the learners were using and how they used them. Similarly, there was also some evidence to support how the OLDI stages helped structure and guide student learning based on the types of data the students included on the maps. The repetitive use of the V&Rmaps was used as one means to compare and contrast the students' learning perspectives throughout LP1-LP4.

Classroom participant observation protocols. Weekly classroom observations were made to capture, consider and describe deeper insights and personal perspectives of contextual learning that occurred within the classroom and in online learning environments. In order to include as much information as possible, a classroom observation protocol was adapted from an existing classroom observation protocol used with permission from the Galileo Educational Network (www.galileo.org). The adapted classroom observation protocol was used each time in order to increase consistency in the types of data collected across multiple classroom observations and to help collect the most relevant and high-quality data in relation to my research questions. The classroom observations also included links to student digital artifacts and photo images taken of the non-digital artifacts during the observations. Each classroom observation was used as a space to collect observations, but also collect any additional data that could provide insight into the learning as it occurred, such as web links, communications from the teacher and OLDI feedback.

All the classroom observations were organized weekly based on the student LP Google folders and the teacher's Google classroom for LP1, LP2 and LP3. The students had the choice to share their final projects in Google sites, or other open digital artifacts as part of their final presentation for LP1-LP3. The researcher described the difference between sharing with each other in proprietary software and using open source digital tools like WordPress blogs. The teacher and students chose to use Google Apps for Education for LP1-LP3. However, for LP4, the researcher connected the classroom observations to the Trello open project management tool. Classroom learning was completed through Google.docs and the students chose to openly share their final digital stories through a class Google folder OR in Trello through a link.

The classroom observations were used as a means to consider how the learning environments expanded, if the OLDI was an effective means of scaffolding the learning opportunities and the observations provided some insight into the perspectives of participants throughout the research.

Data Analysis and Synthesis

Although the initial OLDI framework was designed as a result of the combination of a literature review and a district program pilot project, the researcher waited to collaboratively design the research project with the teacher, using the OLDI framework to guide the learning design, until after the candidacy exam and ethics approval from the university and the school jurisdiction. The collaborative teacher-researcher learning design started with a meeting which included a review of the researcher's blog posts, the proposal and previous project design concepts. The first version of OLDI (Figure 3.1) was used for the initial design collaboration between the teacher and the researcher.

Designing the Learning Pathways. The research project was initially planned to design three projects (LP1-LP3) with three different conceptual and pedagogical frameworks. All of the learning pathways had a common focus on student digital identity, online presence and sharing their personal learning with others. The LP's were connected to Alberta high school curriculum outcomes. Concurrent with the learning pathways design, the researcher focused specifically on how the OLDI framework could be used to support the learning design and at the same time address the three research questions. By the end of the study, the researcher and teacher had used the original OLDI framework to create four separate learning designs and continued to use and redesign the OLDI framework based on data collected throughout each learning pathway.

LP3 was initially planned as the final learning pathway. However, as the teacher and researcher completed the mini phases of analysis and exploration, design and construction and evaluation and reflection for LP3 and realized that not all of the students had demonstrated evidence of learning as individuals in networked learning environments. Due to the collaborative nature of the learning design and group work, many students demonstrated open group identities by sharing as an anonymous group/project social media identity and not individual open learning identities. With the exception of three students, at the end of LP3, 20 students described (in their reflections and classroom observations) that they did not know how to share their learning, or understand why sharing their learning with others would be beneficial or why expanding learning environments could support their personal learning development. The teacher also noticed a disparity between the learning that was demonstrated in class and in online artifacts and the student final presentations.

LP3 was completed at the end of the 2018 school year. As a result of the feedback, the researcher designed LP4 by using the OLDI framework to develop safe learning spaces, to

encourage students to sharing their learning as individuals, to promote peer feedback, to consider learner accountability in terms of group work and being able to contemplate multiple perspectives, to describe personal learning in terms of their individual transformation and not only in terms of group interactions and to provide a community that would give students feedback and support in a timely fashion.

The initial design was scheduled to be completed between October 10, 2018 and December 20, 2018 (10 weeks). As mentioned in the sections above, learning Pathway 4 was not initially planned with the collaborating teacher at the beginning of the research study. The additional prototype (LP4) was designed and facilitated between Jan 7, 2019 – February 28, 2019. All resources were hyperlinked to the high school program Google site created by the teacher with researcher input.

Learning Pathways Data Collection and Analysis Process

The data analysis process undertaken in this DBR study was carried out in such a way that data analysis was completed throughout the research cycles to inform changes to the OLDI framework. By considering McKenney and Reeves's (2012) DBR cycles, the participants each contributed to three phases of research within each micro cycle. Each micro cycle included the three phases and as the research progressed, changes were made to the OLDI framework and each learning pathway in order to better support learning outcomes.

The following chart describes a summary of the learning pathways and includes the key focus areas, key learning outcomes, skills and competencies, duration of the learning pathways and the OLDI stages most of the students were observed considering and participant roles. A more detailed summary of the LP1-LP4 learning activities and resources connected to the OLDI

framework stages can be found in Appendix B (LP1), Appendix C (LP2), Appendix D (LP3) and Appendix E (LP4).



Figure 3.6: Open Learning Design Intervention by Stages

Throughout the data collection period, the researchers and the teacher had check-in meetings at least once a week to: 1) discuss the open learning design intervention activities, 2) consider the researchers' feedback and note the teachers' and student reflections about their learning and experiences and; 3) collaboratively reconsider and make any changes or updates to the open learning design intervention based on any contextual impact and learner perceptions and behaviours.

- The students were encouraged to give the teacher and researcher feedback on their learning experiences through connecting with the teacher or researcher individually, classroom discussions, or through the weekly student reflection activities.

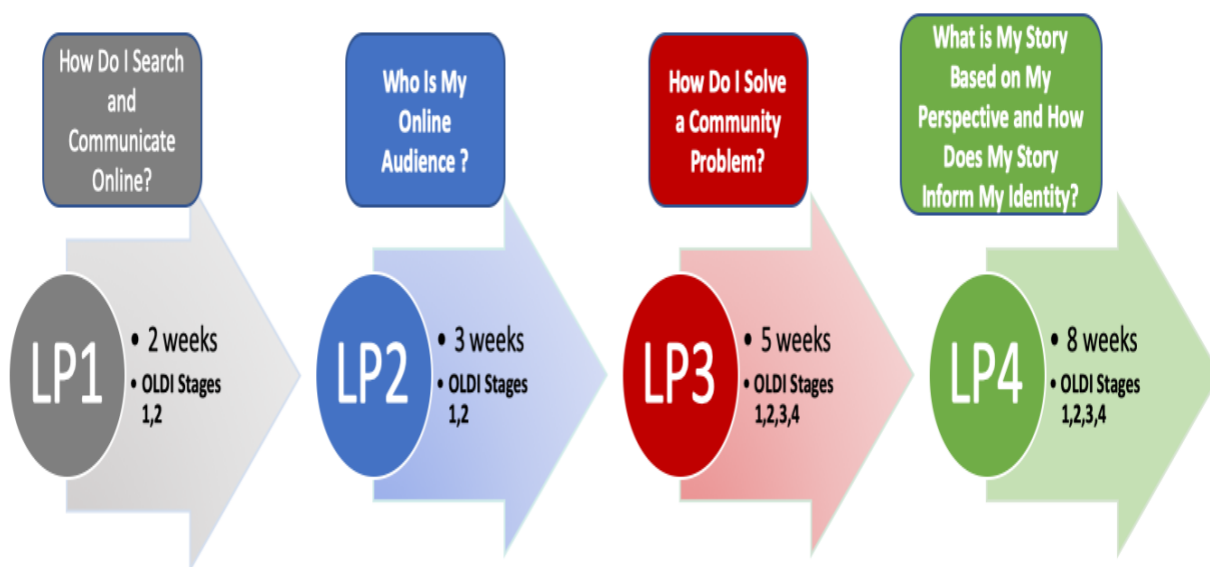
The weekly communications considered:

- The development of the digital literacy skills (and as the research progressed multiliteracy skills) of the students, to connect the evidence of student learning to curriculum and competency outcomes and track student progress
- Analysis of the student reflections. (See Appendix K- Appendix M)

The teacher and researcher always ended each learning pathway with a meeting to synthesize the data collected throughout the learning pathway. It was at these meetings where any major changes in design to the OLDI framework and future learning pathways were considered.

Figure 3.7 summarizes how the teacher and researcher collaborated throughout the research project.

Open Learning Pathways in High School Learning Contexts Using the Open Learning Design Intervention (OLDI) as a Framework for Open Learning Experiences



Sharing Resources	Researcher: Google Site	Researcher: Google Site	Teacher: Project Google Site Researcher: Google Site	Teacher & Researcher: Trello Board
Sharing Learning Experiences as program	Twitter Conference Co-Presentation	Twitter	Twitter Family presentations	Twitter Conference Co-Presentation w/ Researcher Conference Co-Presentation w/ Students District Professional Learning Workshop
Communication Between Teacher & Researcher	2-3 times a week 2 visits a week	2-3 times a week 2 visits a week	5 times a week 2 visits a week	Daily 2-3 visits a week (Sometimes off site)
Collaboration	Teacher: Lead- Teaching class, some teacher-learning design initiated Researcher: Lead -Learning Design	Teacher: Lead- Teaching class, some teacher-learning design initiated Researcher: Lead -Learning Design	Teacher & Researcher: Teaching class & Learning Design	Teacher: Lead- Teaching class, some teacher-learning design initiated Researcher: Lead - Learning Design
Reflections	Many individual	Many individual	None	None

Figure 3.7: Teacher participation in open learning research

The student and teacher perspectives about open learning were collected through reflections (transcribed where necessary), classroom observations, V&R maps and evidence of learning in their digital learning artifacts. Due to the emerging nature of open learning in K-12 learning contexts, the researcher and teacher collaborated to design a research project that

described open learning from the perspectives of the people involved in the open learning process. The data collection was primarily focused on the student, teacher and researcher reflections in order to examine learner and teacher perspectives on open learning. The following questions were considered as the research developed: 1) how can learning become personally relevant, 2) what does expanding a learning environments look like in a high school context, 3) is the Building Futures Program an example of open learning, 4) why interacting and connecting with others can support student learning, 5) how, why, what and with whom do students interact in order to learn, 6) do students connect formal and informal learning in their classroom learning routines, and 7) what are the benefits of sharing learning with others?

Data Collection and Analysis: Phase 1. The data analysis of Phase 1, Macro Cycle 1: Analysis and exploration, was focused on two prototypes called Learning Pathways 1 and 2, which included student, teacher and researcher reflections, classroom observations, V&R maps and one co-presentation between the teacher and researcher. The expert feedback included the teacher and researcher co-presentation, ongoing support from the supervisory committee and other educational experts as they visited the classroom site.

Prior to data collection.

- the researcher completed a literature review on emerging and current examples of research with a focus on designing for sharing, participatory culture and safe learning spaces;
- the researcher collected and reviewed the Alberta Education program of studies, the current participating district digital tools, digital literacy and open learning policies, any artifacts (digital or not) to describe the pedagogical design of the Building Futures

program within the district and any examples of OEP connected to contextual K-12 learning environments across the district;

- the researcher and teacher work collaboratively to design for a new design intervention framework as a result of experimentation with learning designs focused on open educational practice; and
- the researcher, teacher and students completed two pilot studies (LP1 and LP2 micro cycles) using the OLDI framework.

Data collection during LP1 and LP2. The teacher and researcher worked collaboratively to develop and revise a series of activities designed to develop strong foundational digital literacy skills with the students based on Alberta Program of Studies outcomes and Alberta Education curriculum competencies found in English 10 and social studies 10 curriculum.

- The students completed a V&R map at the beginning of LP1, then the end of LP2, LP3 and LP4.
- The students completed prior knowledge activities to ensure the teacher and researcher were meeting their learning needs and to give the teacher and researcher an idea of their current knowledge, skills, abilities and perspectives.
- Analysis of the student reflections. The students completed reflections based on templates (See Appendix K).
- Initially, the teacher recorded personal reflections about the research through zoom, an online conference tool that the researcher and teacher decided to use due to the teacher's comfort level with the tool. The recordings were transcribed and member checked with the teacher.

Data analysis summary LP1 and LP2. The teacher and researcher ended LP1 and LP2 with a check-in meeting to synthesize the data collected throughout the learning pathway. It was at these meetings where any major changes in design to the OLDI framework and future learning pathways were considered. The OLDI framework was changed due to the feedback from the participants in the reflections, V&Rmaps and researcher classroom observations.

V&RMap Analysis. In their reflections, students described how using the Visitor and Resident maps from the beginning of the research helped to shape their ideas that learning happens beyond classroom walls in personal and authentic ways. The V&R maps were originally considered as a means to collect data about the student perceptions of how their learning environments expanded throughout the research project. However, according to the students, the V&R maps were most useful as a reflection tool to develop a stronger awareness of the spaces in which they are already learning. The initial LP1 V&R tool helped the students to develop an awareness of where they learn, who they are learning with and what digital tools support their learning online.

Data Collection and Analysis Phase 2. The data analysis of Phase 2, Macro Cycle 2: Design and construction included two prototypes (LP3 and LP4) which included student, teacher and researcher reflections, classroom observations, V&R maps and consistent communication and feedback between the teacher and researcher. The participating experts expanded to include more people during this phase and included ongoing support from the supervisory committee, experts as they visited the classroom, the families of the students and other immediate community partners.

Data collection during LP3 and LP4.

- The researcher visited the classroom and completed a classroom observation protocol.
- The students completed a V&R map at the end of LP3 and LP4.
- The researcher visited and reviewed student digital artifacts.
- Using the formative assessment rubric as a guide, the teacher and researcher reviewed every participant's project in order to suggest individual feedback and suggestions to all BFA learners.
- The students added their personal reflections and digital artifacts to their Google folders or Google sites
- Analysis of the student reflections. The students completed reflections based on templates (See Appendix L and Appendix M for templates of the reflection questions).
- Students were asked to give feedback about the open learning cycle created by the researcher based on the student reflections, V&Rmaps and classroom observations.

Data analysis summary LP3 and LP4. Due to the opportunity for the researcher and participants to learn about design-based participatory research, there was an extensive collection of data for LP3 and LP4. The student reflections became the primary means of data collection. Throughout the research, student participants were given multiple opportunities to reflect upon their perspectives of their learning experiences. These experiences were documented in specific learning activities which included the learning journal and their project Google.sites for LP3 projects. The students also completed reflections as class assignments in addition to the V&R

maps. An analysis of the classroom observations, teacher and researcher reflections and V&R maps were then triangulated with the student reflections.

It is also important to note a change in researcher role between LP3 and LP4. The researcher had multiple roles to balance within all of the design-based research cycles. For example, the researcher developed relationships with the student participants, the researcher supported the teacher in designing for learning using the OLDI framework, the researcher modelled open educational practice (OEP) for the teacher and the researcher tracked and recorded data. Throughout meso phase 3, the teacher took a more active role in designing, teaching and leading the learning pathway. What was most interesting, was that the students also became much more engaged in the research and process by LP4. The students became the co-designers of their own learning and were able to integrate the OLDI framework to design for their own learning pathways by LP4. As such, by the end of LP4, the researcher had to engage in less support and collaborative roles and expectations than she did for LP1, and thus was able to connect and engage with the students in deeper and more meaningful ways throughout the LP4 classroom visits. A more detailed summary of the LP1-LP4 activities connected to the OLDI framework stages can be found in Appendix B (LP1), Appendix C (LP2), Appendix D (LP3) and Appendix E (LP4).

Data analysis summary LP1-LP4. There was a difference between the amount of data collected in each of the four learning pathways. The student reflections for LP1 and LP2 were not very detailed and were not completed due to some key factors often considered in design-based research (Kennedy-Clark, 2013), which included the lack of experience of the researcher, the number of roles the researcher had to balance and the lack of experience for all research participants in participatory research. The researcher had to begin developing relationships with

the students and teacher during LP1 and LP2, and the researcher was new to participatory research and was challenged by the balance of the role of being a researcher and being an educator, and supporting the teacher in collaborative design. LP1 and LP2 provided the time and space for all of the research participants to develop relationships, define and clarify roles and clarify expectations.

Alternatively, the teacher reflections were more prevalent in LP1 and LP2 than in LP3 and LP4. When the researcher checked with the teacher about the change in reflections, he mentioned his lack of time as a result of designing for a new program (for the following year). As the relationships developed between the research and students, the data collection increased and the quality of the reflections improved. The relationship still developed between the teacher and researcher, and the documentation of this collaborative work was most noted in the researcher reflections, which also increased in number and quality as the research progressed.

There were also differences between the four learning pathways in the classroom observations. The classroom observation protocol can be found in Appendix J. The classroom observation protocol included three sections: Section 1 which included a checklist with questions about teacher practice, student groupings and interactions, environments in which learners are learning, student use of digital literacies and the digital tools used to learn. Section 2 included examples of the Cognitive Level of student knowledge and work and Section 3 included space for specific observations detailing what was occurring in the classroom. For LP1 and LP2, the classroom observations were similar and described how students were using digital tools and spaces to expand their learning. The classroom observations were primarily descriptions of classroom behaviour and how students responded to what they considered, “learning differently” and the cognitive level of student knowledge was at a lower level as there were limited examples

of data that described higher levels of cognitive knowledge. Student, teacher and researcher reflections and V&R maps were used a means to validate the classroom observations.

Data Collection and Analysis Phase 3. The data analysis for Phase 3, Meso Cycle 3: Evaluation and reflection included all of the data collected from all parts of the research. This phase also included broad feedback from other practitioners and researchers during multiple presentations about the research project which included an OER Fellowship presentation, the teacher and researcher co-presenting at a regional educational technology conference, the teacher, students and researcher co-presenting for pre-service Education students at a local University and the researcher presenting at a University graduate poster session and for a final doctoral class. The opportunity to present to a specific audience, who had specific questions about how the students learned and the benefits and strengths of the program, was helpful to inform the researcher's initial open coding, data synthesis and report writing.

As described above, due to the DBR process, the data analysis was completed throughout each micro cycle. The final meso cycle provided the opportunity for the researcher to compare and contrast the data from the entire research project.

Data collection and organization during meso phase 3. After the presentations of the preliminary findings of the research project, the researcher started a full data analysis to compare and contrast data from cycles 1-3. The researcher used QSR Nvivo10© software as a qualitative data analysis computer program to assist in the qualitative analysis process in order to synthesize the data from all learning pathways. The data was collected into the following folders as seen in Figure 3.8 below:

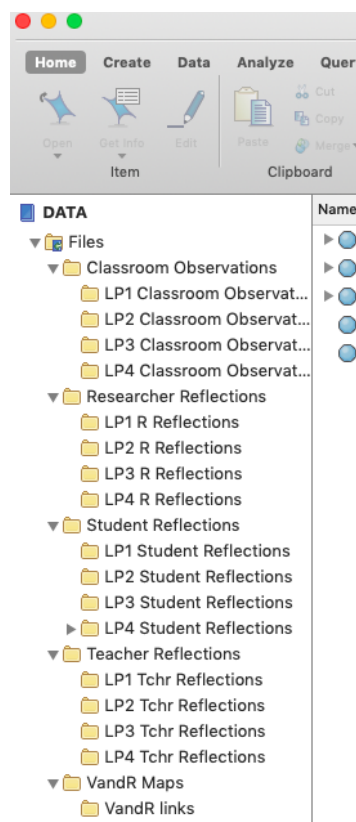


Figure 3.8: Nvivo Folders of Research in Data Collection

Using the DBR methodological approach, the researcher collected a large amount of data, much of which was used to inform the researcher and teacher's collaborative design and refinement of each learning pathway. At the conclusion of the study, the researcher considered multiple lenses from which to code the entire collection of study data in an attempt to balance practice considerations and theoretical considerations. To continue the DBR research approach, the researcher used an iterative approach to the data analysis. An initial coding process created a full set of codes which was reorganized into categories, which were then merged into findings and finally into key themes, concepts, models and the final version of the OLDI framework (Brown, 1999; Saldaña, 2016). The data analysis process is described in the following section.

Data analysis meso phase 3. Using Saldaña's (2016) extensive *Coding Manual for Qualitative Researchers* (2016) as a guide for the final data analysis, to begin the macro phase

three data analysis, the researcher prioritized the data based on the amount of quality examples. The researcher reviewed every participant reflection and classroom observation from each of the four learning pathways (LP1-LP4). With the exception of one of the 23 students, there were multiple examples of student reflections that could be used to describe the students' learning processes and perceptions from the four learning pathways and the students' reflections became the number one data source. The researcher completed classroom observation protocols for multiple classes during the four learning pathways (LP1-LP4) and the classroom observations became the secondary source for data analysis. The teacher reflections were prevalent at the beginning of the study, and then as the study progressed, these reflections were integrated into the researcher reflections on the design cycles, and the teacher-researcher conversations and ongoing communication throughout the four learning pathways. As such, the teacher and researcher reflections became tertiary forms of data collection. Due to the student personalization of the V&R maps, as well as the limited number of responses, the V&R maps became an additional data source to describe student perceptions of expanded learning environments. Any additional digital artifacts were used to explore the emergent codes found within the student reflections.

Coding. The initial coding of student reflections was completed using open coding and followed the qualitative coding suggestions from Saldaña (2016). The researcher examined the student reflections and separated key information based on common themes or ideas. Following the guide of Corbin and Strauss (2008) who describe grounded theory coding, the researcher did not begin to code with a specific research question, instead she focused on a general topic area based on what the student data described. This is an example of some of the initial open coding in the NVivo software using the concept of engagement as a node.

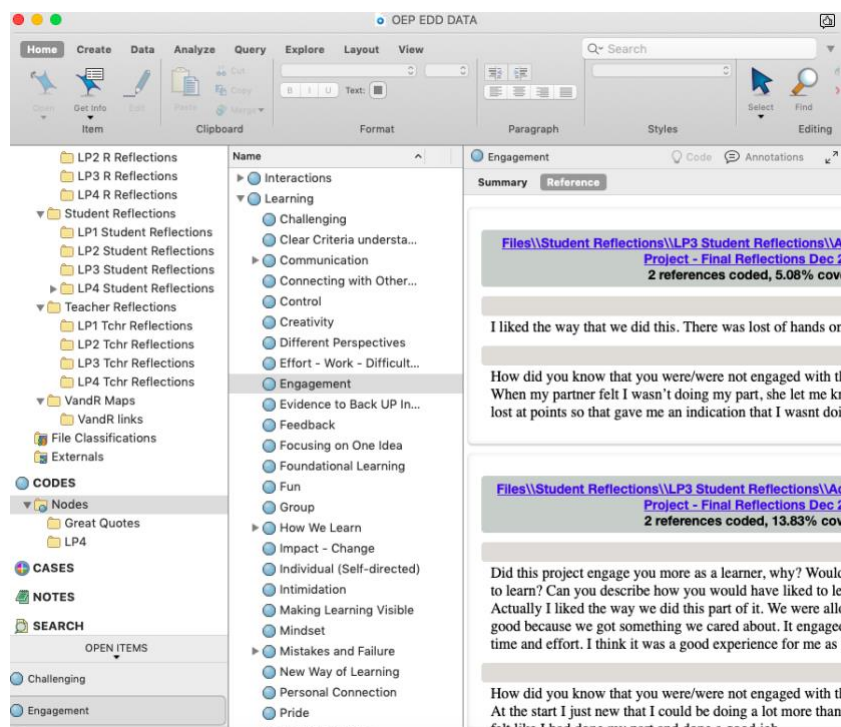


Figure 3.9: Example of Initial Open Coding

As the researcher became more familiar with the broader themes and topics in the data, she became more specific in her coding. At this stage, the researcher used *in-vivo* coding to distinguish smaller and larger categories of data. Figure X provides an example of some of the *in-vivo* coding, which was done separately in word docs rather than in NVivo, as part of the researcher's process of synthesizing broader themes.

I think each project had us push more and more boundaries as we went along. In the first projects the amount risks we took were fairly low, then as we continued along I think it became apparent the gaps we could fill and what we could do to create something bigger than before. Already by the time I got to the second project my research in that one was purely based off of reaching out into the community. I had completed a study that looked at the data and numbers of my peers "screen time" spend throughout the day on their phones. The "Better Airdrie Project" was what really gave the class an opportunity to do something we would never have the chance to do if we weren't in the position and program we're in. It gave us absolute freedom to do what we wanted based off of a few inquiry questions to spark an idea. The more time we spend tossing around the project the more personal and passionate I felt about the project. I learned overall that real learning isn't done behind walls or with boundaries. I believe that the real learning begins when we are left to figure something out, to problem solve, to collaborate and discuss with people of experience. It's about the "doing" and what can be learned from the experience.

Coding colours:

Challenges – Movement

Previously Inconceivable

Clarification needed

Learning Strategy

Risk Taking

Where Learning Happens

Intrinsic Motivation/ Personal Connections

Interactions/Connections

Personal Freedom/Choice

Foundational

Pedagogy

Figure 3.10: Example of *In Vivo* Coding

As the researcher worked with the data, she realized that she had to find a balance between being too general and too specific in her coding. As a result, she decided to develop categories that were not too specific or too general. Using a variety of qualitative data analysis and coding suggestions from Miles, Huberman and Saldaña (2014) the researcher started to collect key concepts and completed a comparative analysis to add similar categories to ensure all smaller categories were collected together. The researcher was then able to add the categories into groups and then emerging themes began to appear. In order to create some kind of boundary to distinguish when the emerging themes had included all the data possible, the researcher considered conceptual emerging theme saturation points. This meant that she meticulously went through the examples of data in the emerging themes to ensure that all emerging themes had

sufficient data, all minor categories fit and connected within larger category (emerging theme) and there was variation within each category (Miles et al., 2014). The researcher also chose to code each learning pathway separately in order to promote open coding rather than prescribed coding. The researcher noticed that there were some similarities between the nodes (key concepts) that emerged from the student reflections in LP3 and LP4.

At this point, the researcher analyzed the emerging themes and data in three different ways to address and account for bias in order to begin connecting themes to the research questions. Based on Saldaña's (2016) recommendations, the researcher used the research questions to split the emerging themes into groups based on how well the emerging themes connected to each research question. This method proved to be the most accurate, easy to understand and clear way of describing the DBR research analysis. The researcher also checked with her supervisor, the teacher and the students as a means to validate the data analysis as an authentic and defensible description of the learning processes throughout the final analysis and as a bias check.

Ethical Considerations

This research was subject to research ethics guidelines and procedures at the University and in the school jurisdiction. Given the specific nature of the OLDI and the context for this research, in a K-12 school jurisdiction, additional attention was paid to privacy and confidentiality.

Institutional research ethics boards. An application to the University of Calgary Conjoint Faculties Research Ethics Board (CFREB) and to the K-12 school district's research ethics review board was completed before the research began and data was collected from participants. Approval of the research by the CFREB and the school jurisdiction ensured that the

foundational ethical considerations were adhered to including gaining informed consent from the students, their parents and the teacher, protecting participants from harm, avoiding deception and protecting the privacy and confidentiality of the research participants (Miles et al., 2014).

Current school district policy. In addition to current ethics protocol, the researcher ensured that the school district's Responsible Use Agreements for all participants were signed to ensure Alberta's Freedom of Information and Privacy (FOIP) Act expectations were clarified and explained (Province of Alberta, 2015). The high school program's digital communication policy states that when learning could be shared in public and open digital spaces, the teacher would send a letter home to parents describing the classroom project and also provided regular email updates during the project. The letter home included a more detailed description of the anticipated outcomes of the project, the networked social media tools the students used for the project and a summary of the project outcomes and an explanation of why the project bridged formal and informal networked learning environments and the timing of the project. Parents were also invited to final presentations of the learning pathway projects (face to face and video conferences) and for multiple activities during LP4 including classroom activities and field trips. The students were also encouraged to share their digital Google folders with their parents.

Informed consent. To ensure there was a clear distinction between the project and the research, a letter of consent for participation in the research study was sent home to the parents and students after the project email was sent home to the parents (See Appendix P). The students chose to participate and consent to the research or not; parents chose to consent to have their child participate in the research or not; the researcher collected all consent forms. Data was collected from students from whom the researcher had both the students' assent and the parents' consent (See Appendix Q and R). The teacher did not know whether or not students and their

parents had consented to participate in the research. All of the participants always had the option to discontinue their participation at any point throughout the research as well as choosing to consent after initially considering not to consent.

Participant confidentiality–learning in open and public spaces. As a result of the district pilot studies (the Positive Online Presence project), the teacher and researcher were able to consider different models in order to examine student perceptions of learning which connected formal and informal learning environments. It is always essential to ensure the security and privacy when considering social media integration. Participants were not asked to share any social media identities, nor were they asked to blend their personal social media identities in any learning pathways. In an attempt to diminish anxiety or distress for the students, the White and LeCornu (2011) visitor and resident mapping activity was intentionally chosen to ensure that the participants were able to choose what aspects of their online identity they wish to have examined and what aspects they wish to keep private. The V&R mapping tool provided an intentional attempt to promote student voice, choice and protection of aspects of personal identity. In addition, LP1 and LP2 provided a strong foundation in digital literacies including data security and privacy. When the students were offered the program in the spring of 2018, the research was also mentioned as a possibility when describing the opportunity to participate in the BFA program. The students were asked to choose a pseudonym to correlate their V&R maps with their evidence of learning to ensure their data was anonymous in the publication of any research. It is important to note that two students (and their parents) chose to give consent to participate in the research after LP4 was completed. As a result, the researcher went back through the online data sources and added the student data that was previously ignored.

The teacher participated in the writing of research articles and summaries and public district blog posts, and as such, is not anonymous, and was aware that he would not be anonymous prior to the research being carried out. As an active participant in the design-based research, the teacher's involvement was also voluntary, and they could stop participating at any time.

Data and personal information storage. The study data and participant information was stored in a variety of ethically safe ways. The V&R maps were stored on the researcher's personal computer as digital artifacts and stored behind a password. The data was saved onto the researcher's password encrypted personal laptop. The classroom observations were collaboratively created in Google docs then downloaded as word docs. The notes were downloaded into Word documents and stored on the researcher's encrypted personal laptop. All digital content was downloaded from Google apps into word docs to be added into NVivo. Some student learning was open to the public based on student choice. It was always the decision of the student if they wished to make their digital content public or private.

Issues of Trustworthiness

Credibility and triangulation of data. In order to ensure that this DBR project is rigorous and credible, Confrey (2006) provides three sources of evidence to examine design-based research processes. These sources consider (i) has the experimentation/investigation has itself been adequately conducted and analyzed? (ii) are the claims justified, robust, significant relative to the data and the theory, and subjected to alternative interpretations? and (iii) are the claims to the practices of education explicit and feasible? This research used these questions to guide the commitment to rigor, validity and credibility throughout the research process.

Credibility is ensuring that the participant's perceptions of the research are validated by the participants themselves (Bloomberg & Volpe, 2016). The iterative validation of data throughout the DBR process through data analysis and member checking is essential because of possible implications of research bias. As Barab and Squire (2004) suggested, "if a researcher is intimately involved in the conceptualization, design, development, implementation, and re-researching of a pedagogical approach, then ensuring that researchers can make credible and trustworthy assertions is a challenge" (p.10). The ongoing participant validation of researcher insights and findings ensured that the research examined the participants' thoughts, feelings and actions during the experience in a credible way. The researcher was able to compare and contrast the student perspectives and was able to clarify any questions during classroom observation time. The researcher strove to ensure credible research findings by collecting and triangulating data with an emphasis on corroborating evidence from various sources (Creswell, 2015). The triangulation of data was demonstrated by choosing a variety of data collection methods; the student reflections and evidence of learning, classroom observations, V&R maps, teacher and researcher reflections, and the final student presentations with teacher feedback and reflections. The researcher consistently modelled open learning by using a personal V&R map as an example for participants as well as describing personal learning throughout the research process by blogging and connecting with other researchers through social media and on the project Google site. The researcher describes and presented analysis and findings, including presenting those which present negative instances or discrepant findings, in order to ensure all perspectives and views were analyzed and documented (Bloomberg & Volpe, 2016).

Similarly, member checking, or respondent validation is a means to ensure the credibility of the data (Creswell, 2015). The researcher had several layers of external and member checking.

Design-based research provides a natural means, through researcher – teacher collaboration and ongoing review of student work, which ensured iterative member checking is completed throughout the entire implementation and data collection phase. In addition, in the initial stages of the research, there was time spent developing a collaborative research relationship. This relationship building included specific team building ground rules, which included expectations around peer feedback, boundaries and communication of research ideas and processes. The students had access to all of their reflections throughout the research project and could make additions or edits to ensure clarity of their ideas. Students were also asked to give the researcher feedback about the OLDI framework and the open learning design cycle. Most importantly, the students co-presented with the teacher and researcher. These co-presentations gave the researcher the opportunity to clarify ideas and ensure that the emerging themes and coding connected with what the participants wanted to articulate. The continuous and regular meetings and discussions between the researcher, the teacher, the supervisor, and supervisory committee provided regular member checking and critique. The teacher was also sent all transcripts of his reflections and interviews, drafts of the emerging themes as they developed and updates of all researcher presentations.

Dependability. In order to be able to track and repeat the research process, the research process must provide evidence of dependability (Bloomberg & Volpe, 2016). Using DBR as a methodological approach has provided an extensive research sandbox which has provided the opportunity to pilot and prototype the methodological design in an authentic learning space (the classroom itself). Numerous open learning pilots and prototypes were attempted throughout the district before the initial research design was chosen. There are multiple points within the DBR process in which the design process was changed due to the flexible nature of the methodology.

As a result of the iterative research tracking process, the research design afforded a transferability that was replicated and remixed to suit the needs of multiple research contexts. This was most evident with the addition of another initially unplanned learning pathway and extension to the data collection timeframe. In addition, the researcher has been asked to transfer and apply the OLDI framework in other regular high school contexts, school district professional learning workshops and for higher education professional open learning opportunities.

Delimitations of the Study

Delimitations of research describe the boundaries that were set for this research study include why the researcher chose her specific topic, objectives, methods and process as well as the specific research context and environment. The researcher chose several delimitations for the research including the choice of methodology and the learning context choice. DBR provided an opportunity to provide multiple perspectives on emerging topics that have yet to be researched and the potential to be extended upon by other researchers in different ways. The emerging nature of this research topic confused many teachers, and it was important to first examine and describe open learning in K-12 contexts. As a result, despite multiple possibilities in which to study open educational practice in K-12 learning environments, the researcher chose to work with a specific high school program and a particular teacher. After numerous other open project attempts across the district, the collaborative relationship developed between the researcher and teachers and provided the kind of authentic research opportunity described by founding design-based researchers (Brown, 1992; McKenney & Reeves, 2012).

Summary

DBR provided the means to design for a research project that focused on an emerging problem of practice while extending upon what is already known about open learning theory.

The OLDI framework changed and was updated based on the feedback and iterative and responsive nature of the DBR data collection and analysis process. The amount of data collected ensured that there were multiple ways to validate and triangulate the participant voices and perceived descriptions of open learning and expanded learning environments. The analysis was completed throughout the study, by interpreting, triangulating and member checking in order to synthesize the data and respond to any changes that needed to be made to the learning design in a timely fashion. DBR provided a flexible and iterative research process that helped support multiple participant roles, participant expectations and participant tensions through multiple iterations. Overall, DBR provided the conditions to examine how students consider how to expand their learning into learning environments.

The fourth chapter describes the next step in the DBR data analysis process. After collecting and coding the data into categories, the categories were then compared and contrasted. The findings that emerged from the comparison of the data collection categories are the next phase in the DBR iteration of data analysis and are described in the following chapters four and five.

Chapter 4: Presentation of Findings That Consider Participant Perspectives

Due to the participatory and iterative nature of the design-based research approach taken in this study, there was an abundance of data from which to consider the research questions. In chapters four and five, the findings from an iterative data analysis that emerged through the three DBR meso cycles, are presented. First, a summary of the research is provided. Then, research question one will be examined which asked, what are students' and teachers' perspectives of open learning experiences? Then, specific findings related to research question one, which summarizes the participant perspectives of open and expanded learning opportunities are described. Chapter 5 is a summary of findings related to research questions two and three, that focused on the extent in which OEP can expand learning opportunities for high school learners and how the OLDI supports teachers in designing for open learning.

Data Demographics

Participants in this study included the researcher, one teacher and twenty-three grade ten students. The male teacher, who was a primary participant, had been teaching for a total of 10 years. The research originally started with 21 students and expanded to 23 grade 10 students by the end of the study. The grade ten students were between 15 and 16 years of age. The teacher had been teaching with the Building Futures program for 5 years with a second teacher who was not included in the study. An equal number of male ($n = 11$) and female ($n = 11$) students assented to participate in the study and one student who self-identified as other. Parents also provided consent for their child to participate in the research. The Building Futures model intentionally integrates students who bring multiple levels of academic abilities in every cohort and there is an effort to encourage diversity and inclusive learning for those students who wish to apply for the program. The student participants applied to join the Building Futures program

from multiple schools across a geographic school zone which includes 5 different high schools and home-schooling learning contexts. Rather than being combined into one assigned course based on academic ability, the students had the option of completing English 10-1 or 10-2 and social studies 10-1 and 10-2 based on their evidence of learning and engagement throughout the year. The students came from different academic programs and socioeconomic backgrounds based on the teacher created intentional selection criteria to the Building Futures program.

Overview

This study describes and reports findings on the completion of one macro phase of a design-based research project to explore how an open learning design intervention can encourage the development of OEP for a teacher, and as a result, to expand learning opportunities for high school students. The three research questions described in Chapter 1 and the Open Learning Design Intervention (OLDI) were used to frame the study in order to consider how open learning can support all learners in making a transition from closed classroom settings to personal learning networks. Several methods of data collection were used in this study which included (i) student, teacher and researcher reflections; (ii) classroom observations and field notes; (iii) visitor and resident maps; and (vi) digital artifacts submitted by participants in the study throughout learning pathways one to learning pathways four. Table 4.1 (below) describes the numbers of each method of data that was analyzed. The table provides evidence to inform an emphasis on analyzing student reflections and digital artifacts and using other data collection methods to support the primary methods.

Table 4.1

Data Collection Tracking Sheet LP1–LP4

	LP1	LP2	LP3	LP4	Totals
Student Reflections	61 Reflections	21 Reflections	75 Reflections	20 Final reflections 31 Activity Reflections	208 Reflections
Digital Artifacts (Including Final Project Presentation links & Videos)	5 Final Project Links	10 Final project links 10 digital activities in Google folder	13 Final project links	23 personal videos 7 documentary video footage cuts 44 Literature Kit Paragraph Summaries	28 Final project links 23 personal videos 7 documentary video footage cuts 10 digital activities 44 paragraph summaries
V&R Maps	17	17	16	12	62 V&R maps
Teacher Reflections	5	3	1 (Final interview)	1 (Final interview)	10 Teacher reflections
Classroom Observations	5	6	8	9	28 classroom observations
‘Other’ Engagement with participants & research partners (over one hour) (Field trips, meetings, presentations)	3	1	1	9	14 “Other” engagements with participants

All of the learning pathways had a common focus on student digital identity, online presence and sharing their personal learning with others. The LPs were connected to Alberta high school curriculum outcomes. Concurrent with the learning pathways design, the researcher focused specifically on how the OLDI framework could be used to support the learning design

and at the same time address the three research questions. By the end of the study, the researcher and teacher had used the original OLDI framework to create four separate learning designs, and continued to change and improve upon the OLDI framework as the data was collected throughout each learning pathway.

Summary of the learning pathways to describe how student learning expanded beyond classroom walls. While all learning pathways were designed to encourage students to expand their learning beyond formal classroom walls, in this study, it became evident that LP1 and LP2 were practice open learning spaces. LP1 and LP2 could be described as walled gardens where students could try new things, make mistakes and try again with limited input and feedback from others beyond classroom walls. The student connections and interactions with other people and social media outside the classroom was limited, but they did interact and connect with public resources and people connected to the teacher and researcher's personal learning networks.

LP1 and LP2 had limited student reflections which expand beyond the basic researcher questions, the students were challenged with basic digital literacy skills and competencies and during classroom observation time, the researcher acted as a co-teacher, mentor, facilitator and researcher in order to model open learning design and pedagogical approaches. With the exception of one student (Student F) who from the beginning of the research demonstrated evidence of learning in communities and networks beyond the classroom walls and regularly integrated these examples into classroom learning, 22 of the participating students began the research study separating their classroom learning from outside the classroom learning. As such, both LP1 and LP2 were walled gardens in which students prepared for open and expanded learning opportunities but did not necessarily demonstrate how to be an open learner. The way in

which the students described how they developed the confidence to expand their learning is described in the findings in the following sections of this chapter and Chapter 5.

Whereas, LP3 and LP4 exemplified how high school learners can expand their learning beyond classroom walls and why they chose to expand them. LP3 was initially planned as the final learning pathway, as initially there were only going to be three micro cycles in the research study. However, as the teacher and researcher completed the mini phases of analysis and exploration, design and construction and evaluation and reflection for LP3, the teacher and researcher realized some discrepancies in the student evidence of learning. At the end of LP3, there were noticeable concerns from the teacher and researcher and from the students.

The teacher noticed a disparity between the learning that was demonstrated in class formative assessment and in online artifacts as a result of formative assessment practices and the student final presentations. During the process, the students would describe or consider possible strategies to solve problems and take action; however, their final (summative) assessments did not describe or demonstrate what they said they were going to do. In addition, not all of the students demonstrated evidence of learning as individuals in networked learning environments. Many of the groups chose to demonstrate their learning through a public group identity in social media (like a project name social media account in Instagram) or a public Google site (blog). Due to the collaborative nature of the learning design and group work, many students demonstrated open group identities by sharing as anonymous group/project social media identity and not individual open learning identities. As a result, it was difficult to distinguish how an individual student was expanding learning as opposed to a group of students. The reflection questions helped to distinguish the differences between group and individual identities, and it was at the end of LP3 that the reflections revealed some anxiety about the concept of sharing

learning with others. The students also described the lack of feedback from the community and how the lack of feedback greatly affected their learning. Many students were incredibly frustrated by the lack of community response to help them with their learning; many felt that the outside world did not take them seriously, or did not have time for them. With the exception of 3 students, by the end of LP3, 20 students had described (in reflections and classroom observations) that they did not know how to share their learning, or understand why sharing their learning with others would be beneficial or why expanding learning environments could support their personal learning development. As a result, major pedagogical design changes were made to encourage students to consider alternative perspectives about the importance of their choice to share for LP4. Discrepancies between the process of learning, what students said they were going to do or wanted to do, with the actual final results, the group public project identities and feedback about how students felt about community feedback, ensured design changes for LP4.

As a result of the feedback, the researcher designed LP4 by using the OLDI framework to develop safe learning spaces, to encourage students to sharing their learning as individuals, to promote peer feedback, to consider learner accountability in terms of group work and being able to contemplate multiple perspectives, to describe personal learning in terms of their individual transformation and not only in terms of group interactions and to provide a community that would give students feedback and support in a timely fashion. It is also important to note throughout LP1-LP4, that there were no examples of inappropriate or unsafe learning experiences in open learning environments based on student reflections, discussions with all the participants, classroom observations or in digital or face to face spaces. This accountability could mean that the students had the time and experience to learn about digital literacy in LP1 and LP2 in their walled gardens which ensured a focus on open learning and positive learning experience

for the students in LP3 and LP4. The findings described in the sections below consider the transformation and stages the learners described as they developed an awareness of the potential of open learning.

Using three main research questions to guide the data collection and analysis, the information from Building Futures Program learners and teacher experiences provided a fertile ground in which to examine the research questions. The data was collected and coded, as described in Chapter 3, and the findings in alignment with the first research question are described in the sections below and following chapter.

Findings: Participant Perspectives of Open Learning Experiences

Table 4.2

Findings Connected to Research Question One: What are Students' and Teachers' Perspectives of Open Learning Experiences?

Finding 1.1	The students described personal, impactful and real-life connections to the learning process as an essential element of open learning.
Finding 1.2	The students described the concept of expanded learning environments in different ways based on their personal learning contexts.
Finding 1.3	The students identified the integration of curriculum and competencies (skills, knowledge and abilities not in the curriculum) as equally important to their personal open learning process.
Finding 1.4	The students indicated awareness of their nodes of learning which included who they interacted, connected and collaborated with and who they shared as.
Finding 1.5	The students indicated a connection between the development of digital literacies and being able to connect and interact with other nodes of learning (people and resources).
Finding 1.6	The students described a transition from digital to multiliteracies as a result of how they communicated their evidence of learning.
Finding 1.7	Students became aware of how learning environments expand by identifying the spaces in which they learn and the digital tools and experiences that are used to support learning in these spaces.
Finding 1.8	The students described how they became aware of the importance of learning spaces in order to be open in their learning.
Finding 1.9	The students indicated that the concept of sharing is dependent upon medium and context.
Finding 1.10	Students indicated they needed opportunities to share with their immediate learning community first in order build confidence before sharing with the broader learning community.
Finding 1.11	Continuous feedback provided participants an opportunity to question the open learning process.
Finding 1.12	When given freedom and control over their own learning, students indicated they felt more ownership of their learning and were more engaged in the learning process.
Finding 1.13	Students indicated that they developed an awareness of different pedagogical approaches.
Finding 1.14	According to the teacher, OEP encourages a development of high school learner identity.
Finding 1.15	The teacher indicated that participatory and collaborative learning design are essential components of open educational practices.

Finding 1.1: The students described personal, impactful and real-life connections to the learning process as an essential element of open learning. One of the most common ways that learners described their learning was through how they perceived that the learning encouraged personal learning connections to their personal learning contexts. The students described their perception of personal connections in three ways: (a) personal interest (passion, relevancy and engagement), (b) making a difference to the world (impact) and (c) real-life connections (connection to career or everyday life skills). In all three types of personal connections the students described an increased sense of learning engagement. In the next three sections, the different student perceptions that describe personal connections to learning are examined.

Personal interest. When considering the personal interest context, student reflections often described why the learning was or was not interesting and engaging to them given their personal interest in the topic or idea. One student said, “LP1 didn’t really connect to my personal life and very few of the topics helped me as a learner” (Student W, LP3). Another stated,

I did not really enjoy doing LP1. Why? Because I felt that our question on FOMO didn’t really apply to me. I thought that another question would have been better. FOMO applies to me a little but not enough to interest me very much. (Student D, LP1)

Similarly, early on in the research, it was evident that some students struggled between recognizing the importance of digital literacy and what we were doing in class, and experiencing the need for technology in more authentic contexts. They described the potential to learn about the key concepts of digital literacy, but in a different more personalized way. For example, when asked for an observation regarding the use of technology in learning, one student said,

I somewhat have mixed feelings about learning online. I don’t enjoy sitting at a desk and looking at a computer all day. I love using my hands and being outside. Yet I know that technology is growing and developing and I feel like we need to know how it works. Society and the world is based upon technology and I feel like if we don’t have the basic

knowledge on how to work it we won't be able to grow and develop. I just wish that there was a different way we could learn about technology. (Student M, LP1)

Based on student feedback, the teacher and researcher noted the importance of personal connection and ensured the learning design increased opportunities for students to make personal connections to the learning pathways. Many students emphasized the connection between personal interest through descriptions of perceived increased student engagement and different feelings about learning. One student said,

Learning outside of the classroom personally doesn't always feel like school, school is something I have to do, but learning outside is something normally based on my interests, in which I take more time to understand. (Student Q, LP4)

While another student reflected that, "The project was our group's idea and we could do something that interested us instead of doing a project that was assigned by the teachers".

(Student B, LP3)

These research reflections about personal connections were an excellent source of feedback for the teacher and researcher and made a direct contribution to future learning pathway learning designs. The early reflections from students informed the learning design by prioritizing attention to personal interests and ensured an emphasis on how to co-design future iterations of learning pathways (LP2-LP4).

Making a difference to the world. Alternatively, the student reflections described a personal connection when they felt like they were making a difference or impacting the world.

Our second last project (LP3) was possibly the most emotionally involved of the four for myself. We tackled an issue that I have been fascinated by since I was old enough to understand it, and through this we were able to bring up an important issue in the community, and see how others in the communities felt. (Student F, LP4)

A challenge I faced with this assignment was understanding the impact of what I can do as an individual in my community, that I can really change the outcome of a situation and negotiation of a topic based on us simply bringing up an issue that we noticed. This week created a way of looking at something in my community and actually thinking about what I can do to potentially fix it. (Student Q, LP1)

When students chose to describe their personal connection to learning as a result of making a difference to the world, their reflections tended to also connect to emotions. These examples also tended to include ways that the students felt that they could contribute to solving or fixing community problems. This cluster of reflections also revealed that the students felt some kind of connection, and possibly some level of responsibility, to their community.

Real-life connections. Finally, some of the students describe personal connection as something that directly connects to real-life, so therefore is more relevant to their learning in terms of connecting course content and topics to their current personal lives and perceived connections to their future job prospects.

LP2 to an extent connects to my personal life because I'm on social media all the time and I never really thought of who is seeing my content so being able to find out who is looking at your online profiles can be a little scary but useful. (Student R, LP3)

Learning outside of the classroom I have been able to develop actual life skills that will be useful to me in the future like how to reach out and what design thinking is, and how it's useful. (Student I, LP4)

LP2 was more interesting to me. We got to learn about big data and how it is used in the real world. (Student G, LP3)

The opportunity for real-life connections in the learning pathways created links to personal, authentic and relevant learning contexts for multiple students. This is one example of how a student described his learning task as a way to represent different aspects of his identity: "My story talked about me being me, race, religion, and many other topics". (Student T, LP4)

Another student described the learning as personally relevant because she was able to describe the space in which she learns, specifically digital spaces, to others in her family,.

LP1 connected me to real life examples by our questions and doing the research. For example one of our questions talks about how teenagers are stereotyped for always being on their phones, and that is because the older generations don't realize that teens can do homework on their phones, too, not just on a computer. This is a real life example

because I deal with this on a weekly basis, my dad doesn't realize that I am doing homework on my phone when he tells me to get off my phone. (Student U, LP3)

Once students started to connect their personal learning contexts with what they were doing in school, the teacher and researcher were able to start co-designing learning pathways with the students that more consistently led to deeper learning. As a result of co-designing the learning pathways three and four, each student created personalized learning pathways that met their learning needs while meeting (and often exceeding) expected curriculum outcomes and personal learning expectations.

Finding 1.2 The students described the concept of expanded learning environments in different ways based on their personal learning contexts. As described in the students and teacher reflections about the student learning, open learning environments are expanded learning environments, because they open the learning to all possible learning contexts rather than limiting them to isolated closed contexts. Specifically, expanded learning environments expand from the formal classroom out and into other learning spaces, experiences, people, digital networks and digital content as described by the students. In the literature, these learning environments have been labeled formal, informal and networked learning environments (boyd, 2010 Greenhow & Askari, 2017; Ito et al., 2013). However, while current research described in Chapter 1 may describe a formal learning environment as one that is walled in by the school district policies or more traditional teacher practices and informal as learning that happens outside of the classroom, the students began to describe different perspectives of what constitutes learning that connects and originates from a formal learning context. At the beginning of the research, most of the students would identify their learning as inside or outside the classroom. By the end of the research, the majority of the students identified the spaces in which they learn as

their learning space, and the distinction between inside or outside the classroom did not appear to matter as much.

The characteristics of expanded learning environments included four major characteristics as described by examples in the student reflections: 1) Expanded learning experiences describe learning that happens all around humans, regardless of formal or informal, digital or face to face learning labels, 2) Expanded learning is a natural, biological and calming process. Students described expanded learning as a natural way to learn that calms them rather than causes anxiety, 3) Expanded learning is contextually authentic and connected. Students perceived connecting with others outside their classroom as relevant and authentic learning which helped them figure out community interests and needs because it connected to real life and authentic learning experiences, and 4) Expanded learning is personally relevant and promotes learner choice. Each of these four characteristics of expanded learning environments will be elaborated upon next.

1. Expanded learning experiences describe learning that happens all around humans, regardless of formal or informal, digital or face to face learning labels.

This student considers the serendipitous nature of learning.

I think we learn while having conversations with others without even realizing it. We often have this mentality of “learning only happens inside school” when that isn’t true. Learning happens all around us and these projects really helped me realize this. (Student C, LP3)

2. Expanded learning is natural, biological and calming. Students described expanded learning as a natural way to learn that calms them rather than causes anxiety.

This student describes her perception of learning as more human and natural.

The biggest difference is that learning outside of the classroom connects with a more real definition of learning. In life you learn every day, and everything you do is processed one way or another in your brain, it then alters and stores itself into a form of useful

information that can be used in the future. The difference between learning in a classical school setting versus in the generality of life, is that learning in school is reduced to only one aspect of learning, study. But in life you are not being taught to learn it is a response you don't have to comply with, you don't have to remember to learn. That's why learning in the real world is so beneficial. Most of the time you are not aware you are in fact "learning" so there is no resistance to it, and more information can be absorbed. I also think it's an important way for students to get exposure to what life is like after they get out of school, so they can come to the less directed and linear idea of "learning". (Student E, LP4)

3. Expanded learning is contextually authentic and connected. Students perceived connecting with others outside their classroom as relevant and authentic learning which helped them figure out community interests and needs because it connected to real life and authentic learning experiences.

The following student describes learning as being connected to community.

I've been able to talk to people who know more about the subject than I do and learn from them, and I was able to learn more about my community, what it needed, and new people from my community. (Student G, LP3)

4. Expanded learning is personally relevant and promotes learner choice.

This student describes the importance of the difference between learning the prescribed curriculum and connecting personal interests to the prescribed curriculum.

In my opinion things are way easier when I have other people to talk to outside the classroom. Since I can learn from people that are not my teachers or classmates also gives me the chance to learn about things I am passionate about. If we couldn't do that it would be a little more traditional by telling you what to learn and how to learn it instead of being able to learn what you want in your own way. (Student G, LP4)

Although there are only four examples above, by the end of LP4, all but one of the students described their learning like a permeable boundary that does not distinguish between formal and informal learning. As the students were encouraged to connect their personal interests and parts of themselves in the learning pathways, their descriptions and awareness of expanded learning environments appeared to increase. While one student may have described expanded or

open learning as sharing her learning with a student they did not know well, another student considered expansion as sharing themselves on social media. The teacher also reflected upon the student difficulty to share with each other, "...the bigger question is what do you want to share with people and what did that look like? Like what holds us back, what is that limitation right?" It is essential to consider what expanding personal learning experiences means to each learner because how the students perceive being an open learner, how they want to expand their learning environment, and who they want to include in that expansion, is likely different for everyone.

Finding 1.3: The students identified the integration of curriculum and competencies (skills, knowledge and abilities not in the curriculum) as equally important to their personal open learning process. In their reflections and as documented in classroom observations, the students described the opportunity to learn beyond the expectations of the curriculum. In their reflections and during classroom observations, the students described the development of communication skills as they reflected upon how they connected, interacted and collaborated with others in order to learn. For example, many students described their new competency in communicating meaning through different visible artifacts in LP2.

LP2 allowed me to see that thinking can be expressed visibly and that resorting to my default of writing doesn't always have to be the case. I really enjoyed the fact that this project has pushed me outside of my comfort zone in so many aspects. Even just the fact of having to stand in front of the class and present on my own brought me to the realization that this unit and this year as a whole has really been able to shape me into a better version of myself. (Student E, LP3)

The same student reflected upon how all four of the projects encouraged her to make connections between curriculum and personal skills and competencies:

The last four projects have touched beyond my school life and into all aspects of who I am as a person. This includes everything from my social skills, to my ability to carry meaningful conversations about real topics, it's expanded my curiosity, advanced my learning techniques, as well as driven me to share and collaborate with everyone around me. (Student E, LP4)

A different student described a specific communication skill that they perceived would support them in multiple career contexts in the future.

I have been able to meet professionals that I would have not have if it weren't for the opportunities that BFA offers. For example, (documentary expert) lending me professional recording technology, sound technology, and helping me in creating my own documentary. I have been able to expand my socializing skills since I am not only speaking with my peers, teachers, but also other kinds of authorities such as: business persons, companies, large social media accounts, and so on. This program has offered me opportunities to express storytelling in different ways and I have met so many amazing people through BFA (Student F, LP4).

The previous examples of student perceptions of the expanded open learning opportunities described curriculum and competency connections as interdisciplinary, interconnected, future career-minded, networked and personally relevant. The students described the connections to their personal goals, passion and interests and their future learning opportunities. In other reflections that connected curriculum and competencies, the students also described their failures and perseverance as learners, and often described what they would do differently in their next learning opportunity. The students also described the importance of building trust and relationships as a key component of their present learning contexts and future learning opportunities.

Finding 1.4: The students and the teacher indicated the student awareness of nodes of learning which included who they interacted, connected and collaborated with and who they shared as. In reflections and digital artifacts and during classroom observations, the students described their nodes of learning. Specifically, they described who and what they connected and interacted with and the identities they used as they shared. The levels correspond with Cronin's (2017) research findings about OEP in higher education environments which consider openness at four levels:

Macro- Will I share openly?

Meso – Who will I share with?

Micro- Who will I share as?

Nano – Will I share this?

Using the data from the student reflections form LP1-LP4 and the classroom observations, a table was created to summarize and describe the evidence of what the students shared, what technology tools were used to share their learning and the nodes they shared their learning with. In table 4.3, the sharing learning relates to the whole process of learning from the beginning of each learning pathway until the end, and includes how the students learn and the products they create as a result of their learning. In the table, a geographic community is defined as the area in which a student could access through public or private transportation, approximately 30 minutes from home to and from one of the nodes of learning.

Student Awareness of Who, What, Where, Why and How They Expand Their Learning.

The following table 4.3 demonstrates how the students' level of openness can be described in terms of how they were willing to expand and share their learning.

Table 4.3

The levels of how far high school learners were willing to expand their learning environment, by considering who they connect with and interact as

Level	Level Description	The Nodes of Learning (Whom the Learner Connects and Interacts with)	What is shared with others
1	Connection to Classroom Teacher/Course Individual identity (individual identity)	Connects with Teacher only, Otherwise may connect with unknown others – but not included in evidence of learning	Final presentation digital artifacts, drafts, learning activities
2	Immediate individual learning space (individual identity)	Teachers, researchers, fellow peers, friends, family	Final presentation digital artifacts, drafts, learning activities
3	Immediate community (public individual identity)	Faith based leaders, community leaders, community partners, district education leaders, online writing communities, online digital resources	Clarifying questions, final presentation digital artifacts
4	Community (public individual identity)	Geographic community businesses and services, closed social media groups	Clarifying questions, final presentation digital artifacts
5	Community (anonymous individual and/or anonymous group identity)	Geographic community businesses and services	Clarifying questions, final presentation digital artifacts
6	Network (anonymous individual and/or group identity)	Social media connections – avatar/pseudonym known to immediate vicinity only, global networks (beyond geographic boundaries)	Clarifying questions, final presentation digital artifacts
7	Networks (publicly open individual identity)	Social media connections, emails, global networks (beyond geographic boundaries)	Clarifying questions, final presentation digital artifacts

Table 4.3 can be compared to the Cronin's (2017) levels of openness in high school learning contexts as described above. The table provides more detail to describe levels open readiness in high school learning contexts.

Teacher perceptions of open learner readiness. The teacher also gave feedback to the researcher about when and how the students transition through or between these levels. The researcher was able to take notes based on classroom observations and validate the teacher observations with additional observations and student reflections. The transition between levels was often influenced by getting timely feedback from one of the nodes of learning or watching and learning from the node of learning, then taking action and completing their learning. If the students were given a task, the students would do one of the following.

1. Sit at their desk and wait for the teacher or researcher to check -in and not attempt to figure out how to complete the task independently

2. Clarify what the teacher had said with a peer or clarify with the teacher/researcher
3. Check their idea with the teacher to confirm they were on the right track
4. Check their idea with a peer to confirm they were on track
5. Look for an example of the task, and try to copy or remix what they found
6. Complete the activity independently, check-in with teacher/researcher when needed.

The teacher noticed this pattern early in the research project. As such, the researcher observed that the teacher started to encourage the students to connect with each other, with other content or with other people outside the classroom in order to avoid students sitting at their desks doing nothing or distracting other students. As the research progressed from LP1-LP4, the number of students who were at their desk waiting to be told what to do (Stage 1) decreased tremendously based on classroom observations. By the end of LP4, there were 5 students that the teacher had to check-in with on a regular basis and who did not demonstrate a willingness to consider how to expand their learning environments independently. It is interesting to note that all of the students had reflected upon their awareness that they were not using their time effectively or considering alternative learning strategies. It was evident that the students perceived they were making choices to not complete the learning tasks without help from the teacher.

Finding 1.5: The students indicated a connection between the development of digital literacies and being able to connect and interact with other nodes of learning (people and resources). During the development of the original OLDI, in the literature review, there was an emphasis on the need to develop digital literacies to support students to expand their learning environments. As a result of the research informed suggestions, LP1 and LP2 were designed to intentionally focus on developing digital literacies which included the development of online

searching skills, consideration of communication skills as well as analytics, data security and privacy. The following section describes multiple student reflections as they questioned the importance of developing skills in digital literacies.

Initial confusion with digital literacy. Initially throughout LP1, the students tended to describe their experiences developing digital literacies with some confusion. For example, at the beginning of the following reflection, the student perceived he did not learn anything; however, by the end of the reflection, he was able to focus on a specific area of interest that he did learn from. He appeared unable to make a connection between the development of digital literacies and the choice of course content which was suggested using a guided inquiry.

My group used Google slides to represent information. This was kind of basic and not the best choice for us. The one topic that I learned the most from was the fake news topic, the reason for that is because I don't pay attention to the news a whole lot so I kind of believe anything I hear. It was nice to explore all of the different news outlets to see which ones are the best to believe, the graph which we had put into our digital artifact was a great way of representing information, I learned a lot from it, all of the different sources and the bias between them (Liberal etc.). (Student I, LP1)

I already knew about a lot of the negative effects of social media on a person's health. We've been taught a lot about the effects during most of our school education, but I hadn't realized as many things as I would have without this project. I learned how exactly the mind works while using social media, not only why you feel how you do. I really found out the way your mind is working/ why you feel how you do. We've only ever been taught the "how" as to why social media is bad, but we've never been taught the "why". One observation I have regarding the use of technology in learning is that it helps a lot in many different ways. Without it, we wouldn't have been able to find even a quarter of the information we did. (Student C, LP1)

Both of these student examples reflect a common thread in the reflection examples from LP1 and into LP2. The students would often start their reflections with previous learning and what they perceived as irrelevant. Then the students would start to almost self-talk in their reflections as they considered how what they knew had been elaborated upon in some way. During the classroom observations, the teacher and researcher consistently heard negative

feedback about the development of digital literacy skills and competencies. We soon learned, as a result of analyzing their reflections and watching their final presentations, that the development of their digital literacies over time also developed their confidence and abilities to connect to deeper and more meaningful learning opportunities, even if many students started out slowly and were not convinced they were learning anything new or relevant.

Digital tools used to expand learning environments. Some students described specific digital tools to explain “what they learned” as opposed to the skills they developed as a result of using the tools. The following student focused on the specific digital tools and how they supported her learning:

I used Google forms to do a survey which I hadn’t done before, as well as Prezi to create the presentation which I believed looked better than a Google slide. (Student U, LP3)

Based on classroom observations and student reflections, Table 4.4 describes the types of digital artifacts the students used as a means to communicate with others and to demonstrate evidence of their learning through described skills, abilities and competencies from LP1-LP4.

Table 4.4

Digital Tools Used by High School Students in order to Expand Learning

Learning Pathway	LP1: Searching Online	LP2: Data & Privacy	LP3: Community	LP4: Storytelling & Perspective
Digital Tools used to Support Student Demonstration of Evidence of Learning	<ul style="list-style-type: none"> • Google Docs • Google Slides • Prezi 	<ul style="list-style-type: none"> • Screen shots • Google Docs • Google Sheets • Google Sites (blogs) • Infographics (Venngage) • Google Slides • Youtube videos 	<ul style="list-style-type: none"> • Google Sites • Google Docs • Google Sheets • Infographics • Videos • Social media tools (Instagram) • Social media analytics (Instagram) 	<ul style="list-style-type: none"> • Google Docs (project organization, journals and reflection) • Video creation software (iMovie) • Sound creation (Audacity)

	<ul style="list-style-type: none"> • Google Trends & Analytics • Personal social media accounts (Instagram, Snapchat & Pinterest) to find pictures and content 	<ul style="list-style-type: none"> • Screenshots • Online communities (eg. MeToWe & Wattpad) • Group Social Media Accounts (Instagram & Snapchat) to communicate with others 	<ul style="list-style-type: none"> • Creative commons licensing – images (eg. Unsplash), sound, video, memes • Trello – project management online tool • Analog (paper) based reflections • Year end celebration of learning individual projects
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Table 4.5 describes the digital literacy skills demonstrated by the students in each of the learning pathways (LP1-LP4).

Table 4.5

Digital Literacy Skills Described by Students in order to Expand Learning

Learning Pathway	LP1: Searching Online	LP2: Data & Privacy	LP3: Community	LP4: Storytelling & Perspective
Digital Literacy Skills Demonstrated by Students	<p>Using text based digital tools to type to communicate</p> <p>Searching and finding information (usually text-based) from a variety of online sources and perspectives</p>	<p>Searching and finding information (usually text-based) from a variety of online sources and perspectives - including multimedia</p> <p>Creation of infographics</p> <p>Creation of online graphs and basic analytics</p> <p>Addition of multimedia into word-processing software</p> <p>Use of online privacy, tracking, security and screen time apps and software</p>	<p>Online project management</p> <p>Online communication skills and use of multiple online communication tools</p> <p>Social media tracking and marketing skills</p> <p>Networking and socialization skills</p>	<p>Choosing multiple mediums in which to demonstrate evidence of learning in online learning environments (text (multiple forms), audio, visual)</p> <p>Developing digital storytelling skills</p> <p>Using digital editing, remixing skills</p>

Table 4.6 describes the digital literacy competencies demonstrated by the students in each of the learning pathways (LP1-LP4).

Table 4.6

Digital Literacy Competencies Described by Students in order to Expand Learning

Learning Pathway	LP1: Searching Online	LP2: Data & Privacy	LP3: Community	LP4: Storytelling & Perspective
Digital Literacy Competencies Demonstrated by Students	<p>Demonstrating awareness of bias in digital learning environments</p> <p>Demonstrating ability to communicate in respectful ways in digital environments</p>	<p>Demonstration and synthesis of data analysis of topic of personal interest</p> <p>Demonstrating awareness of tracking digital data and having digital data tracked</p> <p>Demonstrating awareness of differences between access to data based on perspective and equality</p>	<p>Demonstration and synthesis of data analysis about new to student topic</p> <p>Demonstrating awareness of tracking social media data and having social media digital data tracked</p> <p>Demonstrating how to engage an audience, how to develop empathy, how to find and solve a community problem - online</p>	<p>Demonstration of multiliteracy and trans-literacy based (text (multiple forms), audio, visual)</p> <p>Demonstrating synthesis of multiple forms of storytelling</p> <p>Demonstrating critical analysis of literature and content from multiple perspectives</p> <p>Demonstrating competence in cultural awareness & empathy</p>

In Tables 4.4-4.6, the student reflections indicated the diversity of digital tools they used to support open learning. In addition, the skills and competencies that the students developed, beyond the curriculum expectations, are also described. The digital tools expanded in number and difficulty as the learning pathways progressed as well as the skills and competencies. The variety of tools connected to a wider variety of skills and competencies as well. As a result of the expansion of digital tools, skills and competencies, the students also demonstrated multiliteracy skills and competencies and some demonstrated trans-literacy skills and competencies that exceeded the curriculum literacy expectations. Some examples that demonstrate the development from digital to trans-literacy skills and competencies will be described in the following finding.

Finding 1.6: The students described a transition from digital to multiliteracies as a result of how they communicated their evidence of learning. Among all of the students' reflections, the most prevalent theme that describes how students perceived their development of digital literacies, was through reflections and descriptions of how the students communicated their learning with others. Many students described how digital tools could help expand the ways in which they could communicate evidence of their learning. As described by one student,

One observation I have regarding the use of technology in learning is... There are many different ways to display our work that before I wouldn't have thought of. (Student I, LP1)

The reflections demonstrated different examples of how students transitioned from demonstrating basic digital literacies (like searching for resources and curating data or resources) and into multiliteracies (like considering multiple ways to present their learning digitally). The consideration of multiliteracies and being encouraged by the teacher to demonstrate their learning in multiple ways, brought out many different emotions from the students. The following student described an example of digital literacy skills:

Learning tips on how to make a presentation more visual between projects was a good thing since it encouraged me to keep words to a minimum. Using color coding, different shapes, emoticons, etc. I was able to create a visually appealing project that I am very proud of. (Student I, LP3 Summary)

This student described how they are developing their multiliteracy skills

When I put my infographic together it challenged me. I was used to putting words on a screen and being done with it. This project challenged me to step out of my box and think of other possibilities. I used Pinterest as an example when I was doing one of the topics within my question. When I did research I used my own Pinterest account as an example and I did some tests to prove my information. I need pictures. I took screenshots of the screen and put them in my map. It was easy but it was a difficult thing to think of. (Student U, LP3).

This student described the development of her literacy skills when she described how she created her digital story.

I used a very different approach to what I had planned or to what I would normally even think to use, which was one part because I was looking to do something different and one part because my original few plans fell apart. My story was linear in the least and not explained to certain points, but I suppose this left the audience wondering the reason I chose to put in the different series of lyrics I did. I think my story could be considered similar to the Indigenous structure, because I retold other's stories, old stories as my own, they each had their own meaning and value behind them, which is what I wanted to express, the different lessons I had learned and experiences I had faced. I only used small clips of lyrics, which in a way does contradict the Indigenous aspect of storytelling that speaks to not leaving any detail of piece of a story out. (Student E, LP4)

The development of digital literacies provided a foundation from which the students could expand their learning environments in personal and meaningful ways, which also demonstrated their developing multiliteracies. Although students started out by questioning the relevancy of developing their digital literacy skills, there are clear examples of how the students slowly distinguished between a limited view of digital tools and their use to how to connect and interact with others using multiple media and tools to learn.

Finding 1.7: Students became aware of how learning environments expand by identifying the spaces in which they learn and the digital tools and experiences that are used to support learning in these spaces. As an extension of the descriptions of tools and spaces in which they learned described in the previous section, the students also used V&R maps to describe the tools and spaces in which they learn. As of LP1, there was evidence of unique student perceptions of the perceived boundaries in which they learn. The lack of a perception of clear or standard learning space boundaries became most evident in the changes to some of the V&R maps as the students described their learning spaces because the environments appeared to blend into one giant learning space for the students. In the section that follows, a summary of expanded learning environments as described by comparing and contrasting the student reflections and V&R maps is provided.

Using V&R maps to contextualize where learning occurs and what tools support

learning. The V&R maps provided a means to connect what digital tools and spaces in which students perceived they were learning. Of the 23 participants, only one student did not complete any V&Rmaps. It became evident there was some inconsistency in completing all four V&R maps. The three student examples described in the next section were selected for deeper analysis because all of these students completed the V&R maps for all four learning pathways, and thus the maps could be compared. Of the six students who had completed all of the V&R maps, the three sets of V&R maps were randomly chosen between student identification of male, female and other.

As demonstrated in the maps below, the V&R maps helped students consider and describe their awareness and development of a learning ecosystem that intersected their personal and school (institutional) learning spaces. As described in more detail in Chapter 3, the V&R maps asked students to draw their perceptions of what digital tools and resources they are using to learn with, to indicate whether the students consider their specific digital tools and resources as personal or institutional, and to indicate whether the students perceive that they leave a digital footprint when they use these tools and resources in terms of how much time they spend learning with these nodes of learning and how much importance the nodes of learning have for them.

Figures 4.1- 4.6 are screen shot examples of the V&R maps from three students who described where they learned and what tools they learned with in a variety of ways from LP1-LP4.

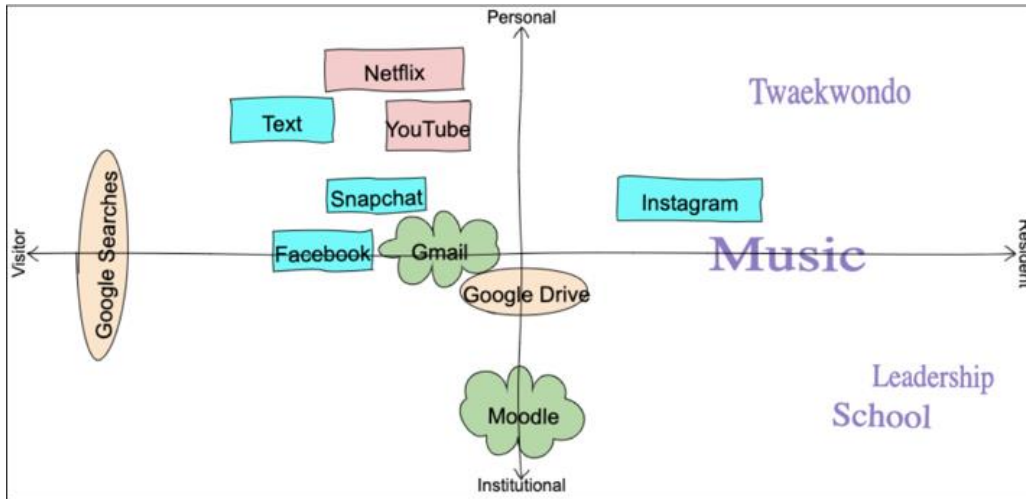


Figure 4.1: V&R map Student E, Before LP1

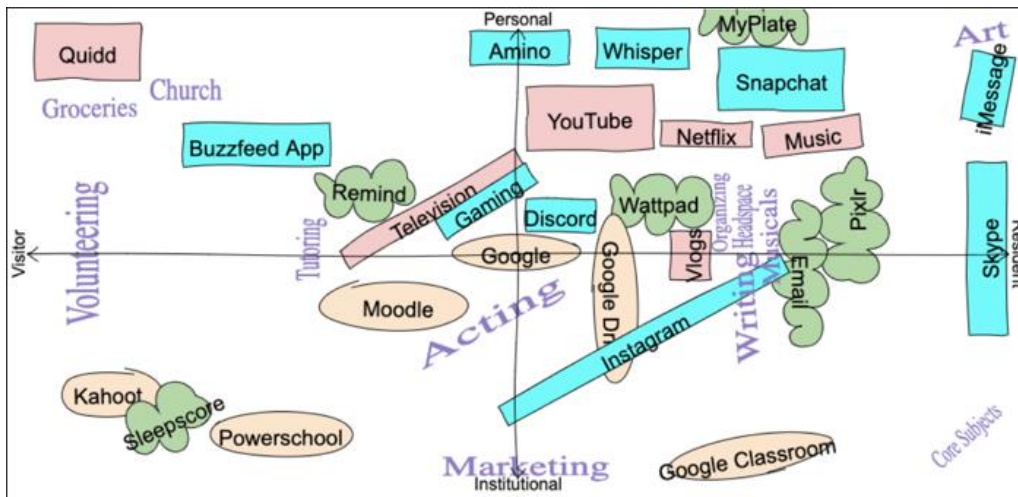


Figure 4.2: V&R map Student F, Before LP1

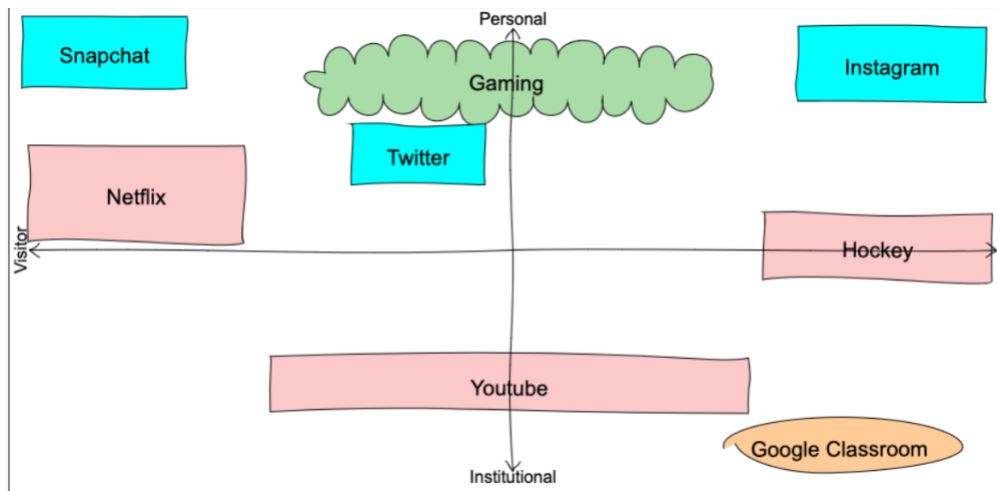


Figure 4.3: V&R map Student I, Before LP1

Based on the student examples of V&R maps above, it is apparent that high school students use multiple technologies to learn in digital spaces. Some of the examples include formal district software where students add content like Google classroom and Moodle while others were considered personal software and applications like Snapchat and Instagram. There are examples of online apps and digital streaming services that provide entertainment, information and resources for students like BuzzFeed, YouTube, Netflix. In addition, communication tools like skype and text were included. Many of these digital tool examples were included and discussed in the LP1 and LP2 digital literacy resources and information. The interesting difference between the three examples, was the decision to include examples of other spaces and places in which Student F and Student E perceived they learned, but Student I only added one example, hockey. This distinction between learning with only digital or digital and face to face nodes of learning, was identified at an early stage was evident throughout the next examples.

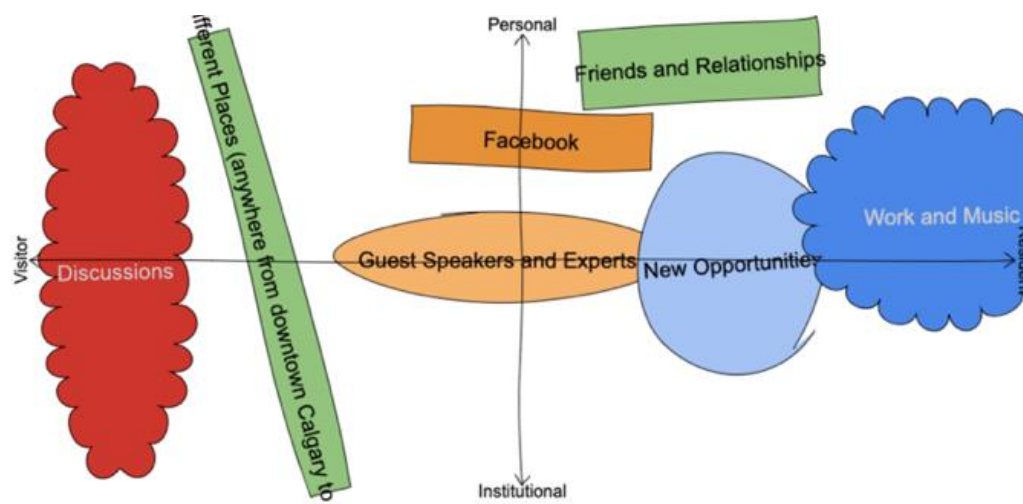


Figure 4.4: V&R map Student E After LP4

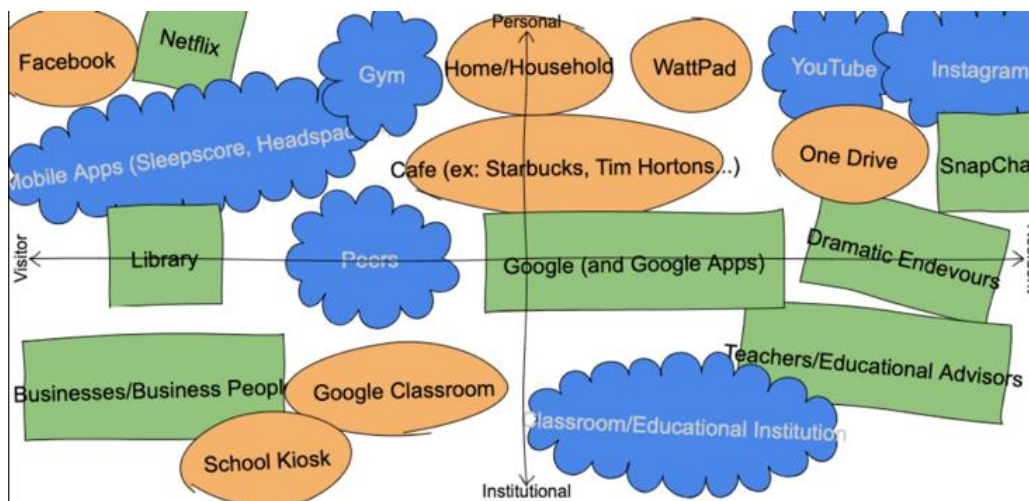


Figure 4.5: V&R map Student F, After LP4

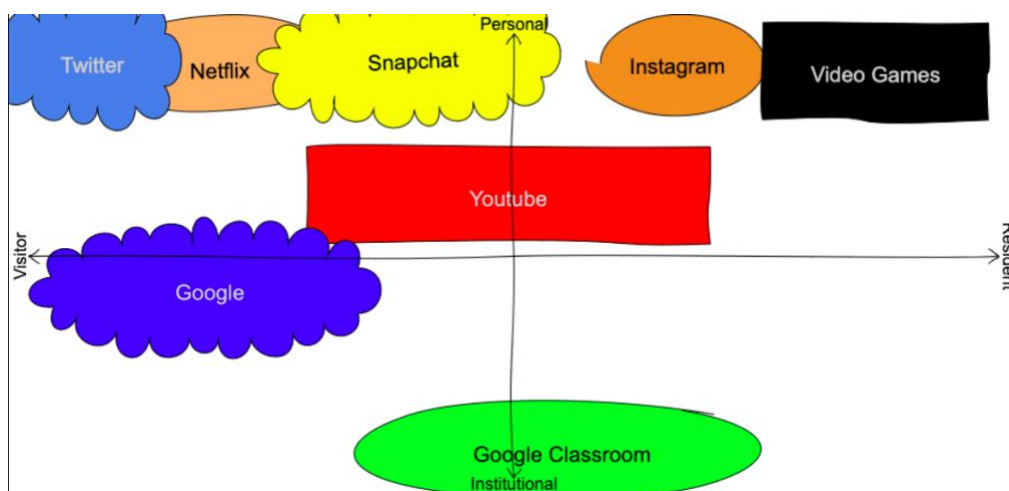


Figure 4.6: V&R map Student I, After LP4

The LP4 final V&R maps were created at the end of the research project. In the LP1 maps, the students had either tended to draw digital tools only or draw a mixture of digital tools and extra-curricular tools (with the exception of Student F who described multiple mediums and contexts). One noticeable difference between V&R maps from LP4 and all of the other learning pathways, was that 4/23 students completed the V&R maps in a less structured way by personalizing the map to describe their perceptions of where learning happens for them. Two of

the students who personalized their LP4 V&R maps were Student E and Student F (as described above). These students added comments about the teacher's provocations to challenge them to think outside the box, included field trips, discussions and other people on their learning maps. In previous V&R maps, the students had focused on digital tools, software and extra-curricular activities as spaces and places in which they learn. LP4 V&R maps now described expanded learning spaces as those which included the spaces and places in which the students perceived they learn *as well as* the people they learn with. As the students described the importance of personal connections to learning in their reflections from LP1-LP4, the teacher and researcher were able to clarify the lack of perceived boundaries from formal into informal learning spaces which integrated and expanded naturally to students, especially in LP4.

The three students used the V&R maps as a personalized data collection tool, in that they chose to add and edit examples based on their own personal learning contexts and understanding of open learning spaces. An interesting distinction between the use of V&R maps in this study and other studies (White and LeCornu, 2017), is that as soon as the students started using the V&R maps (in LP1) the participants also asked if they could include non-digital nodes of learning. As a result, some the students demonstrated that they perceived open learning spaces as digital and non-digital expanded learning environments. The separation of digital and face to face learning spaces was permeable and inconsistent throughout all of the student V&R maps and provided clear evidence of student perceptions of individual learning environments.

Finding 1.8: The students described how they became aware of the importance of safe learning spaces in order to be open in their learning. The importance of considering different perspectives and safe learning spaces was described in some contexts by 18 of the 23 participants throughout the research in multiple contexts. The following word frequency chart

For example, the following student described how she perceived that a safe learning environment connected to her learning success.

Connecting with others increased my success as a learner since it allowed me to hear both sides of the issue, people's stories, understand how this was impacting people in different ways, etc. Connecting with others allowed me to gain more information and further my education on this extremely important issue. (Student W, LP3)

Conditions for safe learning spaces. According to the student perspectives, the most frequently used stem words for safe classrooms were, learn, people, environment, classroom and connect. Based on these key stem words, there were multiple key characteristics that emerged that described how the students built trust, how they learned it was ok to be vulnerable and how they faced their fears about their learning in safe learning spaces. The students' reflections provide some emerging conditions for safe learning spaces.

Conditions for Safe Learning Spaces in High School Open Learning Contexts:

- Freedom to choose what you want to learn and how you want to learn it
- Failure and risk taking is encouraged and recognized and does not jeopardize the learning of others in the learning space
- A relaxed and low stress atmosphere
- Relationships are essential, everyone knows each other and can be honest with each other
- People can share and listen to multiple perspectives
- People can gather information and resources without feeling threatened (especially in online contexts)
- People have a choice about how they participate
- Both students and teachers are accepting and respectful and everyone helps each other to learn

- Learners are supportive, open, welcoming, understanding, positive, judgement free and have a willingness to support you
- Teachers provide feedback and advice, to be accessible, eager to help and to provide access to safe resources that may be needed throughout the learning process

The data identified conditions for open learning spaces and some characteristics of people who participate in the safe learning space. The following excerpts describe what some students considered when they connected and interacted with others outside of their safe learning space. As the students expanded their learning environment, they described what they thought needed to be considered to extend the conditions of safe learning spaces (listed above) from their classroom safe learning spaces into perceived unsafe digital and face-to-face learning contexts. One student reflected,

I think it was a safe learning environment, because we had help and access to safe resources that we may have needed throughout the process. When contacting people, we gave our school information and none of our personal information, nor were we asked for any personal information (school emails, etc). (Student V, LP3)

Another student considered,

When connecting with others outside of the classroom through social media, I made sure to go to organizations or accounts that I understood were a safe place. I worded email communications politely and tried to put no pressure on them to engage in the research, but really wished they would. (Student F, LP4)

According to the students' reflections, safe learning spaces provide an essential condition for open learning to occur in high school learning contexts. Safe learning spaces provide the opportunities for students to try new things, gain support from others, consider multiple perspectives and to feel confident in being themselves. The last two excerpts describe how the

students developed an awareness of their safe learning space, and how they used strategies to extend safe spaces by using communication skill (I worded emails) and digital literacy skills (no personal information). The excerpts above identified connections to stage 1 (Building Relationships), Stage 2 (Co-Designing Learning Pathways) and Stage 3 (Intentionally Sharing Learning Experiences) in the OLDI framework. Safe learning spaces were mentioned throughout the student reflections in contexts that described how the students built confidence when connecting and interacting with others in order to expand their learning environments.

Finding 1.9: The students indicated that the concept of sharing is dependent upon medium and context. There were a variety of contradictions and disparity in the student reflections about how students perceived sharing online with people they did not know personally as opposed to sharing with their classmates. The following two students perceived sharing with social media as unreal because when they share through social media they did not feel like they are sharing with a real person. However, the students also demonstrated that they perceive sharing their learning in class as very realistic, and highly personal.

For me it is easier to share with others on social media because with social media there is a barrier. It is easier because it doesn't feel like you're talking to a person, you're talking to a phone. Something without emotion and something that won't react at all to what you say. With social media you don't have to LOOK into the eyes of another person and see their reactions and emotions. With classmates you are totally open to be subjected to scrutiny and judgment. As well as unwanted feelings of sympathy. (Student W, LP4)

I believe it's a lot easier to share online than it is in the real world. Online, nobody really cares about each other's opinions. If someone online said my story was absolute trash and I deserve to fail, I wouldn't take it to heart because it's just one random person on the internet. There's about a billion different opinions on the internet, but you just don't care because they are just internet randoms. However, if someone said something like that, it would affect you much differently. You actually care about the opinions of the people around you, so they affect you. (Student K, LP4)

Similarly, the following student describes the boundaries she uses to keep her peers from seeing the vulnerable parts of her identity she does not want them to see.

When I was asked if I wanted to share my story I wanted to say no because I don't want people to see the trusting me. I don't want them to see the me that is vulnerable. It wasn't a very deep story but it still shows vulnerability and I don't want anyone to see that side of me. I guess the benefits of sharing my story with them is that they get to know me a bit better but I don't want people to know me. I want to be the person that is there but not really "there" if you know what I mean? (Student D, LP4)

When the researcher member checked with the student to clarify what being really there meant, the student indicated it means to show a specific part of themselves that can be shared without getting hurt.

Personally, I feel that sharing with random people on the internet is easier because they don't know who you are. There is also a good chance they live on the other side of the world and you'll probably never see them. If they judge you or your story, they can't tell everyone you know how bad it is or how good it is. It would just be there and you would never have to talk about it or see it again. (Student D, LP4)

The variation between the student responses to sharing was identified throughout their reflections and during classroom discussions. There was always an awareness that the students had a choice in what they wanted to share and with whom they would share their learning. Throughout the research, the descriptions and examples of how the students' shared varied greatly as well, for example the students chose to share things as groups, with smaller friend groups, with their parents and teacher only and sometimes in public ways. However, with the exception of one student, every student shared their personal digital story from the final activity of LP4 with their peers and some chose to share openly with the public. The depth and breadth of the reflections about this particular concept surpassed any other activity. The discussion and positive feedback about sharing with their peers also exceeded in depth and breadth compared to any other reflection question.

Finding 1.10: Students indicated they needed opportunities to share with their immediate learning community first in order to build confidence before sharing with the broader learning community. When students were encouraged to share their learning

experiences with anyone beyond the teacher and/or their parents/guardians, students described a variety of emotional responses which varied from panic to pride. Most of the descriptions also connected to feelings students expressed about being in a safe learning environment (as described in Figure 4.7 above). In their LP4 reflections, the students described how and why they share their learning with others outside the classroom (mostly online) and inside the classroom. Two students perceived social media sharing as unreal because when they share something from class they do not feel like they are sharing with a real person and say they do not care about online comments or feedback. Some reflections noted that students' awareness of digital safety does make them feel less likely to share, but they still feel like sharing online is not really sharing. However, at least five students perceive sharing their learning with others in their class as very realistic, highly personal, leaving them feeling vulnerable and insecure.

The following section highlights some of the student perceptions of sharing. It is important to note that the students described feelings of anxiety about sharing throughout the research from LP1-LP4. The differences in the descriptions changed from a fear of sharing anything with anyone, to a fear of presenting their learning to each other to anxiety over sharing their stories with each other. The progression of sharing became more personal (sharing learning digital artifacts to sharing personal stories). In this research study, all students had a choice about what they wanted to share at any given point. While the teacher encouraged the students to share in deeper and more personal ways, the students were also aware that the teacher was making a point to encourage sharing and if they did not want to share, they could always demonstrate their learning in alternative ways. What changed throughout the research process was that while some students described their fear and anxiety and their struggles with sharing, others described their

understanding of how sharing could support their learning and others described a sense of pride and confidence in being able to share their learning with others.

Perceptions of sharing. One student described their willingness to share because of their relationships with student peers.

I personally find it easy to share with my classmates, and if I had less worry about online safety I may even be comfortable sharing this online on social media. The reason I find it easier to share with classmates and people who are close to me is because I know them, and I know I am able to clarify things if they are confused or take something the wrong way. (Student F, LP4)

Another student described how sharing helped her discern her personal connections to learning experiences that made her learning more personally meaningful.

For me, sharing my video wasn't that hard. It wasn't a story about me and was a story about my brother who I still care a lot about but it was super, super personal for me. I was proud of the work I did and I wanted to share it with the rest of my class. (Student B, LP4)

The following student described stages of sharing in terms of personal risk. In this example, the student had been given feedback that her peers were deeply appreciative of what she shared with the class, and she was confused about their appreciation and feedback. As she describes in her reflection, she only shared the "surface" of herself, and she chose not to share what she considered deep and personal which demonstrates an understanding of what the students shared, how much they shared and with whom they chose to share their learning.

I didn't really feel like I took a risk, I more or less just told the only story that wasn't as personal as the other stories I could have told. I just scraped the surface of a personal story in my opinion. I didn't want to share a really personal story with the class so I told one that most people probably already knew. So I didn't really take a risk but I guess in other people's eyes it may look as though I did. (Student D, LP4)

What made the two previous reflections about sharing so interesting to the researcher and teacher, was the difference in perception of sharing and why they shared what they did with

others. In Student A's example, she appeared to defend her choice to share a story about her brother rather than herself, alternatively in Student D's example, she appeared confused at the feedback and curiosity she received as a result of what she perceived as "limited" sharing.

Connecting sharing learning and emotional responses. Students described great emotional awareness in their reflections about sharing their learning with others. This student described how he developed perseverance as a result of sharing:

It opens us up to a new experience where we can take risks and learn from it. Next time we need to do something like that, we won't be hesitant or fearful (Student I, LP4).

One student also described some perceived benefits of sharing, such as it provided a sense of giving back to others, satisfaction in contributing to something bigger and building on the work of others, perspectives that connect with the concept of knowledge building.

It was a bit difficult to share my story, because I didn't want to at first. However, multiple people throughout the class were wanting me to present. So, I decided to share. I believe that there are many benefits to sharing your stories and listening to others. You can give knowledge, and gain knowledge about other people and other things. (Student T, LP4)

The following student described learning from/with others as a result of sharing her story and having the opportunity to listen to the stories of her peers:

I was personally very nervous to share this story with everyone. I'm not too sure why yet but it's something that I tend to hide. I try not to but I do. I've been trying to figure out why I got so nervous when it came time to share my story but I'm honestly not too sure. My close friends had already seen it but yet I was dreading it. I think it's very important to share stories that are important to us but sometimes that can be hard. I know that hearing other people's stories and experiences sometimes can help me with my situation depending on what it's about. As well stories are the way that we share information and that's very important. (Student C, LP4)

At the end of LP3, the researcher and teacher noticed that the majority of students had shared their learning with others outside the class, but as a group versus individual identity. There was only one group that connected with others as individuals and made their identity

public. The students who had chosen to pursue to solve community problems individually (of the three individual projects only one was by choice), also chose to keep their identity anonymous. As such, there was limited evidence of expansion into stage 4 of Building Personal Learning Networks as described in the OLDI framework. The students demonstrated that they were dependent upon each other and their groups, in terms of openly sharing their learning, as described so well in the following student's reflection.

You want to be in a group with good people. You don't want to be too close to the people in your group because then you'll be afraid to hurt their feelings, and you don't want to not know anyone in your group or you'll be afraid to speak your mind. I find that my group was good because we were all able to speak our minds without fear of being judged but I was also able to tell them if they aren't working. The one problem with my group was that we got distracted easily and our group wasn't full of super strong workers (Student C, LP4).

In order to encourage the students to share their learning as individuals, and not as groups, the researcher and teacher made an intentional choice to limit the digital expansion for LP4. Although the OLDI framework was still used to design for learning in LP4, the design now encouraged multiple interactions between peers and trusted outside experts in a closed safe learning space in order to encourage all learners to share their learning with their peers. The researcher and teacher identified that as relationships and trust developed, the students were willing to consider co-designing their learning pathway and sharing their learning with more people. The students were consistently challenged to share their learning with each other, in the hopes that by sharing their learning with each other, they would have the confidence to share with others as their own public identity. This was an essential aspect of the research, as the "sharing as a group identity" in LP3 revealed that teachers who consider using OEP must develop safe learning spaces and then give the students an opportunity to share with only their peers and their direct learning community before they share with others as individuals in publicly

open learning spaces. The student descriptions of their emotional states and anxiety about who they share with, clearly identifies a need for an open learning continuum that describe sharing can be encouraged in open learning contexts, a topic that is explored in more detail in chapter 5.

By intentionally encouraging the students to share with their immediate community, the honesty and vulnerability surfaced in the student reflections was expanded upon in numerous ways as the students developed relationships with the researcher. Throughout LP4 reflections, the students were adding personal details and notes, or chatting to the researcher in person, to help clarify and communicate what they really meant in their reflection and how they were learning.

Finding 1.11: Continuous feedback provided participants an opportunity to question the open learning process. The OLDI framework was found to encourage and support the teacher and researcher in designing for learner participation by incorporating continuous feedback loops through participant reflections in combination with active research participation and collaboration. The feedback loops supported the expansion of learning by supporting a learning design shift from sit and get learning to creating opportunities for students to build knowledge for themselves. LP1 and LP2 were focused on basic digital literacy skill development acquired through an inquiry pedagogical lens, which included learning pathway activities guided by a question and resources to support finding answers to those questions. In contrast, LP3 and LP4 focused more on problem solving, working collaboratively in groups to develop collective and individual cognitive responsibilities to be introduced to different perspectives. This resulted in deeper and more detailed reflections about how each student learns as an individual, student's ability to identify learning strategies to support their learning, multiple mediums in which to communicate and demonstrate their learning and evidence of multiple levels of open learner

readiness in terms of sharing their learning with their immediate learning community (their peers). In the sections that follow, the shift from passive learning to knowledge building and the use of feedback loops is tracked through each LP.

The researcher observations, the teacher and student reflections noted that the students needed timely, credible, focused and clear feedback (based on 19 of 23 student responses). While the teacher and researcher supported the students with formative feedback in guiding the learning design of the project, the students were also dependent upon the feedback of others outside the classroom in order to expand their learning environments. Hattie and Timperley (2007), described the importance of the type of feedback and the way it is given timely feedback in order to support student learning. However, Hattie and Timperley's research focused on closed classroom environments and the students in the study were asked to look for feedback and support from others outside the classroom walls. The researcher observed the general lack of feedback from people the students were trying to connect with outside the classroom. In general, people that were outside the classroom and not connected to the school program did not reply to the student emails at all or in a timely manner and this affected student engagement and motivation. There were multiple examples of closed feedback loops within classroom learning environments and continuous or open feedback loops that extended beyond the classroom environment. The following examples describe how the students perceived that to attain feedback, they often required extra support to connect, interact and collaborate with others inside and outside the classroom.

Connecting and interacting with others outside the classroom. There were multiple examples of students describing how connecting beyond the classroom walls with specific people, or as most often described "experts", was important for their learning. For example, this

student uses statistics to describe how she connected with other nodes of learning and her perceived significance of the interactions.

we connected with people from the schools, from the city and with people on social media to answer our questions. We connected with them by email and Instagram/Snapchat. I think it was essential because that's what gave us 95% of our information. (Student U, LP3)

The following student reflects on the importance of connecting with others outside the classroom.

I connected with others through social media and emailing. People I connected with were mostly people I knew from school and friends and family. I connected with them to get their opinion on the subject I was researching about. If I didn't connect with them I wouldn't have been able to get information I needed for my project. (Student M, LP3)

The students articulated and reflected upon many reasons why connecting and interacting with others is important to their learning in different ways. The next section considers the timing of those connections and how the timing influences student learning and their learning engagement.

Timing of feedback. As the learning pathway progressed through multiple classroom observations, the learners became dependent upon the feedback of other nodes inside and outside the classroom. One student describes her experience trying to interact and connect with others.

If I'm gonna be honest I didn't know I was succeeding because it took forever for the schools to email us back and on top of that to find a time we could go in and do surveys. Communicating with others neither increased nor decreased my success as a learner because nobody ever got back to me therefore I did not get any information I needed. (Student D, LP3)

The nodes included finding public online resources (not creative commons licensed resources, but resources on public websites), specific people from the community (who were contacted through email and phone) and anonymous people through social media (who were primarily contacted through Instagram and Facebook). The students often learned that to solve their problems, find information or build upon their ideas, they became dependent upon others in their

community to ensure they had authentic content and relevant opinions. The lack of feedback was pervasively noted in student reflections, as one student so eloquently noted,

A learning consequence is when people don't get back to you when you contact them which can leave you stuck, or your risk could not work or might set you back. (Student P, LP3)

The following student described her internal struggle in order to connect with others because she was intimidated and believed they lacked the ability to communicate and connect with community members.

I struggled with the idea of people shooting me down when I reach out (that if I reach out to people that I might get shot down or possibly in trouble). (Student Q, LP3)

Student reflections on lack of feedback. The lack of feedback also played a major role in the way in which students were able expand their learning environments. The following two students described specific strategies they used when they did not get any feedback, because they perceived that this feedback was necessary for their learning.

A strategy I used was to be calm when they don't reply. I learned that people know more than you think, so it is a good idea to wait for their reply. (Student H, LP3)

I learned that it's not easy trying to get in touch with people, and if they don't respond, you need to have a backup plan. You may email them and depend on their response but if they don't respond you have to move on and think of something different. If you just sit around and wait for people's response, your time is going to fast decrease and you all of a sudden have no project because you depended on this person to answer, but you never had a backup plan. That's another thing that I learned, I learned that you ALWAYS have to have a backup plan, for everything and everything, no matter what. (Student U, LP4)

The balance between being dependent upon others for feedback and figuring out what to do with the information you have, was a constant dilemma for the students as they tried to expand their learning environments. As described by the following student, in his perspective, connecting and interacting with others helped him learn. "During LP3 I found it was easier to connect with people to find the real problem and getting other opinions definitely helps me

learn”. (Student G, LP3) The perseverance to wait for or think of another strategy to receive feedback was evident in the student reflections. During LP3: Community Problem, the students were dependent upon outside community partners and nodes of learning for feedback about their problem and for information. Different students reacted in different ways when the outside experts did not provide timely feedback. As a means of formative assessment, when the students would discuss the lack of feedback with the teacher or researcher, the researcher would ask some general questions about why they contacted the person and when they had sent their initial point of contact.

The students would be encouraged to either contact the person again, seriously consider why this community problem was important or relevant to them personally and if so, find another way to get the information that they needed. Based on teacher and researcher personal reflections and check-ins as a guide to figure out the importance of timely feedback in LP3, the lack of feedback in LP3 was primarily due to the teacher having opened the community problems to solving any community problem. The concept of personal relevancy often came under discussion because the teacher would question if a topic was really personally relevant to a student, if they had limited passion and dedication to getting feedback from the community. Many students only included feedback that they could access through email rather than feedback that they could access by visiting a community partner face to face. They would only connect with others outside the classroom during class time (not during the time that the community was available) and this limited their learning space. Many students became uninterested in a topic, because they were never passionate about it in the first place. As such, some of the students had no issues getting feedback because they were obviously passionate and kept coming up with

strategies in order to get the information they needed. Others chose to wait for feedback and that either resulted in disengagement or unfinished projects.

Based on the feedback that the teacher and researcher received about the importance of timely feedback, and given that they could see the influence of the lack of feedback on student engagement, the learning design was changed in LP4. The teacher and researcher ensured a student feedback process and created bridges of communication between any of the community partners who supported the learning projects. As a result, the lack of feedback comments for LP4 were only based on the lack of time to get feedback, rather than the lack of opportunity to find and receive feedback as evidenced in LP3. Either way, the students describe the feedback loop (getting and receiving feedback through multiple nodes) as an essential component of open learning in high school contexts.

Teacher responses to feedback. The teacher responded to the student and researcher feedback from LP1 in the following ways. The teacher decided to change the learning pathway activity questions from teacher created to student created questions, based on his observation that the students were not completing the activities and appeared to be confused. Although an assessment rubric was created with the intention of being remixed and extended based on student involvement, the teacher and students found the collaborative remixing of the rubric confusing as well. The researcher classroom observation notes describe the rubric activity as particularly difficult for the students. Students said that they were surprised they were being asked for their opinion for their assessment and that they would prefer just being told what to do. The researcher noted how often the students gave the teacher feedback about his lack of task design clarity, when in actuality there were multiple criteria clarified on the whiteboard. The tension between the students wanting to be told what to do and given the information (based on their comments

during class) and the reality of the teacher attempting to facilitate an inquiry model that included multiple ways to learn the information and find the knowledge, was evident in the LP1 and LP2 classroom. There were no tests or quizzes given to test if the students had covered the content. Instead, as described in classroom observations, the teacher relied upon formative assessment throughout the learning pathways process, feedback from the students and researcher and final project presentations and digital artifacts to assess student learning.

Student responses to feedback. While there were multiple of examples of how the teacher encouraged student feedback to validate his learning design, the students, on the other hand, described the teacher feedback as challenging and different than what they were used to. The following student described his perception of the new way in which he was being invited to learn in LP1.

From day one they (Teacher and researcher) hit me with weird questions, that personally, I only asked myself. I never really thought about people asking me, “Why are you doing this, why do you love to do this, why is it that you are choosing to do this, and why did you choose to be here? I never knew how to say it out loud - until I was asked for my opinion. (Student video)

The previous student reflection identified some confusion over being asked to learn in different ways, but it is also clear that he was appreciative of the opportunity to develop his personal opinions and that he knew his opinions would be valued. The teacher and researcher read the reflections and discussed the student feedback in order to ensure that the learning design was effective and that the students were demonstrating key learning outcomes based on the specific learning pathways. The LP2 student reflection from above demonstrates the student response and connection to the formative assessment which was an essential component of the learning design.

Researcher responses to feedback. By the end of LP3, as a means to ensure validity on the OLDI data analysis, the students were asked to reflect on their experience using an open learning cycle as an example of co-designing learning. The researcher decided to create a new visual based on specific open learning cyclical stages with specific descriptions. The teacher asked the researcher to describe the cycle to the whole class and gave the students an opportunity to ask questions for clarification. The students then had the opportunity to give the researcher feedback through a Google.doc. Figure 4.8 captures the development of the awareness of an open learning cycle of learning by the researcher and participants. The researcher created the cycle based on student reflections and classroom observations, and the students gave her feedback on their perceptions of the open learning cycle, based on their personal experiences. This was an example of co-designing the learning pathways together through an interchange of epistemological interchange between an adult in a researcher - teacher role and high school students.

Grade 10 Open Learning Cycle

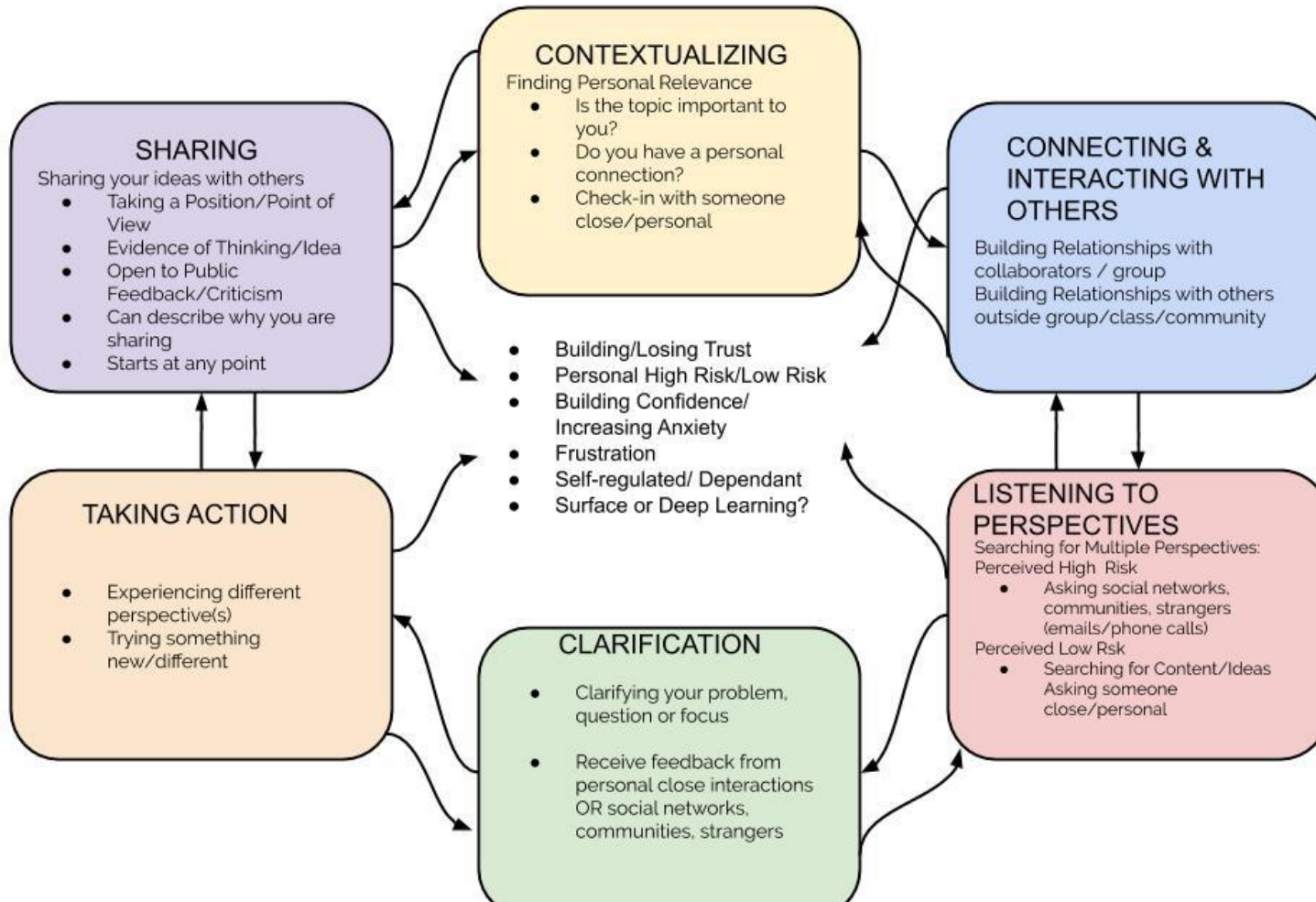


Figure 4.8: The Open Learning Cycle: How a High School Learner Shares their Learning Pathway(s) with Others

The open learning cycle connected to how the students described their expanded learning experiences in LP3. The researcher engaged the students by asking them to reflect about their own learning experiences and provide critical feedback to the researcher to continue to develop the model and the teacher to develop their OEP. The model was presented to the students in class where the students asked questions for clarification and the researcher was given positive feedback.

Giving and receiving feedback proved to be an essential element of open learning as identified through student, teacher and researcher examples. While feedback is an also an essential element of design-based research in order to change and iterate the research intervention, the specific examples above demonstrate the influence of feedback in order to find and identify multiple voices in open learning contexts and to experience and model co-designing learning.

Finding 1.12: When given freedom and control over their own learning, students indicated they felt more ownership of their learning and were more engaged in the learning process. As students began to co-design their learning pathways, the students indicated that they had more freedom, ownership and control over their learning. The participants felt included, for example one student asked if he could add their participation in the research on their resume. The participants' confidence and pride demonstrate that they felt like they contributed and had a voice in the research. Students described a sense of responsibility and ownership for their learning because rather than being given information, students had to find information for themselves in order to complete their activities and learn. Finding useful sources and information for themselves was perceived as difficult, stressful and frustrating by many learners. The first

student describes the learning process as difficult as she describes how stress can be a good thing when it is connected to learning.

This project did engage me as a learner because it was a topic I actually cared about and was interested in. I like that we were given “free” reign over how we decided to create the project, what the topic of the project was, whether we wanted to learn alone or in a group, and so on. I would not change how we learned during this project. I enjoyed LP3 despite all the stress it gave me. I was allowed to do what I thought was needed to complete my project. I wasn’t tied down to anything. (Student C, LP3)

Student reflections about learning being stressful and difficult started in LP1 but ended in LP3. In LP4, where the students were challenged to share their stories with each other, the only mention of anything difficult was sharing their stories with each other (as described in the previous section). By LP4, freedom to learn was described as a means to develop lifelong learning skills. As the following student identified,

I’ve learned that being granted freedom to experiment is actually one of the best learning experiences. It teaches us to think in a way that is limitless, and stretches so much further than the task or assignment. (Student E, LP4)

A learning ecosystem provides the potential for a learner to connect to unlimited learning outcomes and make multiple connections to other learning opportunities. These excerpts described how the students used expanded words (stretches, limitless, further) to describe the potential for open learning which also connect to learning ecosystems and lifelong learning.

Increased learner engagement. Some of the student reflections described a feeling of freedom in learning what was personally relevant to them and therefore perceiving increased learner engagement. The following student describes how she perceived the freedom to choose a personally relevant topic increased their engagement in the learning process.

When you are able to learn and connect with people outside the classroom walls, everyone is way more engaged and from the LP3, everyone was so engaged then (before we were able to learn outside the classroom walls) because they were able to pick a topic

they were passionate about (of course to a limit) but when we found out we had to contact and we were (allowed) to contact people outside of the classroom, I feel for me anyways, it took the project to a whole different level of engagement. (Student U, LP4)

The reflections about how students perceived choice and freedom influenced their learning engagement were mostly from LP3 when students were completing a design thinking, problem solving task to solve a community problem. In LP3, the teacher and researcher noticed that many groups did not deeply consider empathy in their design thinking process. As a result, many problems were easily solved (from the students' perspective). As a result of this observation, in LP4, the design encouraged group work that had time for empathy when considering an alternative perspective. The researcher and teacher intentionally designed for choice in LP4 by ensuring there were multiple literacy genres included in the group activities. As students became more empathetic to the key concepts in LP4, they also described increased engagement in their reflections. Student reflections transitioned from freedom described as problem solving in groups (LP3 reflections) to freedom described as multiple choices and perspectives by considering alternative narratives in LP4. In their reflections, the words choices and freedoms overlapped when considering how student freedom to learn encouraged alternative perspectives. Designing for empathy also emerged as an important aspect to consider when students have freedom to choose what they want to learn.

Finding 1.13: The teacher's perspective of open learning and OEP developed as a result of designing for and participating in open learning experiences. The teacher's perceptions of open learning were interpreted based on the teacher's personal reflections, interviews with the researcher, daily check-ins and collaboration when creating co-presentations. In his reflections, the majority of the focus was devoted to the student perceptions of research and their learning experiences and how he could transform the way the students perceived their

learning and demonstrated their learning. Learning design and how to expand student learning from formal to open learning environments was discussed during the classroom observations, project final check-ins and teacher-research weekly communications.

Balancing practice, theory, and research. Before the data collection began, the teacher was concerned about the idea of research in the classroom, in terms of how things would work, how students would perceive it, why it was important and the benefits to himself and the students.

The idea of going and talking to, having (the researcher) come in the other day to talk to students about research was interesting. For me, the idea of asking students to take part in research, I think is just simply learning what research is. I don't think they actually understood what it is, or what we were asking them. Not because (the researcher) didn't make it clear. It's just that we don't (usually include students as participants), I think the students questioned the idea of research being "done on them". They were skeptical that others would want to know what students think or do. They seemed confused about the idea that they would just be asked to answer questions about what we are doing in the classroom and how do we reflect upon what we are doing as teachers and make it better.

And I think that's what students don't understand. At least, for me, when a student considers 'Why should we do this?' I thought, 'Well, because, we're trying to always find out about how to be better. I mean, it's kind of the motto of BF, is 'get better,' and that means always analyzing yourself.' And I think that's what the beauty about our research is trying to do or even just research in general, and not just what we're trying to do with this project. But just even asking the question, 'How do we get better?' We need to know facts, we need to know some details, or we need to be able to research and figure things out—for ourselves. (Teacher reflection)

The teacher's concern in the excerpt above about "getting better" became a theme of his own personal learning throughout the research project. While the researcher was more focused on how the teacher developed his learning design and pedagogical skills in OEP, it became evident that the teacher's perspective of getting better meant learning how to encourage his learners to be the best learners that *they* could be.

Open learning design and transformation of practice. In his reflections, the teacher frequently described how he envisioned the learning design process and his perceptions of the

impact of the learning design on the students. Early in the cycle, during LP1 and LP2, there were limited reflections and comments that described the teacher's perceptions of OEP. At the beginning of the project, when the researcher and teacher were describing what open learning can do to support teacher learning, the researcher described the moment an expert in the community replied back to her in an open learning context. The teacher replied, "That has never happened to me". At the end of LP4, during the final interview, the teacher said, "I was always putting my stuff (learning design) on the blogs, but it took so much time. I liked the idea of Trello because it showed everyone what we were doing". Although the researcher tried to encourage the teacher to describe his perspectives in terms of OEP during the final learning pathway interviews and check-ins, the teacher did not feel comfortable using open learning examples in his reflections. As a result, there was limited reflective data collected from the teacher that directly connected to OEP or open learning reflections.

The teacher did not feel that he had the time to dedicate himself to reflecting upon his own transformation in terms of open learning in addition to his regular classroom tasks and research participation. He did regularly comment on how much he was learning and how he would have appreciated professional learning about learning design earlier in his career. He also added in his final interview that he would be using many of the ideas and learning design from the Building Futures project in his new program next year.

Although the teacher did not reflect about open educational practice or open learning in particular (other than specific feedback about open learning design guided by the researcher), the researcher did observe and record the numerous conversations, check-ins and end of learning pathway interviews throughout the research study. The teacher and researcher used the OLDI framework as a lens in which to describe the research open learning perspectives because it was

a way to effectively communicate a shared understanding of what we were observing in the classroom and our perspectives of how the students were learning. The teacher and researcher would use the stages from the original OLDI version to compare and contrast what they were seeing, reading and hearing in the classroom.

Summary

The data presented in this chapter were analyzed and summarized in response to research question one: what are the students' and teachers' perspectives of open learning experiences? The approach to analysis, and the key themes and findings that emerged, were presented and described. Overall, some of the themes that emerged included that open learning perceived as an easier way to learn (than previous learning experiences) by the students because it expanded their learning spaces in multiple ways. Open learning encouraged collaboration with others and it is often online which many students consider safe because of the dissociation from reality and real people. A perceived condition of open learning was the development of digital literacies which also helped the students find people, digital content and relevant information online. Open learning was also considered an easy way to learn because it made learning personal and engaging by being authentic and realistic. It provided students access to connect with local community, understand important issues by accessing multiple sources and develop empathy by connecting with others to hear different perspectives and opinions. However, open learning was also described as difficult because it elicited emotional responses when students had to share their learning with others.

As mentioned in Chapter 3, the researcher, teacher and student roles also changed and developed as the design intervention continued and expanded from LP1 to LP4. The changing roles also had an influence on the more descriptive student reflections, limits to teacher

reflections and more in-depth researcher classroom observations. The findings presented in this chapter describe many of the transformations to student learning, as described and perceived by the student's themselves. The students' voices provide a foundation for better understanding and awareness of the potential of open learning in high school contexts. The next chapter presents data analysis and findings that speak to the extent to which OEP can expand learning opportunities for high school learners and how the OLDI supports teachers in designing for open learning.

Chapter 5: Presentation of Findings That Consider How High School Learning Expanded into Open Learning Environments

Overview

In Chapter 4, the researcher described the research findings in relation to research question one, which considered the open learning perspectives of the participants as they considered and described expanded learning environments. In this chapter, the research findings are presented in relation to research questions two, to what extent does OEP expand learning opportunities for K-12 learners and three, how does an open learning design intervention (OLDI) support teachers in designing for learning. The answers to these questions in this chapter, considered how open and expanded learning can provide new and different learning opportunities for high school learners. Additionally, this chapter presents findings about how OLDI can be used as a framework from which to consider how to expand open learning in high school learning contexts. Expanding upon the participant perspectives of open learning presented in Chapter 4, this chapter builds and expands upon the participant perspectives to describe how the learning expanded from formal to informal learning environments, the process of open learning, and how the OLDI provided a framework to inform the teacher's designs for open learning opportunities.

Findings: Expanding Learning Opportunities for High School Learners

The following section describes how the different forms of data were analyzed as a whole, which includes the participant and researcher reflections, student digital artifacts, classroom observations and V&Rmaps, as a means to help describe how the learners considered and exhibited expanded learning experiences and opportunities. The combination and triangulation of different forms of data provided an opportunity for the researcher to analyze how

open learning could encourage high school students to think about learning in different ways as a result of interacting, connecting, collaborating and sharing their learning with others. Once it was determined that students were able to develop an awareness of open learning, as described in Chapter 4, the data was then analyzed to consider the stages, levels and continuums that emerged as a result of designing for open learning.

Table 5.1

Findings Connected to Research Question Two: To what extent does OEP expand learning opportunities for high school learners?

Finding 2.1	In the context of open educational practices, students developed an awareness of deep and surface learning for themselves.
Finding 2.2	The students described learner accountability and self-imposed learner expectations in expanded learning environments.
Finding 2.3	By expanding learning environments, students had the opportunity to use multiple learning strategies to solve problems.
Finding 2.4	The cognitive level of student knowledge increased over time as a result of designing for open learning.
Finding 2.5	As learning environments are expanded from classrooms into networks and open learning spaces, alternative assessment models that consider the integration of curriculum and competencies are required to assess student learning.
Finding 2.6	Open learning is a personal learning experience that is not confined to specific open and closed definitions.
Finding 2.7	Open learning in high school contexts expands into digital and face to face learning environments.
Finding 2.8	Open learning pathway activities extend beyond the completion of formal courses or projects.

Finding 2.1: In the context of open educational practices, students developed an awareness of deep and surface learning for themselves. In one of the classroom observations during LP3, the researcher observed that many of the students had *a deer in headlights* or a confused look when the teacher was asking questions about their learning process and solutions to their problems. The researcher had observed that during the formative assessment time, the teacher had been challenging many of the students to expand upon or extend their problem-solving strategies. The students did not seem to appreciate being challenged to expand upon their ideas and responded with comments like, “*but our ideas work, we are almost done.*” Some students appeared to be confused and perceived the teacher’s challenge as something that required more work for no reason.

During the daily check-in time, as one of the responsive and iterative ways in which to support the students in distinguishing their strategies to be accountable and responsible learners, the teacher and researcher decided to clarify deep and surface learning for the students. During the class time, the researcher described the difference between deep and surface learning to the students. The following diagram was drawn on the board and created in collaboration with student, teacher and researcher participation (See Figure 5.1).

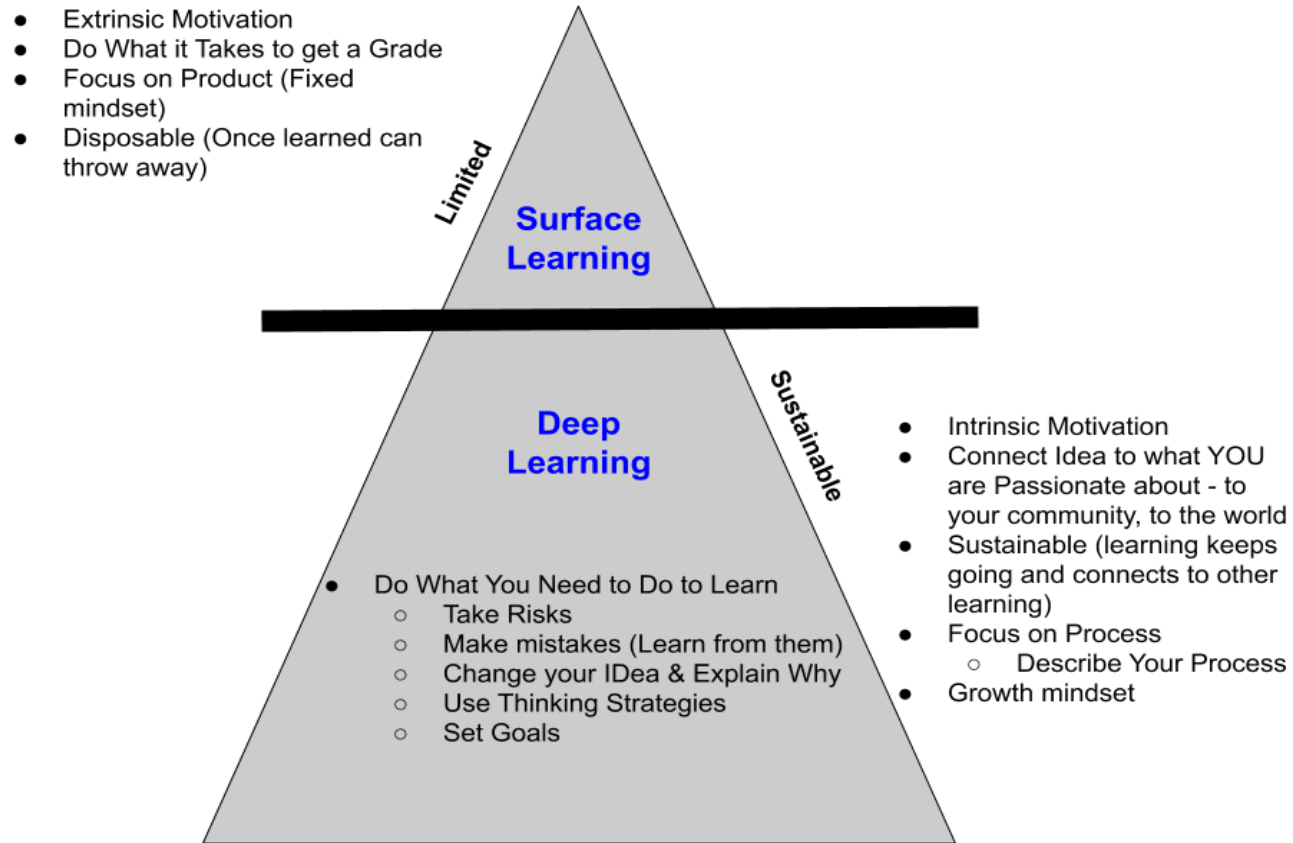


Figure 5.1: Collaboratively Co-Created Deep and Surface Learning Model

After the diagram was drawn, the researcher observed the students and teacher referring to deep and surface learning by giving clear examples of how and why they were extending their learning, expanding upon their problem solving and taking more risks in their learning. The student reflections revealed perceptions and growing understanding of the difference between the energy levels required for meaningful and challenging deep learning and surface learning. In the following example, the student describes how open learning can be overwhelming when she compared the deep-learning she experienced through the learning pathways compared to previous school experiences.

The main difference for me is the depth of learning you get. Traditional learning I feel is very surfaced, but by interacting with other you can get a deeper understanding of something. That being said sometimes that deeper learning can become too much to handle, kind of like an information overload, and for me this causes the “in one ear, out the other” effect. So I feel like there needs to be a balance. (Student M, LP4)

Student understanding of deep and surface learning was evident based on the drawing with multiple students; however, there was one clear example that was documented from the student and researcher perspective that illustrated the growth in student understanding. The researcher documented her experience with a student in this reflection.

Table 5.2

Deep and surface learning comparison of researcher observation and student reflection

Researcher observation	Student P, LP3's Reflection
I asked him about his field trip idea, and he said he still didn't know if he should do it. He seemed anxious and mad at himself, almost disappointed with himself.	<i>At first I was just going to plan a day trip to (the mountains) but I got challenged by my teacher to make it something more</i>
Then I encouraged him, again, to talk to (the community partner contact person) because she had already suggested a summer field trip overseas where current and former BFA students, could volunteer to build a project overseas.	<i>So I went and asked (the community partner contact person) if she had some ideas. I looked at what other people have done like the teacher at (another school) who takes kids to Australia, and (another student) mentioned going to Ecuador during the summer with Me to We.</i>
As I watched (the student), he seemed to be struggling to decide what he should do.	<i>Honestly, I'm lost. I struggled with thinking about cost and how a lot of it won't be possible, but (the researcher) said to just forget about the money.</i>
As I was walking away, all of a sudden, (the student) just got up and told me he was going to talk to the community partner contact. When he came back into the classroom, his whole demeanor was different. He had spoken with the community partner contact person, he had a plan, and he got to work on his computer. His eyes were sparkling (earlier he had a permanent frown and he had his hand in front of his mouth). Now he was coming to me with questions when he needed me (as opposed to me checking in with him every 10 minutes wondering if he was ok).	<i>A strategy I used was, I took (the researcher's) advice and now the trip is basically a go we just need to fundraise for that money problem. Now we are going to Ecuador this summer!</i>

The excerpts from the student and researcher's reflections provide evidence of a change in learning action as a result of the learner interactions with others. The example also

demonstrates how the student was supported in developing strategies to expand his own learning. The daily check-ins between the researcher and teacher provided numerous examples of how responsive the teacher was to the needs of his students and the variety and amount of formative assessment used to build relationships with his students in order to clarify their learning process and to challenge and support the students. As a result of the teacher's responsive practice, which helped students better understand and communicate their learning choices, the student reflections started to include descriptions of how they had a role in their own learning. Their reflections described how their learning was expanding as a result of considering deep and surface learning.

Finding 2.2: The students described learner accountability and self-imposed learner expectations in expanded learning environments. As the projects transitioned from an inquiry learning design (LP1 & LP2) into a design thinking approach (LP3), the classroom observations noted that the students started to develop personal accountability. Most often, the researcher observed fewer students saying, "I don't know what to do" and a greater number of students who turned to each other for clarification or found the answer for themselves in other ways.

One student reflected about his dependency on the teacher for direction and that he was uncomfortable with his newly found accountability.

When (the teacher) was giving pointers and told us how to do it right I felt confident I was doing it correctly but there was some points where I didn't feel like I was going to succeed because I was struggling to learn the way you wanted me to. (Student O, LP3)

Another student reflection revealed initial discomfort with the concept of accountability, yet articulated ownership of their learning through a perceived awareness of passion.

I knew I was succeeding during this project when I actually knew what I was doing and what next steps I would need to take to continue to move forward with the project and that overall it was starting to come together. I also knew because when I felt like I was succeeding, I was passionate about what I was doing and actually wanted to keep going with the project. (Student A, LP3)

In the student reflections, the students provided many examples of how they perceived their responsibility for learning while describing what strategies they should have considered or used in order to become more accountable and responsible for their own learning. Some of the student examples were included above. The researcher documented examples of student behaviour through classroom observation notes that described how students considered how to solve problems, how they could take on more responsibility as a learner and how they transitioned from teacher expectations for their learning to personal expectations of their learning. Overall, the students revealed positive perceptions of their learner responsibilities, however, as some of the previous examples identified, some students were very hesitant at first to take on new responsibility and would have appreciated more teacher direction.

Finding 2.3: By expanding learning environments, students had the opportunity to use multiple learning strategies to solve problems. The researcher observations and student reflections often had similar narratives which the researcher and teacher used to validate data and helped support learning design changes and updates as the projects were in progress. The following table compares and contrasts a narrative from the researcher observation and a students' reflection when faced with problem solving challenges.

Table 5.3

Deep and surface learning comparison of researcher observation and student reflection

Researcher observation	Student G, LP3's Reflection
<p>A LP3 group has broken up... The teacher and I (the researcher) sat down and talked with him and (his new group member) at the beginning of class.</p> <p>After (the teacher) and I (the researcher) spoke with (the student), he said that he hadn't realized this 'new group' already had so much of their project done. The students were concerned about the time it would take to go through each (design thinking) phase. They also admitted they much preferred doing a project that they were interested in. They appeared excited to complete a project they were interested in and almost happy that their group had broken up.</p>	<p>A strategy I used to solve my problem was just simply brainstorming. (The teacher) and (the researcher) helped us come up with a new idea and how to do it. They helped us get ideas and then we took it from there....</p> <p>I learned that figuring things out with just one other person isn't actually as hard as I thought it was if you have the right teachers and idea. Learning doesn't come without working. So far I have gone along with others and let them do most of the hard things. When our group split I started to work harder and learned that it isn't so bad to do something yourself</p>

The previous excerpt illustrates how the formative assessment and support from the teacher and researcher helped the student consider learning strategies for problem solving. Although there were multiple examples of the teacher taking the time to walk through problems with the student and give them individual feedback throughout the research project (this was a pervasive behaviour of the teacher to give one on one check-ins as formative assessment) this example emphasizes how the students negotiated their learning collaboratively with the support of others (in this case the teacher, the researcher and another student). There were two students involved in the discussion with the researcher and teacher, and the students used technology tools, brainstorming webs, talking with parents and other peers and the in-class discussion in order to work through their learning pathway. The multiple ways in which the students

considered how to process and approach their learning in the above example, was observed in multiple different contexts by the researcher throughout LP3 and LP4.

Finding 2.4: The cognitive level of student knowledge increased over time as a result of designing for open learning. The cognitive level of student knowledge describes how the student describes or indicates awareness or understanding of the process of learning and understanding knowledge. In every classroom observation, the researcher used the classroom observation protocol to observe how the students demonstrated learning. There were differences observed between student behaviours in meso stage 1, which included LP1 and LP2, and meso stages 2 and 3 which included LP3 and LP4. As described in Chapter 3, the observation protocol was split into three parts and in part 2 the protocol considered the cognitive level of student knowledge which this was documented in a checklist and notes. There was no clear evidence of higher level of cognitive of student knowledge (apparent in the understanding and knowledge production tasks) in LP1 or LP2 documented in the classroom observations.

In each of the learning pathways, the classroom observations section two began with evidence of “Knowledge Acquisition and Performative Tasks” (See Appendix J for more details about the Classroom observation protocol). In LP1-LP2, as mentioned in previous sections, the researcher and teacher supported learners with formative assessment during much of the classroom time and there was no clear evidence higher level of cognitive of student knowledge (apparent in the understanding and knowledge production tasks) in LP1 or LP2 documented in the classroom observation protocol. The students spent more of their time completing tasks, figuring out how inquiry works and developing digital literacy skills to demonstrate their learning in different ways. However, In LP3 and LP4, the learning provoked problem solving (usually in groups) and the opportunity to consider multiple perspectives (with multiple people to

connect and engage with when questions arose). The learning design shifted from guided inquiry to individual inquiry, and many students were observed using learning strategies, connecting with their peers or other nodes of learning to find information and answers. As a result, the researcher had more time to observe and clarify student perspectives made in their reflections and during classroom observations. Not only did the researcher have time to write some quick observations, the researcher was able to distinguish open learner readiness as the learners continued through the OLDI framework and their learning was demonstrated through an increase in evidence of “understanding and knowledge production tasks”. The following observations were documented on three days throughout LP3 in the graph below:

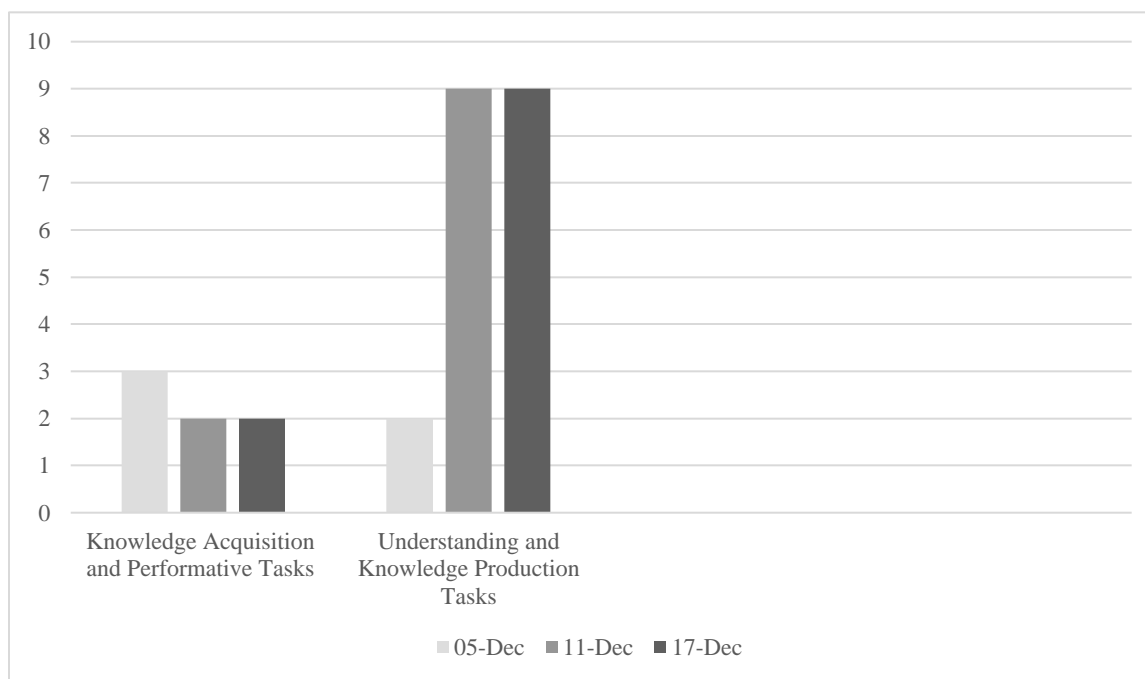


Figure 5.2: LP3 Cognitive Level of Student Knowledge Classroom Observations (3 observation days)

A comparison of the observations from the three days reveals that similar evidence of learning was documented over multiple days and posits that deeper learning can occur when OLDI stages included personal learning networks and all four stages. In addition to evidence of

surface and deep learning in LP3, a similar pattern emerged in LP4. In the classroom observations, part 3, the following observations were documented on five days during LP4 in the graph below.

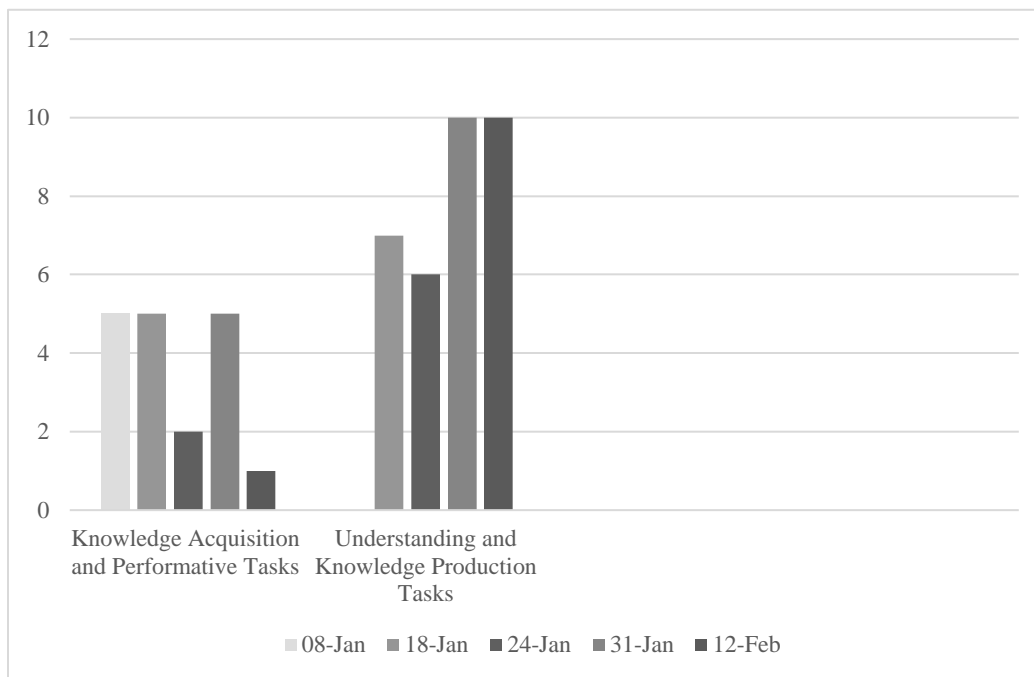


Figure 5.3: LP4 Cognitive Level of Student Knowledge Classroom Observations (5 observation days)

Both LP3 and LP4 classroom observations demonstrate evidence of increased understanding and knowledge production tasks which suggests a more diverse and complicated demonstration of cognitive functions in how students described and indicated their learning. This increase in cognitive function also connected with the OLDI framework. The teacher and researcher had designed for expanding learning to include OLDI stage 3 and 4 in the LP3 and LP4 learning design. As such, it could be asserted that as the open learning design transitioned into more open and personalized learning environments, the evidence of more complicated cognitive learning also increased.

Finding 2.5: As learning environments are expanded from classrooms into networks and open learning spaces, alternative assessment models that consider the integration of curriculum and competencies are required to assess student learning. The researcher was able to collect data from multiple sources in order to create assessment rubrics that considered evidence of student learning from a teacher perspective and individual perspective. The data collection included student digital artifacts, student reflections, classroom observations, discussions with the teacher and researcher reflections.

The teacher and researcher used Erickson and Lanning's (2014) conceptual learning rubrics to consider formative assessment. The researcher was able to track formative assessment during classroom observations and was used to support the Learning Process Rubric. Classroom observations also included the observation protocol that helped the researcher collect data for the Learning Process Rubric as well. There were three rubrics that were created in order to assess the different components of the learning pathways. The researcher and participants co-created the original draft of the Open Readiness Rubric (See Appendix N1) for LP1 and LP2. The students were asked to use the rubric to self-assess their learning and the teacher was asked to use the rubric to assess the student learning. The Original Open Readiness Rubric used for LP1 and LP2 was adapted from Vygotsky's (1978) zone of proximal development, Kozulin (2003) and Kolb (1984). The students and teacher found trying to self-assess their learning and stage of openness and co-creating the rubric confusing, as described in student reflections in Chapter 4. The teacher did not feel that the time was needed to co-create rubrics with the students.

As a result of the confusion and feedback, the researcher revised the rubric into two separate rubrics for assessment for LP3 and LP4. The Open Learning Summative Assessment Rubric combined some of the theoretical ideas from Vygotsky (1978), Kozulin (2003), National

Academies of Sciences, Engineering, and Medicine (2018), and Roberts (2018) is described Appendix O.

The second rubric that was developed for assessment was called the Open Readiness Rubric (found in Appendix N2) and can be used as a self-assessment tool, a group assessment tool or a teacher can use the tool to assess open learner readiness. The content and assessment considerations for the open readiness rubric were chosen based on the connection to learner competencies rather than a connection to curriculum skill or outcome, as well as learner demonstration of characteristics of open learning (based on this research and open learning theory). The theoretical foundations for the Open Readiness Rubric expanded upon the ideas of Vygotsky (1978), but also included Stornaiuolo, Smith, and Philips (2017), Cronin (2017), and Kolb (1984).

The content and assessment considerations for the Open Readiness Rubric were developed in consultation with the students and the teacher, using the feedback from the open learning cycle mentioned in Chapter 4 and students' reflections. The researcher and teacher decided that open learning included student awareness and choice in terms of who they want to share with, what they want to share and how they want to share their learning. As such, the Open Learning Rubric was not ever to be intended to be used as a means to grade the student, but rather used to inform the student as a means of formative, peer or self-assessment to support the learners as they expanded their learning into different environments and experiences and with different nodes of learning.

The researcher and teacher had numerous conversations about how to assess for emerging learning as a result of using the OLDI framework to expand learning opportunities. The final

rubrics (found in the Appendix) were updated by the researcher and shared with the teacher for validation. The teacher did not use the assessment rubrics for his final summative assessment.

Student evidence of learning. The student evidence of learning was recorded below by the researcher and validated by the teacher based on the Open Learning Summative Assessment Rubric. The chart below demonstrates the high student engagement and completion of student learning activities. All of the 23 students completed their summative assignments. Only 3 of 23 students did not complete the reflections for LP3 and/or LP4.

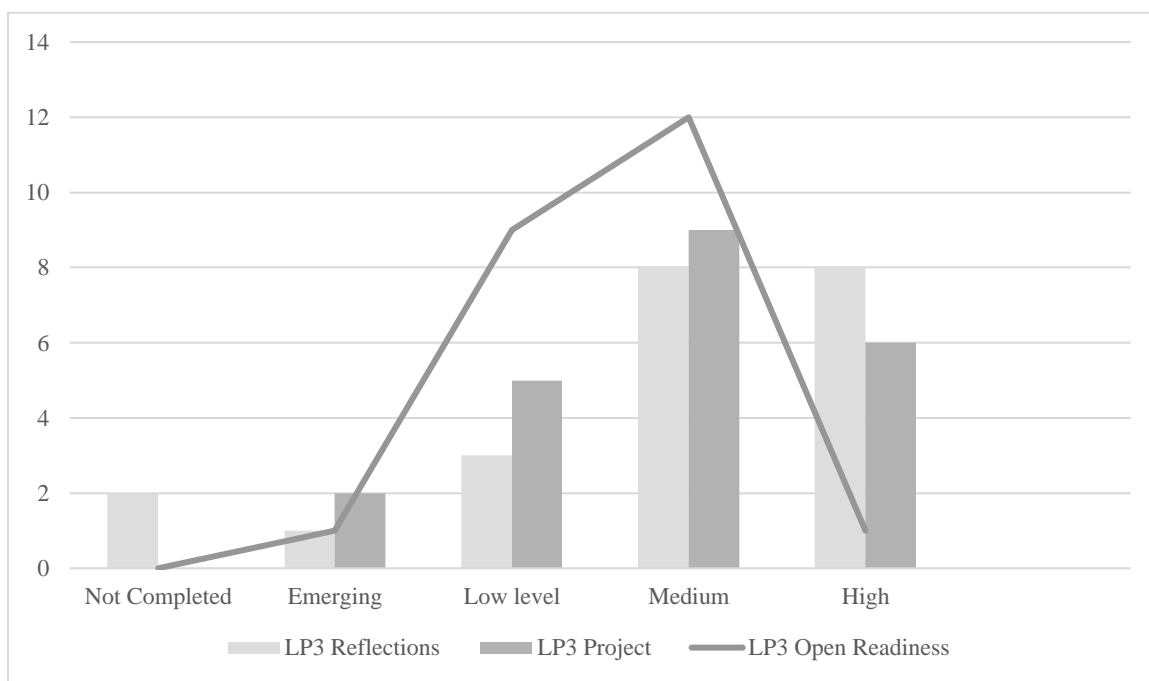


Figure 5.4: LP3 Assessment levels for reflections, projects and open readiness

The following graph represents the assessment levels for student participants in LP4.

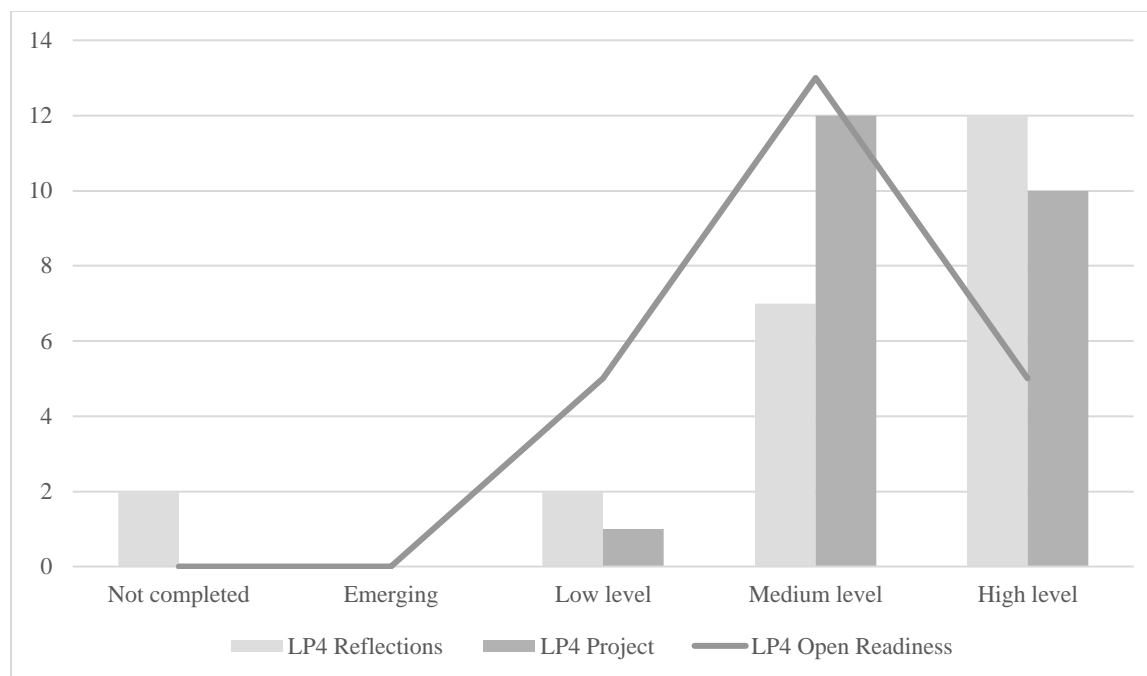


Figure 5.5: LP4 Assessment levels for reflections, projects and open readiness

In consultation with the researcher, the teacher agreed that his summative and formative assessment final marks correlated with the assessment chart above for all participating students. The combination of different assessment methods provided a means to validate the rubrics created as a result of the research project. The students were more successful in their summative curriculum focused learning as well as they demonstrated increased open readiness between LP3 and LP4. The discrepancy between the two modes of assessment is in the “highest” level. More students demonstrated the skills and competencies to meet curriculum requirements, as such they were at a “high” level. However, not all students demonstrated “high” levels of open readiness and open learning. Therefore, the research suggests that there is a difference between high levels of demonstration of learning from a summative curriculum perspective as compared to a demonstration of evidence of learning from an open learning perspective.

The teacher did note that the rubrics created by the researcher had more details and would give the student and parent a better idea of how the learning connected curriculum and competency-based learning as well the permeable boundaries that expanded from formal and into informal learning environments. The open readiness rubric can be used by multiple people (the student, peers and the teacher) and this multi-use of an assessment rubric was also supported by the teacher.

Finding 2.6: Open learning is a personal learning experience that is not confined to specific open and closed definitions. As a result of the emphasis on formative assessment and transparent evidence of learning, the way in which students described expanding learning environments was highly personal and contextual. The students did not label their learning in binary constructs like “open or closed”, “in the classroom and outside the classroom” or “formal or informal”. As a result, in the data analysis, continuums of open learning based on personal open learning experiences and contexts, became apparent.

In LP1, LP2 and LP3, the teacher primarily designed for learning that expanded beyond classroom walls that connected to people within the community mostly through digital communication that included emails, social media and digital content. By LP4, the expansion of the learning environments became very personal as the relationships in the class strengthened. The teacher designed for learning that connected with people who came into the classroom, people whose stories were shared with the development of relationships, participant family members and students developing relationships with themselves by being honest with themselves. The expansion described by the students was conditional on their control over how far they wanted to pull others into their learning environment and how far they wanted to expand out towards others. As such, every student had different learning experiences, different

interactions, different expectations for themselves and different learning environments. The following figure demonstrates how expanding learning opportunities affords iterative and flexible open learning continuums that describe personal ways of knowing in personal learning contexts.

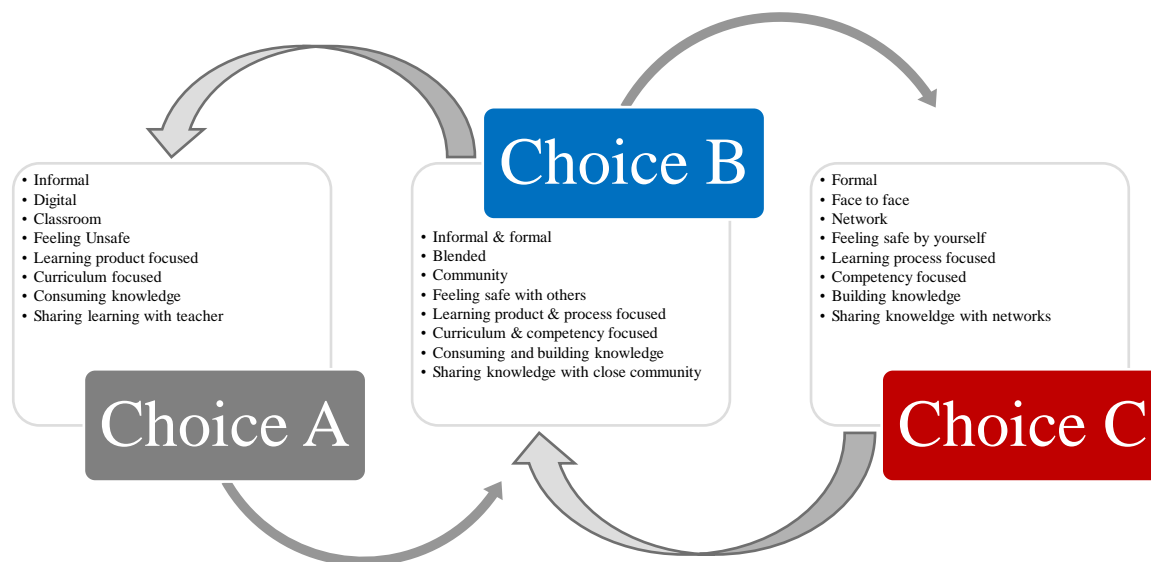


Figure 5.6: Examples of high school open learning continuums

The open learning continuums that were used as examples as a result of the analysis are based on participant descriptions of where they learn and how they learn and there was no specific coded example that determined how students learned and where they learned. Alternatively, the data analysis used open learning continuums to describe expanded open learning as a means to describe the grey space which expands upon the open literature previously described in chapter 1 and closed or walled learning contexts. The classroom observations and the student and teacher reflections provided multiple examples of how to describe open learning continuums. In this research, the continuums were influenced by numerous factors; however, the

most influential factor was learner readiness in terms of the participants being ready to take the risk to expand the learning environment by taking responsibility for what they learn, how they learn it, who they learn with, who they choose to learn as and how they demonstrate evidence of their own learning.

Finding 2.7: Open learning in high school contexts expands into digital and face to face learning environments. While there were some differences in the coding between face to face and digital open learning environments, there were no notable differences. The data analysis that demonstrated the participant perception that open learning is apparent in digital and analog contexts is substantial. The following chart summarizes the reflection descriptions between digital and face to face open learning experiences. The key finding is that open learning can occur in digital and face to face learning environments and is not dependent upon digital learning networks when using the OLDI framework.

Table 5.4

High School Digital and Face to Face Open Learning Experiences

Digital open learning	Human Learner Connection	Non-digital open learning
<p>The opportunity for all learners to access and build relationships and connect with other nodes of learning (which include people and digital artifacts) in digital contexts in order to bridge communities and expand networks</p> <p>The learner may have public or anonymous identities, group or individual.</p> <p>Nodes of learning can be natural experiences and digital experiences (connections to non-biotic and biotic nodes of learning)</p>	<p>Learner decides how far their learning environment expands</p>	<p>The opportunity for all learners to connect to place (bio ecosystem), peers, family, community which are interconnected through relationships and cultural experiences which has the appearance of a digitally connected network, but in a living & breathing learning ecosystem with many more F2F relationships</p> <p>The learners tend to have more public identities with other learners. As a result they had to have individual identities.</p> <p>Nodes of learning can be natural experiences (connections to non-biotic nodes of learning - like watching an ant and learning from what they learn)</p>

The key finding is that open learning can occur in digital and face to face learning environments and is not dependent upon digital learning networks when using the OLDI framework. OLDI was originally designed to support the development of digital literacies through which the students could connect to digital communities and networks. However, through participant reflections and classroom observations, it became apparent that high school open learning requires supportive and trusting face to face relationships from which to expand into open and networked learning. The following image describes how open learning develops in digital and face to face learning networks.

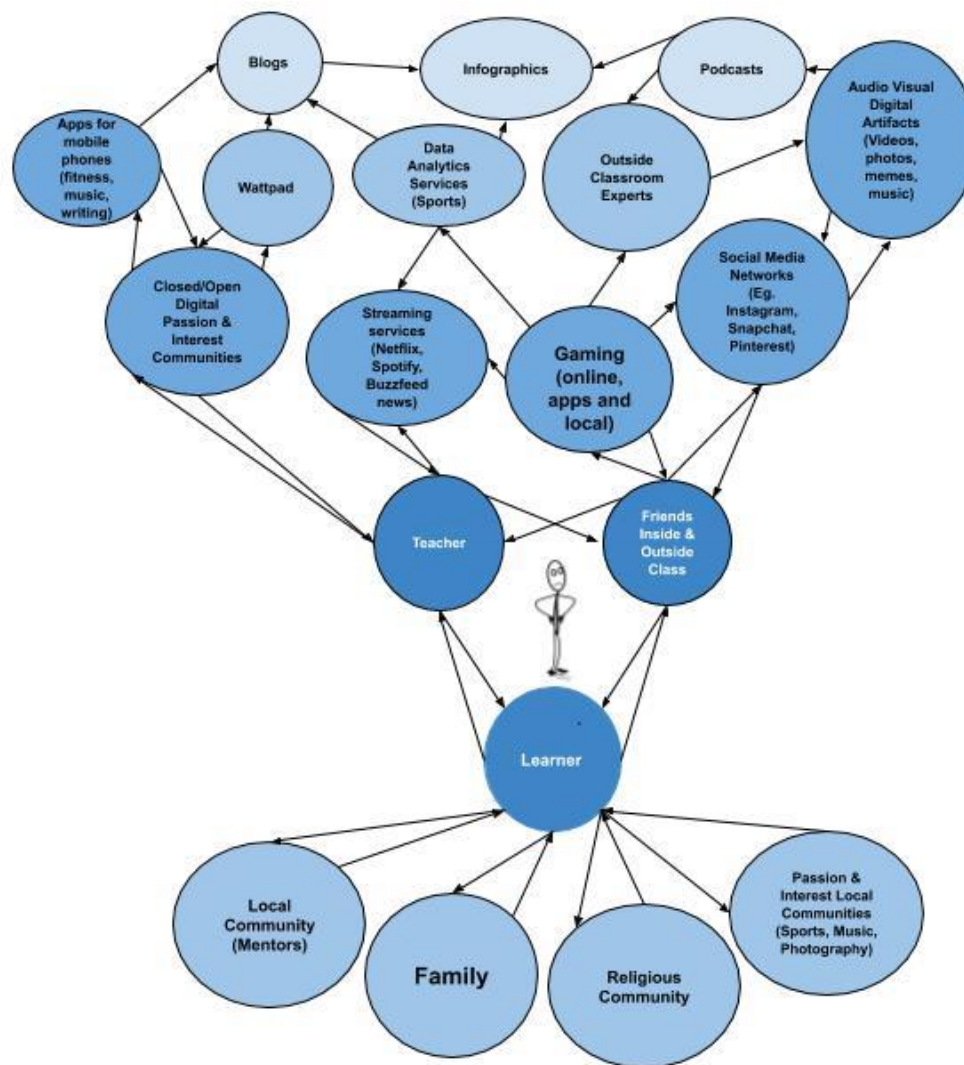


Figure 5.7: High School Open Learning: Individual to Community to Networks

The digital learning experiences did not provide the most meaningful means for students to trust and develop these relationships. Instead, the students turned to their family and friends, trusted community experts and faith-based leaders in order to initially expand their learning environments. The community connections were digital and non-digital as well. Once students were able to feel safe within these smaller communities, a few students were able to expand as their public individual identity into digital networks and non-digital networks.

Finding 2.8: Open learning pathway activities extend beyond the completion of formal courses or projects. When considering how to track personal learning networks, the researcher only collected data based on information from student reflections, classroom observations and interactions with the participants after the completion of LP4. There was no collection of personal social media or texts unless the student copy and pasted a screenshot for evidence. As such, the evidence of personal learning networks was only evident in data collection passed through the ethics approval.

In LP1 and LP2, the expanded PLN was more connected to the teacher and researcher's PLN, and by LP3 the expanded PLN included some student PLN examples. It should be noted that Student F demonstrated an expanded PLN from the beginning of the project in their first reflection and V&Rmap, however, they were the exception.

Figure 5.8 describes the numbers of additional learning projects that developed, and the additional people involved as an extension of LP1, LP2, LP3 and LP4.

Meso Phase 1		Meso Phase 2		Meso Phase 3																		
<table border="1"> <tr> <td>LP1</td> <td>LP2</td> </tr> <tr> <td>Researcher Teacher Students</td> <td>Researcher Teacher Students</td> </tr> <tr> <td>Interactions with Digital content/resources</td> <td>Outside Expert (1) Interactions with digital content/resources</td> </tr> </table> <p>Additional Projects: 0</p>		LP1	LP2	Researcher Teacher Students	Researcher Teacher Students	Interactions with Digital content/resources	Outside Expert (1) Interactions with digital content/resources	<table border="1"> <tr> <td>LP3</td> <td>LP4</td> </tr> <tr> <td>Researcher Teacher Students Family</td> <td>Researcher Teacher</td> </tr> <tr> <td>Outside Experts (Not Known Before LP3) (More than 20)</td> <td> <ul style="list-style-type: none"> • Students • Family • Other Teacher • Community Partner • Outside Experts (Not Known before LP4) • School District Specialists </td> </tr> <tr> <td>Outside Experts (Known before LP3)</td> <td></td> </tr> <tr> <td>Social Media Connections (More than 20 – do not all know someone personally)</td> <td>• University presentation</td> </tr> <tr> <td></td> <td>Connections (More than 20 all know someone in the program personally)</td> </tr> </table> <p>Additional Projects: Summer Overseas trip Leadership project</p> <p>Unlimited & limited connections with content/resources/social media/people</p>		LP3	LP4	Researcher Teacher Students Family	Researcher Teacher	Outside Experts (Not Known Before LP3) (More than 20)	<ul style="list-style-type: none"> • Students • Family • Other Teacher • Community Partner • Outside Experts (Not Known before LP4) • School District Specialists 	Outside Experts (Known before LP3)		Social Media Connections (More than 20 – do not all know someone personally)	• University presentation		Connections (More than 20 all know someone in the program personally)	<p>People and Projects:</p> <p><i>Knowledge Mobilization Presentations:</i> Teacher Researcher Students</p> <p><i>Professional Learning workshops:</i> Community Partner School District Specialists Researcher Students Principal Director of Learning UNESCO project</p> <p><i>Final Exhibition of Learning:</i> Other BFA teacher Community Partner Principal School District Specialists</p> <p><i>Program Design for Next Year:</i> Teacher Other Program teachers Learning Specialist</p> <p><i>Award Video:</i> Remixing of video for K-12 Technology Integration Award</p>
LP1	LP2																					
Researcher Teacher Students	Researcher Teacher Students																					
Interactions with Digital content/resources	Outside Expert (1) Interactions with digital content/resources																					
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Social Media Connections (More than 20 – do not all know someone personally)	• University presentation																					
	Connections (More than 20 all know someone in the program personally)																					

Figure 5.8: Expansion of Nodes of Learning and Learning Experiences from LP1-LP4

As demonstrated in the table, there is a noticeable increase in the continuation of learning activities in LP3 and LP4 as a result of using OEP. As documented in researcher field notes, according to the student feedback during classroom observations, the key characteristics of sustainable learning activities are: 1) they are not disposable, and often never end, 2) promote student choice or are personally relevant, 3) have multiple entry points, 4) are flexible and supportive for all learners, and 5) are often serendipitous or contextually created. Many of the projects that started in one of the learning pathways have already been remixed into new projects outside of formal classroom walls.

Findings: The Open Learning Design Intervention (OLDI) Framework Supports Teachers in Designing for Open learning

In the previous chapter, the findings exemplified how open learning is perceived and described by the participants and how they perceived their learning to have expanded beyond classroom walls. At the beginning of this chapter, research question two was examined which considered the extent to which open learning can be considered for high school learners. In this section of the chapter, all of the findings from Chapter 4 and earlier in this chapter, are synthesized in order to provide a response to research question three, which considers how the open learning design intervention (OLDI) can support teachers in designing for the learning pathways. The emerging findings from this research are all interconnected and can be interchanged as the research question findings, depending on context or situation. As such, the following findings include possible examples that could also be included in the previous findings; however, it was determined that these findings are most applicable to open learning design for the OLDI framework. This chapter's findings describe how the OLDI framework provided a lens that supported the teacher and researcher in designing for open learning

opportunities for high school students and how the participants expanded their learning (the action of learning openly) based on student reflections and classroom observations. The following table summarizes findings for research question three.

Table 5.5

Findings Connected To Research Question Three: How does an open learning design intervention (OLDI) support teachers in designing for learning?

Finding 3.1	When using the OLDI framework the teacher developed and encouraged teacher-student relationships throughout the open learning process.
Finding 3.2	When using the OLDI framework the teacher designed for effective group work when preparing students to expand their learning beyond classroom walls.
Finding 3.3	When using the OLDI framework the teacher considered learner readiness in order to co-design learning pathways with students.
Finding 3.4	When using the OLDI framework the teachers considered how student learning identities and mindset influence personal learning experiences.
Finding 3.5	When using the OLDI framework the teachers designed for multiple pedagogical approaches which expanded into multiple learning spaces.
Finding 3.6	The teacher indicated that participatory and collaborative learning design are essential components of open educational practices.

Finding 3.1: When using the OLDI framework the teacher developed and encouraged teacher-student relationships throughout the open learning process. In the final interview, the teacher said, “Learning is all about relationships, but now I know how to connect student learning with relationship”. The decision to design for LP4 and include it in the research, was made by the teacher and the researcher for closure because the research seemed unfinished by LP3. During the teacher-researcher LP3 summary interview, the teacher mentioned some of the concerns he had with the evidence of understanding demonstrated by the students. The students had difficulty articulating what their definition of community was and therefore had problems brainstorming problems to solve problems. He mentioned the student reflections, classroom observations and final presentations as examples of the students’ lack of understanding about their community.

The teacher suggested that the students may have had difficulty figuring out community problems, because many of them had difficulty articulating their own personal problems and concerns. Although the students had connected with other nodes of learning in LP1-LP3, in LP3 the researcher and teacher documented the groups documented and reflected upon ‘project’ learning identities rather than individual identities. When describing the benefits of interacting with others, some of the student reflections described the challenges of working in a group and interacting with others as described in Chapter 4.

Although the student reflections were a positive first step, the teacher and researcher still felt something was missing and there were “missing steps or stages to explore” (Teacher, final reflection) because there were limited examples of how individual students were internalizing and demonstrating transformations. Due to the group projects, it was difficult to validate a connection between individual student perceptions of open learning in their product versus their formative assessment (classroom observations) and reflections on process. The final presentation of the LP3 projects, with the exception of three projects that were completed individually or in pairs, were not in alignment with the learning processes described by the students. The students did not share their personal learning identities with others (which included peers, family, outside experts and the public). By LP3, the students (in general) only shared a finished product, not their process with others.

The teacher had a desire to design for learning that connected to community, but not necessarily through digital communities and networks, but through knowing each student’s personal story and the stories of others. In the final interview, he described how he felt that students were still struggling to describe and understand their own identities, “... the lack of

understanding about who they are, and where, and how they learn, that really was missing” (Teacher, final interview).

The teacher reflected upon the original concept of the open learning design intervention that had included digital literacies in order to interact, connect and collaborate with others in expanded networked spaces outside of the classroom walls. As such, digital literacies were the original skills and competencies that were focused on in order to support expanded learning environments. However, based on the classroom observations, student and teacher reflections, in order to design for expanded learning environments, the teacher, the researcher and the grade 10 students needed to develop relationships in face to face and digital learning contexts and they needed to develop skills and competencies that helped them to connect, interact and engage with others.

I love that we were able to bring in the indigenous elders. I think they gave us a different perspective that we just wouldn't be able to get. But I think the real reason why the learning worked so well, was because storytelling is the one thing that binds everyone together like. It describes who we actually are as human beings. That is probably the most essential thing. If we understand our own story, then at least we have the opportunity to be able to connect with others, try to learn from others and I think better understand who we are (Teacher interview, LP4).

While in LP1, LP2 and LP3 the OLDI had focused on group work and collaboration as a means to develop communication, interaction, networking and collaboration competencies, the LP4 focused on developing personal identity in order to build relationships with others. The students needed to develop a relationship with themselves as learners and other people in their immediate learning community, before they were ready to share their identities and learning with others.

Relationships as the foundation for learning. In their reflections, the students described how relationships helped them to learn new things they had never learned before about themselves and others. The following student connected the importance of trust when considering storytelling.

The storytelling project gave me even more love for stories, I am always looking to learn more about people, it gives people more trust in you knowing that you trust them with your personal stories (Student U, LP4).

Another student describes her group relationships that occurred inside and out of classroom walls.

I have been able to realize that my learning stretches beyond school walls, and that I don't just have to be in school to come up with ideas or use the resources around me. I have been able to strengthen relationships. I know this might not be the answer you're looking for but for LP1 (fellow students) and I did the project together and we hung out outside of school to complete it. I think it might have been during that homework session that we all became friends. I think we learn while having conversations with others without even realizing it. We often have this mentality of "learning only happens inside school" when that isn't true. Learning happens all around us and these projects really helped me realize this (Student B, LP4).

As demonstrated in the previous student reflections, the emphasis on getting to know yourself and your own identity, helped students develop confidence to expand their own personal learning environments and networks. The following student describes how she was afforded the opportunities, as a result of intentional open learning design which included co-designing her learning pathway, for her to build relationships in ways she had never considered before.

I was able to build relationships with people I would never thought I would have before. (Student W, LP4)

OEP encourages safe learning relationships. In terms of using the OLDI framework, the teacher supported the researcher by helping the researcher to develop authentic and safe relationships with the students. The teacher and researcher would often co-teach the class together and the student feedback included comments about how the researcher and teacher each

contributed to student learning. The researcher observed how the teacher had built relationships with the students as a result of learning about their personal interests and passions and how he changed his practice in response to the student feedback on the importance of personal connections. LP1 and LP2 provided the opportunity for the researcher to develop similar relationships and observe student digital literacy competency, while the teacher considered how to implement and support the new learning design. By LP3, the teacher and researcher worked in collaboration in order to support student learning. The researcher and teacher worked together to figure out how to support students in their attempts to interact, connect and collaborate with others outside the classroom. The classroom observations during LP3 were often spent working with groups, learning about their project and supporting their needs. As a result of the researcher co-teaching with the teacher, communicating through observation day check-ins and emails/texting which, collaboratively, both the teacher and researcher felt that the research was not complete at the end of LP3.

The teacher may not have articulated clear connections to OEP throughout the research; however, by the end of the project he was able to identify and clarify his perceptions of transparent open learning opportunities. The teacher described that as the students developed a better understanding of themselves, they were better able to connect the curriculum to their own learning. The teacher also identified the importance of safe learning environments in developing the spaces in which students can get to know themselves as learners. He also identified the need for connections between the learners, feedback which lacks judgement and the ability to consider different perspectives. According to the teacher, the key to open learning in high school contexts, is building the conditions for students to feel supported enough to know they have a personal

learning identity that is different from other learners, they can learn with and from each other and they have the ability to expand their learning when they want to learn something for themselves.

Using DBR as a means to collect data provided the opportunity to probe and decipher the participant perspectives in multiple contexts and situations. The OLDI framework was used to guide the participants in realizing the importance of relationships in learning contexts. The multiple learning pathway cycles also helped to build relationships between the researcher and participants in considering the importance of relationships throughout learning opportunities.

Finding 3.2: When using the OLDI framework the teacher designed for effective group work when preparing students to expand their learning beyond classroom walls. In an early LP1 reflection, students mentioned the challenges of group work. In sociocultural constructivist learning contexts, learners are encouraged to interact, connect and collaborate together. From the very beginning of the classroom observations, there were multiple examples of students experiencing difficulty in working with others, specifically with peers during group work and when outside experts did not get back to them when they asked them questions in LP3: Community problems. As a result, the teacher made a considerable and intentional effort to support the students in developing group work strategies as they developed their collaboration and communication skills throughout LP1-LP4 because he continued to design for collaboration, interaction and connections in as many ways possible. It is important to note that although the teacher always designed for group collaboration, some students still chose to work independently as the teacher always offered learner choice.

As a result of the collaborative group work student feedback, the teacher and researcher designed for multiple groups learning contexts as well as individual learning opportunities. By LP4: Storytelling & Perspective, the group learning design also always included individual

responsibilities and not just individual assessment like in LP3: Community Problem. A conceptual-framework learning design, provided the flexibility for all students to participate and contribute to group task, while still demonstrating their awareness and understanding of curriculum and competencies.

For example, the teacher observed that when the students were in groups, they separated the tasks so they were learning cooperatively (splitting up the tasks and finishing a task based on a checklist) rather than collaboratively (building upon the ideas of each other in order to problem solve and contribute a new idea or concept). As such, the teacher considered how students could work in groups in order to give each other feedback and support, and also transition to individual relevant and meaningful projects at the same time. The teacher questioned if the students knew how to work in groups,

“...for collaboration, I think, between students, it was made really apparent when the girls just said, “Oh, we have our three questions,” and then each of them assigned themselves a question. They didn’t actually work through together to actually answer the question. They saw it as more, what’s the most efficient way of answering the question. So therefore, for me, that kind of talks to the idea that maybe some of the questions weren’t meaningful for them...it’s not stuff that they’re actually interested in”. (Teacher reflection).

In some student reflections, the students claimed that they had experienced academic success in their previous learning environments, and felt hesitant to work with others at first, as evidenced by comments that they were concerned how their marks may be affected if other students did not do their fair share of the work. During classroom observations, the teacher clarified the assessment expectations which were that all students would have group and individual grades that included their final presentation, formative group work assessment, daily learning journal and final reflections. For LP3, the teacher had also prepared a group work ground rules contract to support group project management. Students demonstrated multiple

ways in which to work in groups effectively by the end of LP3; however, the group work also promoted a dependency on each other and group learner identities that seemed to directly create barriers for students to learn openly and independently. As such, the teacher and researcher designed for group work that encouraged peer feedback and individual accountability. There were also students who chose to work individually, because no one wanted to join in to solve their chosen community problem. For LP4, the teacher and researcher chose to assign the groups and students could volunteer to assume specific roles within the group in order to ensure each person had some kind of specific accountability. In LP4, the pedagogical approach encouraged multiple perspectives and a time and space for these perspectives to be heard. The group roles, focus on perspectives and storytelling and individual final project, ensured that all students were given the opportunity to share their learning with each other, if they chose to do so. The teacher and students worked together to design for clear criteria for group work and the students described their group interactions as more positive and successful experiences by LP4.

Finding 3.3: When using the OLDI framework the teacher considered learner readiness in order to co-design learning pathways with students. Contexts and outcomes of OLDI planning meetings, and the teacher perceptions of open learning design, were collected in personal teacher reflections, interviews, daily check-ins and collaboration with the researcher when creating co-presentations.

Developing a co-designing learning process. From the beginning of the research, the teacher described open learning design in terms of how to include the students as active participants in their own learning journeys by co-designing learning pathways with the students. He wanted them to be engaged participants in their own individual learning process. From the first classroom observation, it was apparent that OEP learning design encouraged all participants

to think about how to be an active participant in designing their learning in different ways. The student reaction and response to having the opportunity to participate, engage and become actively involved in co-designing their learning pathway with the teacher varied between all the student participants. However, all students identified that they knew they had the choice and opportunity to influence their personal learning journey.

Throughout LP1-LP4, the teacher and researcher transitioned through multiple pedagogical approaches, while integrating the OLDI framework to support the development of open learning. The data findings up to this point have given multiple examples of how students were engaged or frustrated in the learning process. Jacobsen et al's (2011) research which examined student behaviour in order to describe high school learner engagement as a result of using technology was summarized in chapter 2. The four levels were disengagement, ritualistic compliance, academic engagement and intellectual engagement. Like the four levels of learner engagement, all of the participants (including the teacher) demonstrated different levels of engagement based on their ability to co-design their personal learning pathways. Finding 1.4 detailed how the students described and demonstrated evidence of open readiness. Their open readiness mindset also contributed to their co-designing learning readiness. While the teacher created the learning conditions to support open learning (like safe learning spaces, being transparent in describing his practice and encouraging learner agency), the students also had to participate and choose to engage in co-designing their open learning pathways. The relationships between the teacher and students and the researcher and students also deeply influenced the potential for students to co-design their learning. None of the following examples occurred without a learning relationship of some kind between a student and an "other". The following

section describes examples of different combinations of participant co-design throughout the research project.

Initial teacher and researcher attempts at co-designing for alternative ways of learning and knowing. During the initial classroom observations, numerous students commented about the different ways that they were learning. Specifically, the teacher was using an inquiry learning design to encourage the students to learn how to ask questions and find the answers for themselves. The students often described the new way of learning as relearning how to learn. The teacher reflected upon his surprise at the student comments about how they were learning in a new way or relearning how to learn. In a teacher reflection, the teacher described a student's comment.

According to (student) he has always been taught one way of learning. I'm still flabbergasted by that. I wonder, "What are we doing with our kids in schools," and, "How do we promote this idea of there are different forms of knowledge out there, there's different ways to approach learning?" (Teacher personal reflection)

The different ways to learn were described in terms of learning design and pedagogical approaches, assessment and how students demonstrated evidence of their learning. This student describes his initial reaction of the learning design experience when he was asked about how he learned, "I discovered that I really only knew one type of learning and that was writing a lot." (Student O, LP3)

Student reflections also described some initial student reactions about figuring out the answer to questions for themselves. Early in the research, some students would describe their awareness of a different way of learning, without describing the actual pedagogical process. One student describes her difficulty understanding that it is ok to have more than one answer when using an inquiry learning process.

Part of the reason I love math and science is because there are exact answers. I know in the world there isn't just one answer to every question and that this is part of the learning process but it's difficult to ask questions and not get a clear answer in return. (Student A, LP1)

Similarly, the following student describes his initial perceptions of how he had previously learned in response to the LP1 inquiry process.

I was introduced to a different way of looking at things, more of a personal way of learning instead of the basic textbook learning (here are the facts now regurgitate it back to me), learning through interactive discussions and thinking outside the box. A problem that I faced was learning how to learn a different way, I was always taught that there was only one way to learn, and every other way of learning was wrong. Something that helped me learn and expand my mind was the 3 question assignment, being challenged to research anything that I could think of in an area, and coming up with a way to present my learnings to the class. This challenge offered me a chance to step back and look at how I learn, it allowed me to have a taste of something new and fresh. (Student Q, LP1)

When summarizing the classroom observations, the researcher made numerous notes to capture the questions the students had in LP1 about relearning how to learn and evidence of frustration through classroom noise levels, lack of task completion and constant student hands in the air with questions. The reflections and reactions to learning in different ways in LP1 was defensive and skeptical by the majority of students. Some students ignored the class activities and chatted with their peers, some sat back and waited to be told what to do, some waited to speak one on one for clarification with the teacher and some asked questions about what we were doing, how we were learning. Based on the overwhelming amount of questions about what “kind” of learning was happening, the researcher noted the need to clearly describe pedagogical approaches to the learners and “why” the teacher would choose to teach differently. In addition, although the teacher attempted to co-design the learning pathway rubric with the students, the students described confusion at being part of a rubric creation and an expectation to “do the learning for themselves”.

After LP1, the teacher and researcher reflected that common criteria for the learning pathway needed to be clearly articulated. The teacher felt that it was important to describe which foundational skills and competencies would be developed (for example literacy, numeracy or multi-literacies as opposed to just “digital literacies”) and what curriculum would be covered. The teacher modeled the negotiation of how to be transparent in his learning design, specifically describing how and why he was intentionally choosing to teach the way he did. He demonstrated how he needed to look for evidence of his success through the evidence of the student learning. The teacher’s openness was a key stepping stone in how the teacher and students started to consider how to negotiate how they would demonstrate evidence of their learning and how the students would be assessed.

The students were guided through an inquiry project and LP1 was best described as teacher and researcher co-designed (not student-teacher co-design), despite the best efforts to encourage learner agency. While all students completed the presentations at the end of LP1, much of the student feedback described how boring and similar the student presentations and projects were. However, all students were active learners in some way, either they stated their frustration during classroom observations, they asked individual questions, they described their confusion and frustration in their reflections or they participated with enthusiasm and supported the teacher and researcher as they figured things out. In LP1, the students demonstrated disengagement, ritualistic compliance with small examples of academic engagement (Jacobsen et al., 2011).

Collaborative participant attempts at co-designing learning pathways. After LP1, the teacher and researcher reflected that common criteria for the learning pathway needed to be clearly articulated. The teacher felt that it was important to describe which foundational skills

and competencies would be developed (for example literacy, numeracy or multi-literacies as opposed to just “digital literacies”) and what curriculum would be covered. The teacher modeled the negotiation of how to be transparent in his learning design, specifically describing how and why he was intentionally choosing to teach the way he did. He demonstrated how he needed to look for evidence of his success through the evidence of the student learning. The teacher’s openness was a key stepping stone in how the teacher and students started to consider how to negotiate how they would demonstrate evidence of their learning and how the students would be assessed.

As described in chapter 3, as a result of the classroom observations, student feedback and student and teacher reflections, the researcher updated the OLDI learning design for LP2 to include more personal connections to learning and encouraged the teacher to be more transparent in the pedagogical process. The students were encouraged to give feedback about their feeling about how they were learning and how the learning design could be changed or improved to meet their needs. The students were told that they would use a similar pedagogical design (inquiry with a presentation at the end of the LP) and they would be responsible for completing the learning pathways in groups. As the teacher and researcher were learning how to co-design together, the students would also now be encouraged to be part of co-designing their learning process, in whatever way they thought was possible.

In the classroom observation notes, the students were much more focused on their learning during LP2 than during LP1. During LP2 classroom observations, the researcher noted that less time was spent supporting the teacher with classroom management, and more time developing relationships and getting to know the student participants. The researcher was able to support individual students during classroom observations by helping students on specific

lessons by answering questions and clarifying details. The researcher observed that the classroom was less noisy and more students were on task when they had time to work independently. The teacher spent more time clearly describing expectations at the beginning of class, rather than answering the same question throughout the class. Most students were able to clearly understand what the LP2 expectations were and noted that they found the topic interesting in their reflections. The teacher also became engaged in the topic and enriched and added resources to the original resource list. In LP2, the students demonstrated less disengagement, some ritualistic compliance with more examples of academic engagement (Jacobsen et al., 2011).

After building trust and relationships with the students in LP1 and LP2, the teacher and researcher initiated a project about solving community problems for LP3. The teacher wanted to the students to develop their inquiry skills by solving a community problem using a design thinking pedagogical approach. Each community problem idea was pitched to the class, and students formed groups based on their personal interest in a topic or idea. This was the first time the students chose their groups based on topic rather than choosing their group based on friends. As a result some groups were bigger than others, and some students were left by themselves. All students were expected to learn with others (either students inside the class or other people outside the classroom). By emphasizing transparent evidence of learning which tracked each individual's learning process, the students described how they co-designed their own personal learning pathways as well as who and what they interacted with and as. Check-ins with the teacher and researcher provided formative assessment and the opportunity to shape the direction of their own learning journeys.

In LP3, the classroom observations described four types of student behaviour. There were a few disengaged students who demonstrated ritualistic compliance by completing the project in the time allotted. However, there were also multiple disengaged and frustrated students because their projects were not going well and they felt that they could complete the projects by themselves without the teacher or researcher support. The reflections and classroom observations indicated that these students lacked problem solving, group collaboration, learning strategies, project management skills or they were waiting for feedback that did not come. These students had to work through how to problem solve and learn for themselves and demonstrated multiple different levels of engagement throughout the LP3. Although they may have been disengaged at certain points, they were always actively involved in some part of the process of learning. These ‘frustrated and disengaged students’ also demonstrated academic engagement as well as demonstrated intellectual engagement. As described in previous findings, the students who were most intellectually engaged were able to best demonstrate how to co-design learning by demonstrating confidence in their learning, asking questions about the learning process, demonstrating multiple learning strategies, connecting their learning to personal interests, considering personal assessment strategies as well as formative and summative assessment, demonstrating intrinsic motivation, demonstrate multiple ways to communicate their learning and demonstrated project management and goal setting skills.

All 23 students described that they developed an awareness or re-awareness that there are different ways to learn. From the beginning of the research there was one student who was willing to try anything at any time and in any place. By the end of the research project, all 23 students had described their awareness of alternative ways to learn and how to participate in their personal learning process by co-designing their learning through reflections or during classroom

observations. At the end of LP4, there were 3/23 students who clearly articulated or reflected that they a) preferred a more traditional and teacher directed approach to learning or b) a different pedagogical approach (like gamification) or c) they were not engaged in the learning process and had limited engagement for personal reasons. Of the 20 other students, 8 described their awareness of alternative learning opportunities supported or increased their enjoyment and engagement in some way and 7 others described transformational learning experiences and increased engagement as a result of thinking about learning in different ways

The following student reflection excerpts describe how the students felt they were challenged to consider different ways to engage in their personal learning process by co-designing their own personal learning process. As their engagement increased, their ability to co-design their learning also increased. This student contributed to a class video where she describes some of her perceived differences between previous learning experiences and her learning experiences in the research project.

In traditional school, we're not really told to take risks, or like go outside of your comfort zone, and here we have a sign, and one of the rules is to take risks. Which is something really incredible that our teachers are pushing us out far. Not to the point where it's uncomfortable, but to a point where we are becoming better learners and better students, and better people. It's just, almost like a breath of fresh air, where I feel like I'm actually learning stuff that I'm going to be using in the future. (Student B, LP4)

By the end of LP4, the students described how the new method of learning gave them new, previously inconceivable, learning opportunities. The following student used his final LP4 reflection to reveal his initial reactions to the research learning design process and his final perception of the learning experience.

To be perfectly honest I was kind of sketched out by the new method of learning at the beginning but as we continued on with it I got more comfortable learning in new ways. Most of this unit is based around perspectives and after looking at all the perspectives in the unit you really see how important they are. (Student J, LP4)

By LP4, the following student was able to summarize her perspectives of open learning and the opportunity to be part of designing her personal learning pathways.

For me the main difference is flexibility in being able to choose how and what to learn. Doing this kind of learning blows up our playing field by a hundred times. With the accessibility and technology we hold in our very hands today it should be a tool we use on a daily basis, interactions and learning from one another, working together is the reason the human race is running the world. It's the reason we've gotten so far. When working with others you must have an open mind and the willingness to learn, it builds up your knowledge of topics you may had never known much about before. (Student E, LP4)

Modelling co-design between research and teacher. Throughout the research project, the researcher observed the teacher and students considering a wide variety of means in which to demonstrate their personal evidence of learning. Some of the students and the parents of the students had some difficulties conceptualizing the idea that learning can be communicated in multiple ways.

The following example from the LP2 teacher and researcher final project feedback meeting, describes how the teacher and researcher problem solved collaboratively in order to support an open learning design and a parent concern about the concepts being covered in class.

The teacher began by saying,

I was just sitting there thinking, it's all about having parents who are on-board with trying to support kids with the digital aspect of it all. Whereas if you have kids who don't understand what the limit is. I had a parent ask me, "Oh, when is this digital literacy thing done?" I answered "Oh, why is that?" And they responded, "Well, it's because my daughter likes to write."

I thought about that perspective of learning then said, "It just looks different. She can't visually represent her ideas. She struggles how to not use words when she's representing her learning. I said that's just as important as anything else is. So just this understanding of what's considered even important, what's important creation of or communication of ideas and thoughts, is also there's still an issue there with how parents are understanding the concepts from class. How do you balance a perspective that says even how to understand how the digital world doesn't work as well. It's also hard that that student is limited in their digital literacies.

Then the researcher responded,

Do you think we should be blogging now?

The teacher added,

Maybe the idea of blogging is just that we get people to blog what they are doing (but not make it personal) and maybe give them exemplars from the other students to show them what they're thinking.

Then the researcher suggested,

So maybe we focus on the e-Portfolio idea as reflections and blogging to show their finished work?. And then not wait and say if you want to blog about this, go ahead. But what we need from you is how are you thinking about your learning and what are you doing and how are you making those connections? Is that what you are thinking?

Then the teacher finishes the discussion by saying,

Yeah, and especially directed, just simple questions that stay the same. How are you thinking about your learning? What does that mean to you?

The example above illustrates how the teacher and researcher communicated to ensure we had the same perspectives when considering how to encourage students to consider multiple ways to demonstrate evidence of learning. As described by the teacher, he had to defend his practice to parents and his education community. Similar to students demonstrating their ability to provide evidence of learning in multiple ways, the teacher had to demonstrate evidence of his desire to transform his teaching in multiple mediums and spaces as well. DBR provided a supportive research approach that ensured the teacher felt supported in his practice when communicating with parents and with his students.

The researcher and teacher check-ins throughout the research served a similar purpose compared to the student examples that provided solutions to problems, talked about challenges and considered next steps throughout the research to support learners in a wide variety of ways. The teacher-researcher collaboration modeled the open learning design, especially in LP3 and LP4.

The development co-designing learning pathways through collaborative presentations.

At the end of LP1, the researcher and teacher co-presented the research project at a regional conference focused on rethinking high school pedagogical approaches. The following slide describes how OLDI (Version 1) was connected to the Building Futures program and how the teacher and the researcher would integrate open learning through OLDI by expanding the learning beyond the classroom walls into the local community. In the final slide there is evidence of the integration of a diagram of the four phases of OLDI described in the researcher's blogpost. There is also evidence of annotations which describe how the OLDI framework could be applied to the learning context. The pink labels were used to identify where the teacher and researcher perceived evidence of open learning to have occurred in LP1, which ends at stage 3 and does not integrate into stage 4.

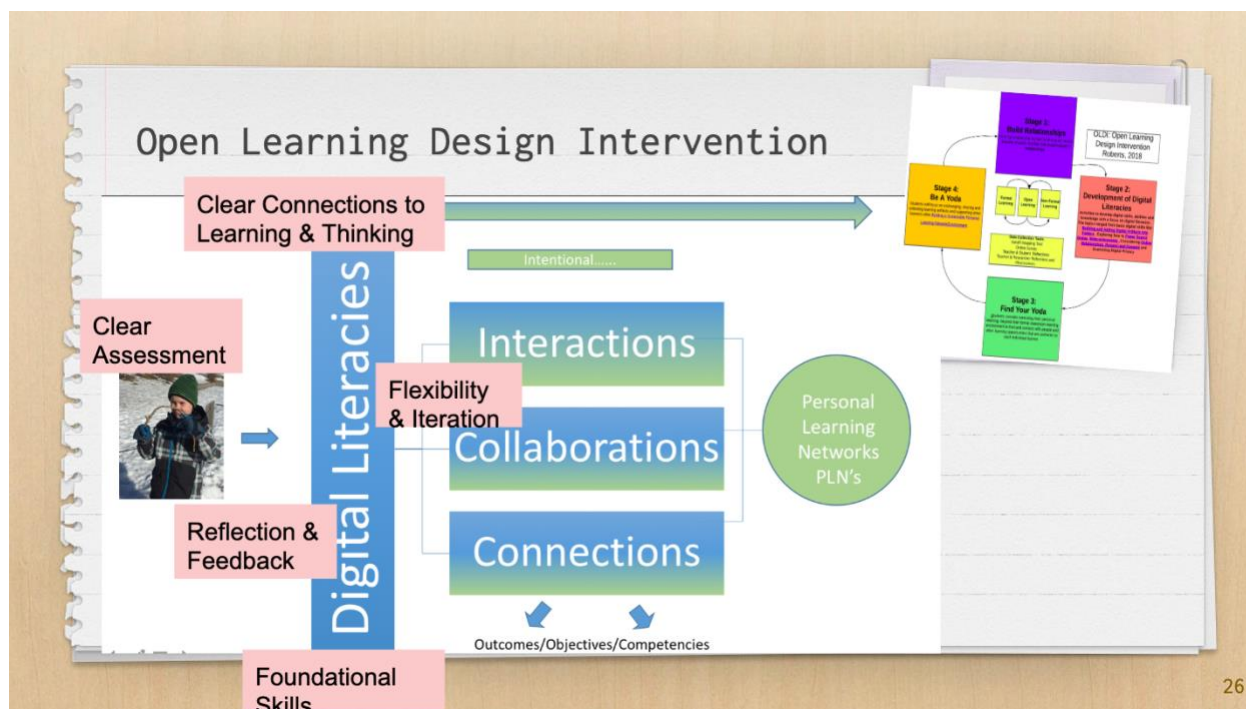


Figure 5.9: Teacher-Researcher, Co-Presentation Slide

The collaborative presentations also included the co-presentation with the teacher, researcher and students mentioned in the research question two findings. Collaborating and building presentations together provided an opportunity for clarification about research goals, feedback about the research learning design and an opportunity to communicate the research experiences. The most important aspect of co-presentation was the opportunity for multiple voices and perspectives that could inform next steps. The co-presentations provided a means for the researcher to balance the tensions of DBR while developing and maintaining relationships with the participants (OLDI stage 1), distinguishing which aspects of co-designing learning are prioritized by the students, teacher and researcher (OLDI stage 2), modeling intentional sharing with the participants (OLDI stage 3) while also modeling how to build a personal learning network. (OLDI stage 4).

At least 10 students and the teacher described how they perceived that they experienced learning that they had never experienced before due to increased learning engagement, personal connection and choice and active participation in co-designing their learning pathways. The previously inconceivable learning opportunities became a reality for the participants, “Now I know there is more to learning and I know how to get to where I want to get to” (Student F, LP4). The OLDI framework can support the teacher in designing for these new learning opportunities. The socio-constructivist principles which ensure that the participants explored their learning pathways, they were supported with learning strategies, formative feedback, the development of relationship and communication skills were evident in the teacher OEP as a result of the OLDI framework. Now that the participants have developed an awareness of previously inconceivable learning, they will know how to find it again.

Finding 3.4: When using the OLDI framework the teachers considered how student learning identities and mindset influence personal learning experiences. At the beginning of the research, when the learners were initially confused by being encouraged to think for themselves and communicate their learning in multiple ways throughout their reflections and in the classroom observations, the researcher questioned if the OLDI framework would be an effective learning design. As described in Chapter 4, the students came into the research with preconceived learning habits and mindsets and many students were skeptical about taking risks and trying something new. However, as the students began to take risks with their learning, and as they received positive support and formative feedback from the teacher and researcher, they began to demonstrate that the emphasis always has to be on their individual learning and not on giving the teacher one answer. Throughout the research, the teacher and researcher emphasized the importance of taking advantage of new opportunities, and taking risks, failing and trying again. Like the students, DBR provided the means for the teacher and researcher to build upon the OLDI framework in order to design for feeling comfortable and confident enough to take risks, connect with others, fail and then try again. At the end of the research, in the final interview, the teacher reflected upon what he perceived as the most important aspects of the research. These included, student awareness of what learning could look like for themselves, building relationships and building their own learning story.

I mean I always think back to small little comments that kids have made throughout this whole process of like, “Oh, wow. Look, I’m actually learning something,” or, “I’ve never even thought about it this way.” I think (the projects) just really showcased exactly what we are missing in education... These kids have no idea who they are. Even just that one Friday, that we were showing all the videos and stories, it was probably one of the cooler moments, teaching-wise, because it was probably one of the first times, where kids, I think, were actually connecting to and with each other. They were sharing who they really were.

The teacher contemplated the importance of the human aspect of learning within an ecosystem,

I think there is a human component to it. I think it kind of brought it back to us, like every one of us – our identity as learners and humans. The students, they had a really tough time connecting. It's like with all curriculum, they always have a tough time connecting it back to themselves. Whereas, I think this was the first time where they saw, an actual story about themselves. An actual story about themselves that they have never even considered before.

The teacher emphasized that in his opinion, the most essential part of any learning environment, was building relationships with students, as relationships encourage multiple interactions and lifelong learning opportunities. Based on classroom observations in LP4, the emphasis on relationships also encouraged the participants to trust and share knowledge with each other, especially storytelling and different perspectives. In the teacher's view, it is by listening to stories of others that students can hear multiple perspectives and then these perspectives lead to their own understanding about themselves as a learner. According to the teacher, as students develop this understanding of their own learner identity, they are more able to continue to see the importance of building and expanding their learning by becoming lifelong learners.

Although the teacher did not provide detailed analysis of his OEP, his reflections and communications indicated that “OEP represents an emerging form of learning design, which draws from existing models of constructivist and networked pedagogy” (Paskevicius, 2017, p.125). The teacher was concerned about how OEP could influence student identity, specifically digital and learner identity that he perceived could also influence future career aspirations. The teacher was most concerned that every student had the opportunity to figure out how to learn so they could become lifelong learners, a key characteristic of open learning in any learning context. In the final interview, the teacher reflected upon LP4 and how the storytelling aspect had helped the students consider who they are as a learner how they learn, the importance of

seeing each other as individual learners and how they can use each other to learn through connecting and interacting.

There was some tension between the researcher's focus on designing for OEP which may or may not influence a learner's identity and the teacher's desire to shape learner identity in order to encourage students to learn how to learn. The teacher and researcher agreed in LP1 that the teacher would trust the researcher to support the initial learning design, and his role would be to encourage students to participate in order to develop their identity.

Finding 3.5: When using the OLDI framework the teachers designed for multiple pedagogical approaches which expanded into multiple learning spaces.

In Figure 5.10, the learning pathways are compared in order to see the progression of how using OLDI as a lens helped the teacher scaffold open learning through stages and the differences between how the student learning expanded from formal classroom learning environments into informal open networks using OEP from LP1-LP4.

Open Learning Design Intervention (OLDI) by Stages

Alberta Education Program of Studies: Curriculum, English 10 (1,2) and Social Studies 10 (1,2) (Humanities) & Unlimited Competencies

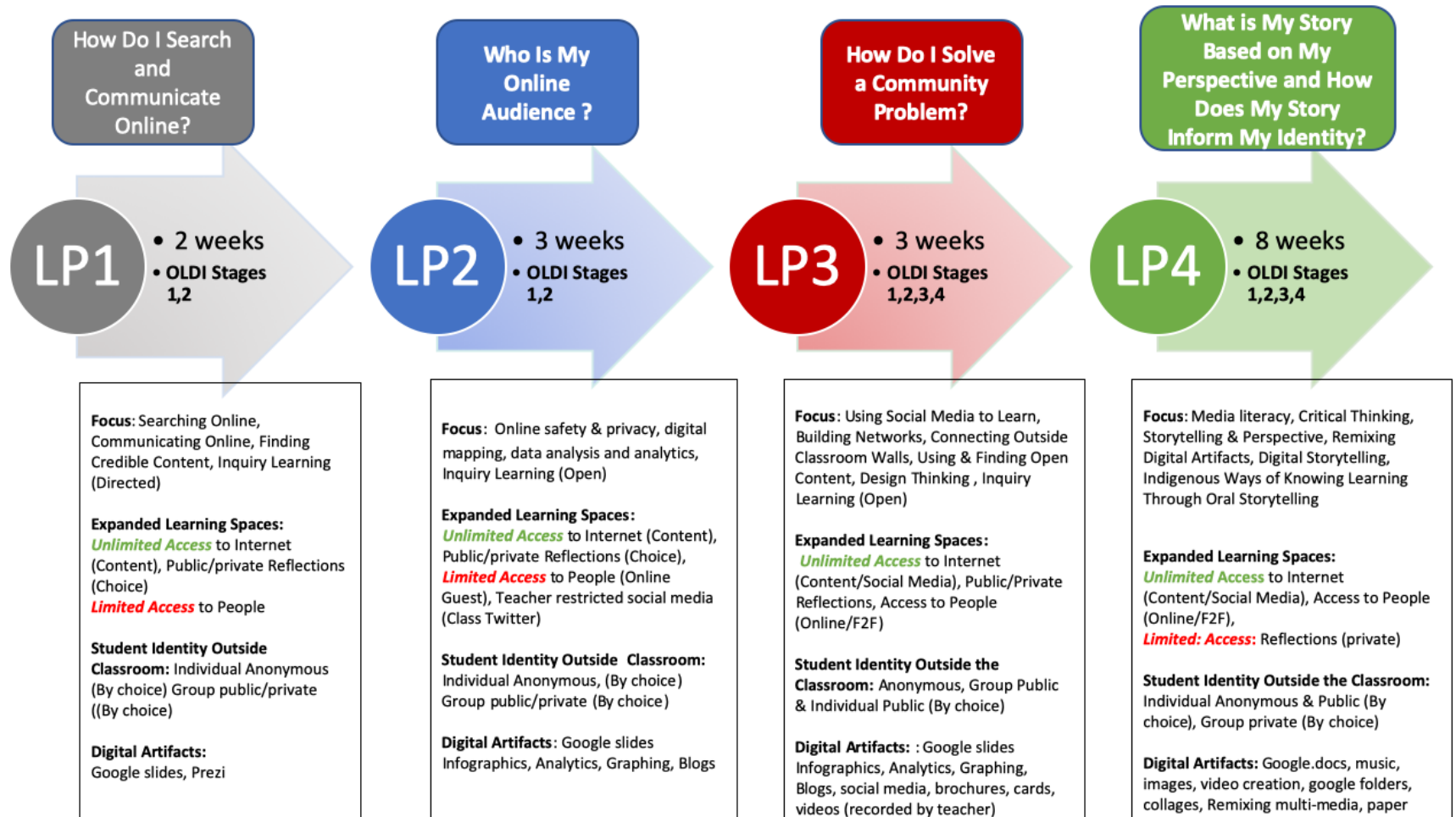


Figure 5.10: A summary of how the OLDI framework helped shape the open learning design to support the participants as they expanded their learning environments from LP1-LP4

Figure 5.10 describes the evidence of open learning stages, as scaffolded by the OLDI framework, starting in LP1 (Stages 1 and 2 findings documented), LP2 (Stages 1, 2 and 3 findings documented), LP3 (Stages 1, 2, 3 and 4 findings documented) and LP4 (Stages 1, 2, 3 and 4 findings documented). The increase in stages is related to an increase in interactions with nodes of learning. In LP1 the students were limited to interactions with digital content and people within their classroom. From the beginning, the students were able to document and demonstrate evidence of learning using multiple digital artifact creation options. In LP2, the student learning environments expanded to include the people that they could connect to and the class twitter updates in social media, as well as unlimited access to digital content and how they chose to demonstrate their learning in digital format. By LP3, the students had unlimited access to anyone outside the classroom and anything (digital content). Their evidence of learning continued to be unlimited, as the students continued to use multiple means to communicate their learning.

Finally, in LP4, although all four stages were designed for and observed using the OLDI framework, the student's ability to share their learning artifacts was limited to Google classrooms or personal collections of learning artifacts, due to the topic and themes within the discussions. From LP1-LP3, the teacher had closed access to his practice and pedagogical approaches by limiting the access to Google classroom. He did add resources to a class Google site. However, for LP4, the teacher and researcher chose to share all class content (resources), activities, resources and links on a public project management tool called Trello. As such, the classroom resources, content, connections and interactions were shared as a result of expanded learning environments throughout the four learning pathways. However, once relationships and competencies in digital literacies had been observed, who the learners interacted and connected with and how they shared their learning was dependent upon the learning context. This is where

there was evidence of open continuum grey zones that described the expanded learning spaces that have previously been described as only openly accessible to everyone or closed to everyone. There is evidence that an OLDI framework can be used as a means to create an open continuum of learning by providing opportunities for students to expand their learning environments through increased interactions and connections and multiple means to communicate their learning, while still limiting how the learning is shared in order to provide safe and ethical learning spaces.

Finding 3.6: The teacher indicated that participatory and collaborative learning designs are essential components of open educational practices. The teacher was always an eager participant in giving the researcher feedback about learning design considerations. The primary communications between the researcher and teacher did consider basic learning design which included how his teaching connected to assessment, learning resources, learning outcomes and teaching and learning activities (Biggs and Tang, 2011). Throughout LP1-LP4, the researcher would model or describe how the learning design could be presented using OEP to the teacher. The teacher would then make some additions and edits to the learning design and then begin the learning pathway with his students. When a lesson did not go as planned, or the teacher (and often the teacher and researcher) were given student feedback that the learning design needed to change, the teacher and researcher would collaborate and rethink the issue. The modelling and responsive approach to learning design was mainly used throughout LP1-LP3. The only difference between LP1, LP2 and LP3 in terms of learning design, was that the teacher started communicating with the community partners to complete LP3 at the beginning of LP1. The teacher was the main contact between the community partners and the students, and the researcher provided learning design support for the assessment, group work and additional

design thinking resources. In LP4, the students focused on storytelling and perspectives and listened to experts in order to understand how perspective and storytelling can influence history, globalization and their personal identity. The researcher designed the project learning pathway and connected with community partners while the teacher focused on encouraging the students to develop their learning identity. The collaborative co-teaching and co-designing of the learning pathways supported the teacher in developing his OEP and therefore modeling open learning for the students.

Summary of Findings

The research findings that have emerged from the multiple sources of data collection were repeated from different perspectives and contexts. The repetition of data to support multiple themes provided data validation from different perspectives which is a result of the participatory nature of a design-based research methodological approach. Some of the findings are similar to other current research in K-12 learning design and some of the findings expand upon and/or are new to K-12 current research contexts, especially in the discipline of open learning and open learning design. This chapter considered the findings that support three research questions that were considered throughout the data collection from LP1-LP4. Chapter 6 will provide an analysis of how the findings (based on extensive coding and data analysis as described in chapter 3) are used to help inform practice and theory that considers how OEP expands learning opportunities for high school learners by describing student and teacher perceptions of open learning.

Chapter 6: Analysis and Discussion

The synthesis of data and discussion of key study findings, evidence of local impact, theoretical insights and design principles is presented in the final two chapters of this dissertation. Chapter 6 begins with an overview and summary of one macro phase of DBR. Key research and literature findings are then summarized in relation to Hegarty's (2015) attributes of open pedagogy. The emerging findings that delineate this research study about OEP from current research considering OEP are also compared to Scardamalia and Bereiter's (2014) Principles of Knowledge Building to provide an additional theoretical lens with researcher reflections and interpretations. The theoretical insights into the major high school open learning themes and design principles emerging from this research, including a revision of the OLDI framework, are discussed at the end of Chapter 6. Ahead in Chapter 7, the implications for leaders, researchers and policy makers are discussed, study conclusions are presented, followed by a discussion of the limitations of the study, evidence of local impact which guided the significance and recommendations for future research resulting from this study.

Overview

Using DBR as the methodological approach for this research on open learning served to provide the conditions in which OEP could be examined using multiple contexts, iterations, forms of data collection and participants within a dynamic and authentic learning environment. The three phases within each DBR cycle (Analysis and Exploration, Designing and Construction, and the Evaluation and Reflection) provided the guidance that ensured a flexible, participatory, iterative, pragmatic and responsive research process. The DBR phases encouraged time and attention to collecting and analyzing data throughout the research process, developing relationships with the participants, encouraging participants to consider multiple roles within the

research project, emphasizing reflection about the research and learning process for all participants. Using the OLDI framework as the conceptual lens in which to weave OEP provided a means in which to analyze the increased student participation and engagement and document the changes in teacher practice from LP1-LP4. However, one of the strengths of DBR is the emphasis on balancing theory with practice. The following section describes how the participant perceptions of expanded learning environments and expanded open learning findings presented in Chapter 4 and 5, intersect with the theoretical principles of Hegarty's Attributes of Open Pedagogy (2015). In order to contextualize the research findings within current K-12 literature, five themes of knowledge creation (Scardamalia & Bereiter, 2014) are also considered, in order to analyze the extensions and different findings that emerged from the initial analysis which only focused on open pedagogy. After a discussion analysis, the chapter ends with three themes that describe open learning in high school learning environments and the revised version of the OLDI framework.

Discussion of the Findings

Using attributes of open pedagogy to compare and contrast high school open learning and open educational practices. Hegarty (2015) describes eight attributes of open pedagogy that have been used in this research as a lens to consider how OEP expand learning opportunities for high school learners. It is important to note that Hegarty (2015) herself noted the difficulty in separating each of the attributes, "I have found it challenging, in fact almost impossible, to separate the components of an open pedagogy into neat, segregated dimensions" (p. 11). Acknowledging this challenge, Hegarty's attributes were chosen as a means to document and validate how the learning was different for learners in open high school learning contexts by being able to connect the research findings with these a priori attributes. The following table

describes the comparison of Hegarty's open pedagogy attributes and research findings from this study.

Table 6.1

Comparison of Research Findings to Hegarty's (2015) Eight Attributes of Open Pedagogy

Eight Open Pedagogy Attributes	Research Literature Findings	Research Project Findings	Research Extensions (High School Open Learning Context)
<p>Attribute 1: Participatory Technologies</p> <p>It is the media used to create the OER that are important, as well as how content is shared, and the technologies used to promote participation (Hegarty, 2015, p.5).</p>	<p>Participatory culture (Jenkins et. al, 2008; Jenkins et al., 2016)</p> <p>Situated learning theory (Lave & Wenger, 1991)</p> <p>Participatory co-design (Garcia et al., 2014; Roshelle, Penuel and Sheckman , 2006) high school learner engagement behaviour levels (Jacobsen et.al., 2011)</p>	<p>Finding 1.4: The students indicated awareness of their nodes of learning which included who they interacted, connected and collaborated with and who they shared as.</p> <p>Finding 1.5: The students indicated a connection between the development of digital literacies and being able to connect and interact with other nodes of learning (people and resources).</p> <p>Finding 1.7: Students became aware of how learning environments expand by identifying the spaces in which they learn and the digital tools and experiences that are used to support learning in these spaces.</p> <p>Finding 3.2: The OLDI framework encourages the teacher to design for effective group work when preparing students to expand their learning beyond classroom walls.</p> <p>Finding 3.3: When using the OLDI framework the teacher considered learner readiness in order to co-design learning pathways with students</p> <p>Finding 3.6: The teacher indicated that participatory and collaborative learning design are essential components of OEP.</p> <p>1.4, 1.5, 1.7, 3.2, 3.3, 3.6</p>	<p><i>Essential conditions for high school open learning included:</i></p> <ul style="list-style-type: none"> • Choice and voice in what to share, where to share it, who to share it as, and with whom. • Skills, abilities and competency in digital and multiliteracies <p><i>Essential elements for high school OEP included:</i></p> <ul style="list-style-type: none"> • Participatory culture includes formal into informal learning collaborations • Transparency around how and why to: a) share learning, b) build knowledge in community c) collaborate in groups • Co-designing learning pathways • Access to multiple nodes of learning <p><i>Essential elements of high school open learner awareness included:</i></p> <ul style="list-style-type: none"> • What students were accessing in terms of bias/perspective and how their security, privacy and identity and participation was being tracked and monitored.
<p>Attribute 2: People, Openness, Trust</p> <p>“The type of support structure that would engage learners in critical learning on an open network</p>	<p>Learners connecting with content and with others (Couros & Hildebrandt, 2016; M. Johnson, 2008; Robson, 2016; Wenger, 2009)</p> <p>Networked publics (boyd, 2010)</p> <p>Relationships, trust, learning outside of oneself, connecting with others (Barth, 1969)</p>	<p>Finding 1.8: The students described how they became aware of the importance of safe learning spaces in order to be open in their learning.</p> <p>Finding 3.1: The OLDI framework encourages teachers to focus on developing and supporting teacher-student relationships throughout the open learning process.</p>	<p><i>Essential conditions for high school open learning included:</i></p> <ul style="list-style-type: none"> • Contextualizing connections and relationships with others, considering multiple perspectives, building relationships, interacting & connecting with others and safe learning spaces

Eight Open Pedagogy Attributes	Research Literature Findings	Research Project Findings	Research Extensions (High School Open Learning Context)
<p>should be based on the creation of a place or community where people feel comfortable, trusted, and valued, and where people can access and interact with resources and each other” (Kop et al., 2011, p. 88).</p>		<p>1.1, 1.2, 1.8, 3.1</p>	<p><i>Essential elements for high school OEP included:</i></p> <ul style="list-style-type: none"> • Authentic, relevant & meaningful learning experiences • Building student-teacher relationships <p><i>Essential elements of high school open learner awareness included:</i></p> <ul style="list-style-type: none"> • Personal relevancy in any learning context
<p>Attribute 3: Innovation and Creativity</p> <p>Changes to pedagogy must also occur, if students are to participate more meaningfully in their education (L. Johnson et al., 2014).</p>	<p>Emerging practices (Veletsianos, 2016).</p> <p>Shift between open, personalized and open from one-size-fits all. (Chatti et al., 2010, p. 4)</p> <p>Arc of life learning – learning ecosystem (Jordan et al., 2017; Thomas & Seely Brown, 2011)</p> <p>Nodes of learning (Siemens, 2005)</p> <p>Integration of formal-informal learning (Jenkins et al., 2016)</p>	<p>Finding 1.6: The students described a transition from digital to multiliteracies as a result of how they communicated their evidence of learning.</p> <p>Finding 1.13: Students indicated that they developed an awareness of different pedagogical approaches.</p> <p>Finding 2.1: In the context of open educational practices, students developed an awareness of deep and surface learning for themselves.</p> <p>Finding 2.3: By expanding learning environments, students had the opportunity to use multiple learning strategies to solve problems.</p> <p>Finding 2.4: The cognitive level of student knowledge increased over time as a result of designing for open learning.</p> <p>Finding 2.5: As learning environments are expanded from classrooms into networks and open learning spaces, alternative assessment models that consider the integration of curriculum and competencies are required to assess student learning.</p> <p>Finding 3.4: When using the OLDI framework the teachers considered how student learning identities and mindset influence personal learning experiences.</p> <p>Finding 3.5: When using the OLDI framework the teachers designed for multiple pedagogical approaches which expanded into multiple learning spaces.</p> <p>1.6, 1.13, 2.1, 2.3, 2.4, 2.5, 3.4, 3.5</p>	<p><i>Essential conditions for high school open learning included:</i></p> <ul style="list-style-type: none"> • The development of Multiliteracies (more expanded ways of thinking about literacy) & new ways to think about epistemology and pedagogy (Does connect to Greenhow & Askari, 2017 but not to Hegarty, 2015) <p><i>Essential elements for high school OEP included:</i></p> <ul style="list-style-type: none"> • Alternative assessment strategies (including multiple forms of formative assessment) need to be considered to support students through graduated stages of open learning and open learning continuums that interconnect with learning ecosystems. • Multiple pedagogical approaches <p><i>Essential elements of high school open learner awareness included:</i></p> <ul style="list-style-type: none"> • Personal learner identity, the expectation that students need to figure out how to participate in the learning process in order to make it meaningful for themselves (learner mindset/readiness), lifelong learning strategies

Eight Open Pedagogy Attributes	Research Literature Findings	Research Project Findings	Research Extensions (High School Open Learning Context)
<p>Attribute 4: Sharing Ideas and Resources</p> <p>The benefits of OER and OEP are not always immediately obvious to teachers. (Hegarty, 2015, p. 8)</p> <p>The flow-on effect that occurs through sharing resources is regarded by Conole (2013) as a conduit for expanding the personal knowledge and skills that teachers hold.</p>	<p>Designing for Sharing (Conole, 2013)</p> <p>Teachers adapt rather than adopt OER (de los Arcos et al., 2016)</p>	<p>Finding 1.9: The students indicated that the concept of sharing is dependent upon medium and context.</p> <p>Finding 2.6 Open learning is a personal learning experience that is not confined to specific open and closed definitions.</p> <p>Finding 2.8: Open learning pathway activities extend beyond the completion of formal courses or projects.</p> <p>1.9, 2.6, 2.8</p>	<p><i>Essential conditions for high school open learning included:</i></p> <ul style="list-style-type: none"> Open learning is personalized in context, perspective and timing. <p><i>Essential elements for high school OEP included:</i></p> <ul style="list-style-type: none"> The research findings focused on the learning process and practices to support learning and understanding over product creation or use. OEP occurred without OER, however, OER was appreciated and used when available. Learning pathways provide the opportunities for student learning to extend beyond formal classroom contexts <p><i>Essential elements of high school open learner awareness included:</i></p> <ul style="list-style-type: none"> Context determines who students are willing to share their learning with/as
<p>Attribute 5: Connected Community</p> <p>To participate in a connected community, the conduit of social media or other technological system is needed (Hegarty, 2015)</p>	<p>Social media as a space for learning which includes attributes of formality and informality (Colley et al., 2003).</p> <p>Networked learning (Sloep & Kester, 2009)</p> <p>Development of personal learning network (PLN) (Drexler, 2014; Downes, 2012; Wilson et al., 2006)</p> <p>Using social media to network, adopting a constructivist, community-centered pedagogical approach (Greenhow & Askari, 2017).</p>	<p>Finding 1.10: The students indicated they needed opportunities to share with their immediate learning community first in order to build confidence before sharing with the broader learning community.</p> <p>Finding 2.6: Open learning in high school contexts expands into digital and face to face learning environments.</p> <p>1.10, 2.6</p>	<p><i>Essential conditions for high school open learning included:</i></p> <ul style="list-style-type: none"> Access to multiple nodes of learning <p><i>Essential elements for high school OEP included:</i></p> <ul style="list-style-type: none"> Connections from formal into informal communities of learning which included examples digital and face-to-face face open learning into communities and networks. <p><i>Essential elements of high school open learner awareness included:</i></p> <ul style="list-style-type: none"> Personal learner identity and connection to community
<p>Attribute 6: Learner-Generated</p> <p>Opening' up the process to empower students to take the lead, solve problems, and work collectively to produce artifacts that they share, discuss, reconfigure, and redeploy (Hegarty, 2015 from Ehlers & Conole, 2010)</p>	<p>Making, creating, building knowledge (Jenkins et al., 2008; Scardamalia & Bereiter, 2014)</p> <p>Barth (1969) – assumptions about open education</p> <p>Open pedagogy is based on the individual growth as a learner in the world today, the indirect influence of educators and the developmentally appropriate learning outcomes for an individual (Paquette, 2005).</p> <p>Student empowerment (Tonks et al., 2013)</p>	<p>Finding 1.1: The students described personal, impactful and real-life connections to the learning process as an essential element of open learning.</p> <p>Finding 1.2: The students described the concept of expanded learning environments in different ways based on their personal learning contexts.</p> <p>Finding 1.3: The students identified the integration of curriculum and competencies (skills, knowledge and abilities not in the curriculum) as equally important to their personal open learning process.</p> <p>Finding 1.12: When given freedom and control over their own learning, students indicated they felt more ownership of their learning and</p>	<p><i>Essential conditions for high school open learning included:</i></p> <ul style="list-style-type: none"> Access to multiple nodes of learning <p><i>Essential elements for high school OEP included:</i></p> <ul style="list-style-type: none"> Designing for openness including voice, choice, perspective and access to learning experiences Integration of curriculum & 21st century learning competencies <p><i>Essential elements of high school open learner awareness included:</i></p> <ul style="list-style-type: none"> Connections to personal learning contexts, epistemological choice and learner responsibility, ownership. Expanded learning environments are different for each learner Development of learner identity

Eight Open Pedagogy Attributes	Research Literature Findings	Research Project Findings	Research Extensions (High School Open Learning Context)
		<p>were more engaged in the learning process.</p> <p>Finding 1.14: According to the teacher, OEP encourages a development of high school learner identity.</p> <p>Finding 2.2: The students described increased learner accountability and increased self-imposed learner expectations in expanded learning environments.</p> <p>1.1, 1.2, 1.3, 1.12, 1.14, 2.2</p>	
<p>Attribute 7: Reflective Practice</p> <p>Curation of digital artifacts and OER for students, Collaboration between peers helps to support reflective practice and feedback from peers.</p>	<p>All teachers need to have basic digital knowledge in order to share/ collaborate (Graham et al. (2014) Teacher improves digital literacy & design skills (in making/ repurposing OER) (Conole, 2013; Tonks et al., 2013). Transforming practice (McGreal, 2017) Better meet needs of students (Blomgren, 2017)</p>	<p>Finding 2.4: The cognitive level of student knowledge increased over time as a result of designing for open learning.</p> <p>2.4</p>	<p><i>Essential conditions for high school open learning included:</i></p> <ul style="list-style-type: none"> • Participatory learning culture <p><i>Essential elements for high school OEP included:</i></p> <ul style="list-style-type: none"> • Multiple pedagogical approaches • Responsive reflection practices • Co-designing learning pathways (shared responsibility) <p><i>Essential elements of high school open learner awareness included:</i></p> <ul style="list-style-type: none"> • competency in personally reflecting on learning. Student ability to demonstrate their understanding of how they learn, not just learning artifacts as evidence of learning.
<p>Attribute 8: Peer Review</p> <p>Fear of criticism from peers has been shown to inhibit engagement in an open learning community (Cocciolo, 2009).</p>	<p>Who to share with/as? (Cronin, 2017) Open readiness</p> <p>Zone of Proximal Development (Vygotsky, 1978), 7 levels of support for ZPD (Tharp, 1993)</p>	<p>1.11: Continuous feedback provided participants an opportunity to question the open learning process.</p> <p>Finding 1.15: The teacher indicated that participatory and collaborative learning design are essential components of open educational practices.</p> <p>1.11, 1.15</p>	<p><i>Essential conditions for high school open learning included:</i></p> <ul style="list-style-type: none"> • Participatory learning culture <p><i>Essential elements for high school OEP included:</i></p> <ul style="list-style-type: none"> • Building learning relationships • Modeling sharing and building knowledge <p><i>Essential elements of high school open learner awareness included:</i></p> <ul style="list-style-type: none"> • Giving and receiving feedback about learning from others.

Comparing the findings to Hegarty’s eight attributes of open pedagogy. While Hegarty’s (2015) open pedagogy attributes can be used as a lens to consider how OEP can be used to support expanded high school learning environments, the attributes alone are insufficient to fully describe high school open learning contexts. As a result of the comparison and analysis using Hegarty’s open pedagogy attributes, research literature and research project findings, some additional research extensions and unique findings have emerged. Hegarty asked an important question in her description of attributes of open pedagogy. She considered, “How can an open pedagogy benefit learners and teachers alike, and precipitate creative and inclusive communities in an OEPosphere?” (Hegarty, 2015, p. 3). The similarities, differences and possible extensions to current research are discussed in the section that follows to present an analysis of how high school open learning is part of the OEPosphere.

Attribute 1: Participatory technologies. When comparing the research findings to the participatory technologies attribute, the similarities included the use of digital tools to encourage collaboration, connection and interaction. However, the differences were immediately contextualized due to the consideration of Lave and Wenger’s (1991) situated learning theory. The learners in this context were 15 or 16 years old and the teacher was legally and ethically bound by provincial laws and school jurisdiction policies to support their privacy and security. When considering the participatory technologies used by students, it was essential to ensure the development of digital literacies in order for the participants to be aware of what they were accessing in terms of bias and perspective and how their security, privacy and identity and participation is being tracked and monitored. The development of these essential multiliteracy skills ensured that students had the opportunity to consider which direction they wanted to take in their learning pathways as they considered what learning to share, where to share it, who to

share it as and with. Participatory culture includes formal and informal learning collaborations around affiliations, expressions, collaborative problem-solving and circulation (Jenkins et.al, 2008). The opportunity to expand from formal into informal learning environments in order to connect and interact with different groups of people (and nodes of learning) was also dependent on the learner competency in multiliteracies. As such, in order to design for the use of participatory technologies, high school teachers need to consider how to develop and support participant competency in digital and multiliteracies.

Attribute 2: People, openness, and trust. The second open pedagogy attribute, which considers people, openness and trust, is also an essential element for open learning in high school contexts. Hegarty's (2015) description includes a safe space where people can feel comfortable, trusted, valued and can access and interact with resources (Kop, 2011). The initial stage in the OLDI framework is the Building of relationships throughout any learning experience. These relationships and connections are also essential (Couros & Hildebrandt, 2016; Johnson, 2008; Robson, 2016; Wenger, 2009) because they expand upon the previous attribution of participation by encouraging the idea of learning outside of oneself by connecting with others (Barth, 1969). In the present research, people, openness and trust can be described as contextualizing personal relevancy and context, connections and relationships with others, considering multiple perspectives, building connections to and within safe learning spaces. Figure 6.2 describes the stages of relationships needed within open high school learning contexts.

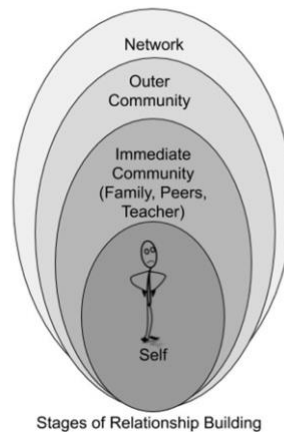


Figure 6.1: Stages of Relationship Building in High School Open Learning Contexts.

First, the learner needs a relationship with themselves in order to develop the confidence to learn with others and be able to contextualize the personal connections of their learning opportunities. Then, the learner will build a relationship with their immediate community which includes their teacher, peers and family. The next step is building relationships outside of their immediate community with the outer community. Finally, the learner will consider building relationships with those in outside networks. As the learners expanded their learning environments, they also expanded the variety and number of relationships. Connecting and interacting with other people and other nodes of learning was a means to learn about new perspectives. These new perspectives also influenced the development of relationships because when the learners considered new perspectives, they also developed empathy towards others by encouraging multiple voices. The demonstration of empathy, trust and of being valued by their peers, the teacher, the researcher and others helped to support the safe and caring learning spaces.

Attribute 3: Innovation and creativity. As a result of feeling safe and knowing they had multiple trusting relationships and people to support them, the research participants also demonstrated attribution three which encompasses innovation and creativity. Johnson et al. (2014) described innovation and creativity in open pedagogy in terms of changing pedagogy where students participate more meaningfully in their education. In the review of current literature, open innovation and creativity in K-12 contexts referred to emerging practices (Veletsianos, 2016), a shift between open, personalized and open from one-size-fits all learning (Chatti et al., 2010), learning ecosystems (Thomas & Seely Brown, 2011), the changing role of learner into active participant rather than inactive audience member (Jordan et al., 2017), the concept of nodes of learning rather than just learning with people or content (Siemens, 2005, and connected participatory learning through the expansion from formal into informal learning environments (Jenkins et al., 2016).

In the research study, the participants described aspects of all of the connections to current research in addition to creative innovations in pedagogy, specifically in formative assessment and learning design. Essential elements for OEP included alternative and multiple assessment strategies which includes multiple forms and variations of formative assessment, summative assessment and a self- assessment to support open learning. While much of the initial formative assessment throughout the research project was initiated by the teacher and researcher, formal and self-assessment became more innovative and creative as the students became learning resources for one another (William & Leahy, 2015). Similarly, one of Scardamalia and Bereiter's (2014) knowledge building principles describes the importance of embedded, concurrent and transformative assessment as a more accurate description of the assessment practices that emerged in the present research. In order for students to have a clear understanding of how to

expand their learning into open learning environments, it was apparent that students needed multiple forms of assessment. As described in the Chapter 5 findings, these alternative forms of assessment included formative assessment (for example teacher and peer feedback, co-designing learning pathways and clear learning pathways criteria) as well an open learning readiness assessment (self-assessment and teacher assessment) and a final summative assessment.

In addition, the findings expanded upon the concept of formative assessment by going beyond feedback loops that are used as a means of formative assessment between students and teachers. When describing feedback loops in formative assessment contexts, the feedback loop process is centered in formative classroom settings where the teacher and students have specific roles and expectations that focus on supporting student learning around set parameters by closing feedback formative loops (Furtak, Glasser, & Wolfe, 2016). There was evidence of multiple formative assessment feedback loops in the research findings, especially as students began to build trust and relationships with the teacher, researcher and other students during group project activities. In addition, the feedback loops described in the findings also described connections and interactions with other people and nodes of learning outside the formal classroom context in openly networked feedback loops. This kind of feedback was described as a means to expand upon ideas or build knowledge. When the students were unable to connect or interact with others, they described their experience as a negative feedback loop because they were dependent upon the actions of others within their learning environments and were disappointed when others did not support them in their learning process. The networked feedback loops in the findings are most comparable to positive and negative feedback loops which are described in complexity theory (Turner & Baker, 2019). The closed and open feedback loops, and the student dependency

in order to expand their learning environments and the connection to complexity theory is a new innovation for open pedagogy, should be explored further in future research.

The findings also expanded upon the idea of co-designing learning. Current research in co-designing learning emphasizes the importance of multiple partners and collaborative design when designing the learning process for a group of people, curriculum, a class, a course or a project. For example, Voogt et al. (2014) describe co-designing learning as engagement in collaborative design activities which encourage knowledge building principles. However, in the research findings, co-designing learning pathways was described as a process that was more focused on individual learners. In the research project, each student co-designed their personal learning pathways with the teacher, the researcher, their peers and others. The learners were an active and engaged part of their personal learning process. In this study, co-designing learning could be described as the process of inquiry in order to meet student learning needs, integrate curriculum and competencies and personalize student learning pathway relevancy and authenticity. The co-design process described in the findings is similar to open learning design described by Conole (2013), who asserts that,

“ making design processes more explicit and shareable will enable teachers to develop more effective learning environments and interventions for learners and help make the intended design more explicit and hence shareable with other teachers and learners. It will help learners to make more sense of their ... associated learning pathways” (p. 1).

As such, the co-designing of learning pathways described in the present research offers an example of open learning design intervention encouraged by Conole (2013) and is also an area ripe for additional research.

Additional creativity and innovation were apparent as students developed their digital literacies skills into greater competency with multiliteracies (Leander & Boldt, 2013), linked with their increased participation in the design process and the expectation that learners need to

effectively communicate their learning. For example, in LP4, students demonstrated evidence of learning through multiliteracies by learning through and with digital forms of communication, but also expanded into other mediums including multimedia theatre with social media connections, blanket ceremonies, oral storytelling and digital storytelling. Scardamalia and Bereiter (2014) suggested that multiliteracies are apparent as learners express themselves in the “open world” by developing competency in constructively using authoritative information. The evidence of multiliteracy was most apparent in the students’ presentations of personal digital stories at the end of LP4. As the teacher noted during the final reflection, “I had never experienced that level of trust and vulnerability before by students. Their stories were amazing and I did not know how to assess them ...and I can’t describe how emotional I felt while I was watching them.” (Teacher, final interview).

Finally, the innovative and creative research findings demonstrated evidence of an integrated curriculum which is education that intersects disciplines by emphasizing key aspects of the curriculum in order to consider a major concept of study (Drake & Burns, 2004). In this research, the integrated curriculum also interconnected and ensured equal opportunity for students to demonstrate learning competencies and how they understood the curriculum. The assessment, multiliteracies and integrated curriculum were all essential conditions of OEP.

Attribute 4: Sharing ideas and resources. The fourth attribute of open pedagogy was the most difficult to compare and contrast with emerging findings in this study because of the difference between an emphasis on open pedagogical process versus on open products. The use of open educational resources (OER) as a means to learn openly (Wiley & Hilton, 2018) is known as “OER enabled pedagogy,” and is defined as “the set of teaching and learning practices that are only possible or practical in the context of the 5R permissions that are characteristic of

OER” (Wiley & Hilton, 2018, Abstract section, para. 1). Based on Hegarty’s examples, her description of this attribute aligns with Wiley and Hilton’s definition, and not with the research findings or K-12 experiences with openly sharing ideas and resources in the present study. While traditional open learning research has included OER in some capacity, there was limited awareness or interest in open educational resources by the participants in this study and the inclusion or exclusion of OER likely would not have affected the outcome of the study.

Alternatively, in the present research, there was an emphasis on how to co-design for sharing learning (Conole, 2013), and evidence of the teacher and students adapting rather than adopting OER (de los Arcos et al., 2016). Most interestingly, there was evidence in the research findings to support knowledge creation which is connected to Bereiter and Scardamalia’s (2003), (2014) Knowledge Building theory. Two of the principles of knowledge building that have proven to be challenging when introduced in educational contexts are Idea Improvement and Understanding through Collaborative Explanation Building which were both evident in this research study. Using a DBR methodological approach helped to provide the conditions for the teacher and researcher to model iterative, flexible and ever-changing responsive designs to support student learning. Early student learning expectations often included descriptions of learning processes that could help them to attain a certain percentage or grade. The conversations about deep and surface learning, as described in Chapter 5, initiated a change in learner and learning expectations. In particular, some of the students described a change in understanding between finishing a project and constantly changing and updating an idea in a project, in order to create something new. Their transition from describing work as completed to an idea in progress was an example of knowledge building. In addition, the participants described a change in their ways of experiencing and describing learning as they considered conceptual understandings in

order to create new ideas. This was most apparent in the research when the majority of the students came into LP4 describing their prior knowledge of Indigenous culture and history as high, and completing the conceptually focused learning pathway with a different understanding as a result of collaborating and connecting with multiple texts, mediums, experts, perspectives and spaces and places in which to learn, which relates to learning as collaborative explanation building, or knowledge building in community (Scardamalia and Bereiter, 2014). As such, Hegarty's (2015) description of attribute four was well identified in this research study.

Attribute 5: Connected community. The open attributes of connected community were apparent in multiple ways during the research study. The participants described how and why they connected with community (close and networked) in order to expand their learning. In the current research there are multiple examples that also have evidence to support a connection between learner and the community. Colley et al. (2003) developed a model that considers learning that connects informal and formal learning environments, Sloep and Kester (2009) described digital networked learning opportunities, Drexler (2014) and Downes (2012) described the importance of a PLN (personal learning network) and Greenhow and Askari (2017) used social media to examine learning in networked constructivist, community-centered pedagogical approaches. The findings support the development of personal learning environments (PLE), where student networks (to support their PLE) was first restricted to families, then to the teacher, close friends and community, then the broader community and finally a bigger more public learning network (Castaneda, & Adell, 2013). The sense of community and need to contribute to a shared community, influenced high school open learner readiness. The high school learners demonstrated a specific pattern as they expanded their personal learning environments,

connected to family, friends and the teacher, connected to their immediate community, the public community and then expanded into networks.

The major distinction between Hegarty's (2015) attribute of connected communities and the high school perspective in this study, is the evidence of open learning in face to face and digital contexts. Hegarty (2015) described the connected community as one where "the conduit of social media or other technical system is needed" (p. 10). This research expands upon the current description of connected communities by including the evidence that an essential element of OEP in high school learning includes connections from formal into informal communities of learning which included examples digital and face-to-face face open learning.

Attribute 6: Learner-generated. Like other descriptions of open pedagogy attributes, the concept of learner generated was similar and different to the findings in the research project. Ehlers and Conole (2010) described learner generated as not just focused on learner generated content, but also on the 'opening' up process to empower students to take the lead, solve problems, and work collectively to produce artifacts that they share, discuss and remix. In the current research there were examples that aligned with Hegarty's open attribute six, including making, creating, and knowledge building (Bereiter & Scardamalia, 20003), Barth's (1969) assumptions about open education, Paquette's (2005) description of open pedagogy as one of individual growth as a learner in the world today, the indirect influence of educators and the developmentally appropriate learning outcomes for an individual and most recently the connection between OER and student empowerment (Tonks et al. 2013).

However, the attribute description did not account for the findings which demonstrated the essential elements of open learner awareness in high school which included connections to personal learning contexts, epistemological choice, and learner responsibility. In the findings, at

least three different ways in which to describe authentic personal connections to learning emerged as an awareness that there is more than one way to learn (epistemological choice) and the students demonstrated ownership of their learning as described through freedom and control. The emerging findings which demonstrated an increase in student accountability and feeling of ownership of learning.

Specifically, the findings describe how the learners co-designed their learning pathways by goal setting, being empowered to describe how they understand what they are learning, considering strategies to extend their learning, how they felt challenged, proud and confident of their learning and how they can learn for themselves. The participant descriptions can be understood using knowledge building principles that connect to the findings of freedom and choice, which are epistemic agency and democratizing knowledge (Bereiter & Scardamalia, 2003). Learner generated can also be considered evidence of intrinsic as opposed to extrinsic motivation which was often described in student reflections and classroom observation feedback.

Attribute 7: Reflective practice. Attribute seven considers the reflection that occurs as a result of collaboration, creation, remixing and use of OER as well as feedback from colleagues. Due to the higher education context, such as Cochrane's (2014) study considering transformative pedagogy with mobile use and focus on OER audience engagement, such as Alevizou's (2012) study which considered the collaboration of participants at a conference about OER, it is difficult to make connections between Hegarty's description of reflective practice and the present research findings. Some current literature from K-12 contexts that considers how teacher collaboration and use of OER can transform teacher practice (McGreal, 2017) includes the assertion that all teachers need to have basic digital knowledge in order to share and collaborate in open learning spaces (Graham et al., 2014), teachers improve in digital literacy and design

skills when they make and repurpose OER (Conole, 2013; Tonks et al., 2013) and how by remixing and using OER teachers can better meet the needs of students (Blomgren, 2017).

The findings in this study describe the importance of student reflections, throughout the OLDI framework and at multiple points throughout open learning pathways. The reflections encouraged the students to clearly describe their learning process to themselves (and others) and supported learners in considering how to set higher expectations for themselves in terms of cognitive responsibilities. In general, with the exception of five students, the reflections gradually became deeper, more personal, more descriptive, more connected to conceptual ideas and demonstrated evidence of more critical thinking as the students progressed from LP1 to LP4. The evidence of reflection was most obvious in the personal digital stories at the end of LP4. By the end of the research, all of the students shared their stories and many of the digital stories were remixed, changed and updated from the original form days after the assignment was shared with the class and after receiving peer and community feedback. This demonstration of accountability to share with a trusted community is another example of a knowledge building principle called collective responsibility (Bereiter & Scardamalia, 2003). The participants demonstrated that they valued and felt responsibility for the collective knowledge building in community. By LP4, there were multiple reflections that described how the students learned from and with each other that clearly identified the value of the sense of responsibility the students felt for their collective community knowledge.

Attribute 8: Peer review. Finally, the open pedagogy peer review attribute describes how the fear of criticism from peers has been shown to inhibit engagement in an open learning community (Cocciolo, 2009). In the current research, peer review was described in terms of how

researchers examine Vygotsky's zone of proximal development (ZPD). For example, Tharp (1993) developed levels of attaining independent learning through assistive dialogue. This dialogue considered feedback and questioning as two means to support students in expanding their cognitive development. Giving and receiving feedback about learning from others became an essential element of open learner awareness throughout the research. The importance of timely feedback and interactions, continuous feedback loops, and formative assessment also emerged from the findings as means to consider peer review. The difference between Hegarty's (2015) perspective of peer review and the participant's perspectives were primarily due to the different educational contexts: post-secondary versus high school. However, while it changed in LP3 and LP4, the participants did describe an emotional response (usually negative) to sharing their learning with others in LP1 and LP2. As noted in the previous attribute, knowledge in community is a collective responsibility and projects like citizen science and open data provide current practical examples of the potential of peer review in collective public contexts. Sharing learning in open environments that are open to critical feedback can also be considered in higher education as potential future research that informs open scholarship and open research. However, individual learners also need to learn how and why to share their learning with others. Their open readiness (Cronin, 2017), which considers macro to micro readiness factors like who learners want to share as and with as well as what do they want to share, are essential elements of open learner awareness at all ages.

In summary, Hegarty's (2015) attributes provided a lens in which to compare and contrast open pedagogical theory in the form of attributes from a Higher education context to the research completed in a high school learning context. Using the attributes provided evidence of some similarities and differences between open learning in high school learning contexts. The

similarities helped to connect this research to current research in open learning. However, the differences provided multiple extensions to current open learning research that contextualizes the high school open learning process, student perceptions of the impact of open learning and how the OLDI can provide a framework which describes how to design for open learning. As a result, this research can be compared to current research in open learning and be used as a means to consider alternative approaches and concepts to expand upon current research in open learning which will be considered in chapter 7. Figure 6.2 below describes the three central themes contextualized in high school open learning environments that emerged from the comparison of the attributes, current research and research findings.

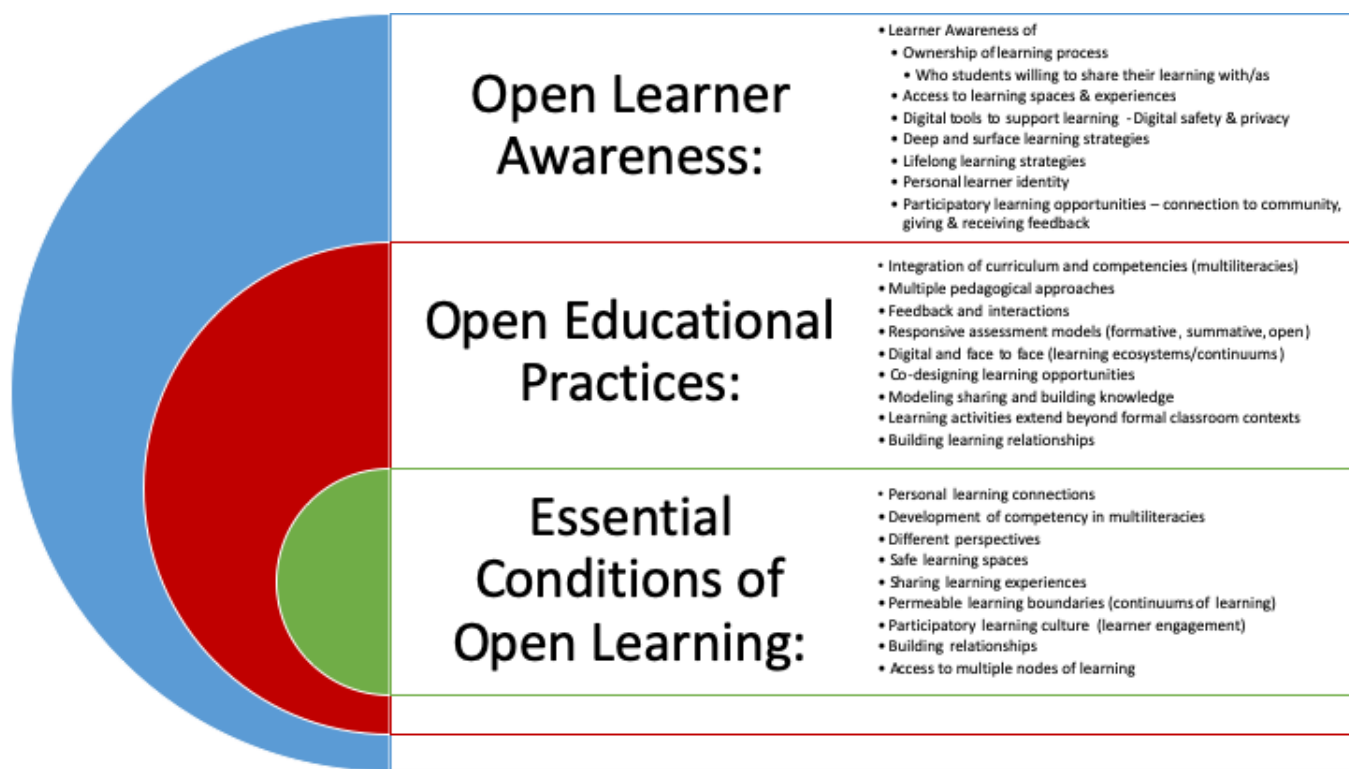


Figure 6.2: Emerging Themes which Describe Open learning in High School Learning Environments

Figure 6.2 is a synthesis of all of the study findings into three major themes that describe open learning in high school learning environments: 1) Essential elements of open learning, 2)

OEP, and 3) Open learner awareness. These findings contribute to the final version of the OLDI framework. By using Hegarty’s (2015) attributes of open pedagogy, the research can provide a new lens from which the extensions and contextualization of open learning in high school learning contexts can be added to current research in open learning.

Open Learning Design Intervention (OLDI) Final Version

The OLDI Framework provided a lens through which to design for OEP through the research design form LP1-LP4. The teacher and researcher used OLDI to compare and contrast open learning outcomes and as a means to reflect upon how the students perceived benefits and weaknesses of expanded open learning opportunities. The following model illustrates the final version of OLDI and a description of each of the stages is included beneath the framework image.

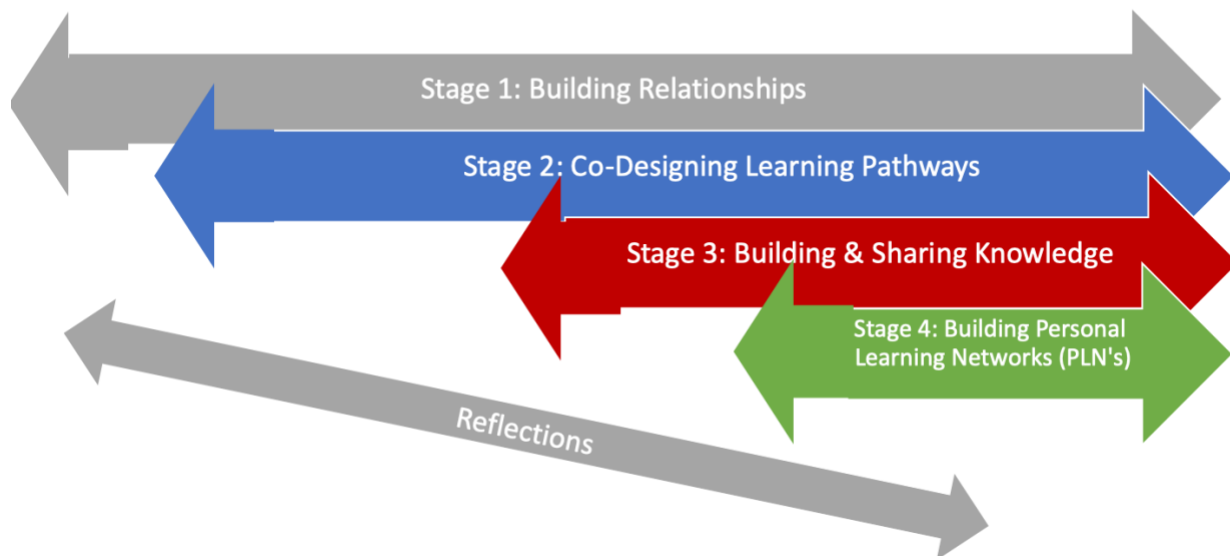


Figure 6.3: Open Learning Design Intervention (OLDI) Framework

Reflections. One of the most essential elements when designing for open learning and using the OLDI framework, is the development of reflective practices. Reflective practices are

essential for the teacher, the students and in future research studies, the researcher as well. Reflecting on learning is a metacognitive process that consider how students think about concepts and ideas and process the learning in their own personal learning contexts. By using OEP, teachers can encourage students to expand their learning by connecting, interacting and collaborating with other people and nodes of learning which includes communicating their learning in different mediums which often permeate preconceived formal and informal learning barriers. As such, reflections are a critical factor in the OLDI framework because they provide a means for students to take the time to process their learning, process perspectives and learning experiences, while also giving them a space in which to describe how and where they are learning. The concept of intentionally monitoring one's cognition and cognitive processes and regulating them is difficult because learners are generally not conscious of why they are doing what they are doing (Georghiades, 2004). By including reflections as an essential aspect of becoming an open learner, students may be better able to consider perspectives of how they think and learn, and it opens a space for the teacher and researcher to engage with each learner about their learning, and tailor their responses and feedback for each learner. Reflections can provide insight into the perspectives of the learner as they transition through stages of open learning, they can ensure the safe learning spaces are being developed and encountered and most importantly, the act of reflecting can give students the time and space to learn in their own way in their own time, while they explore their open learning pathways.

Stage 1: Building relationships. In this stage, all participants build relationships with each other which includes teacher-student relationships and student-student relationships. As the OLDI framework expands to include next stages, the relationships also expand to include additional people and nodes of learning. Part of building a relationship is getting to know a

person's interests and passions. By getting to know people in personally meaningful ways, there is an opportunity for teachers to support learners in considering how learning opportunities can be connected to their personal learning contexts. Personal connections to learning contexts is a key factor in becoming an open learner. As mentioned in an earlier section in this chapter, relationships transition from a self-awareness and identity which describes the relationship the learner has with themselves to relationships with global networks.

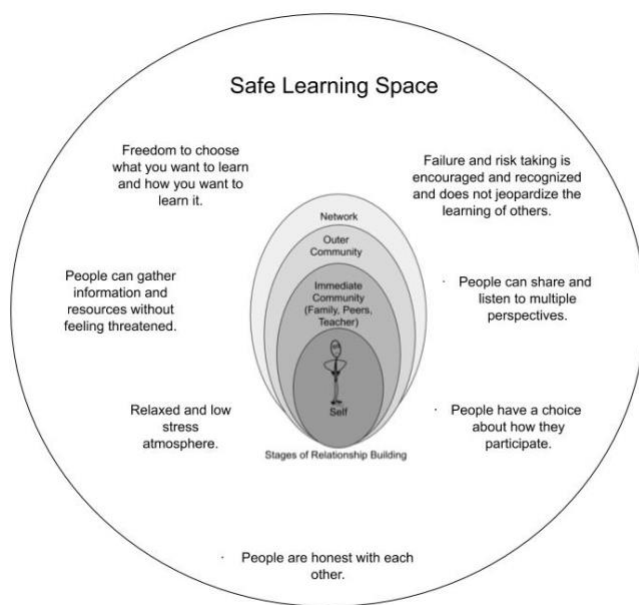


Figure 6.4: Safe Learning Space in Open High School Learning Environments

Building relationships also provide a way to communicate about different perspectives and opinions, and in turn, this understanding can build empathy and compassion. When learners feel that their voices are heard and valued, they often connect the importance of relationships with safe learning spaces. As such, building relationships in open high school learning contexts include multiple relationships between teachers, students and other nodes of learning (that are constantly changing and being developed) which can encourage personal connections to learning

contexts in order to promote learner voice, awareness of multiple perspectives, develop empathy and create safe learning spaces.

Stage 2: Co-designing learning pathways. In this stage the learner and teacher (facilitator) negotiate how to co-design their learning pathway in order to meet the student's learning needs. The learner needs to be engaged in the learning process which is developed through agency and transparency in the teacher's practice. The teacher strives to encourage learners to reach a level of intellectual engagement rather than one of ritualistic compliance (Jacobsen et al. 2011). The following table describes considerations that can be negotiated to support a co-design process as an open educational practice to design for open learning.

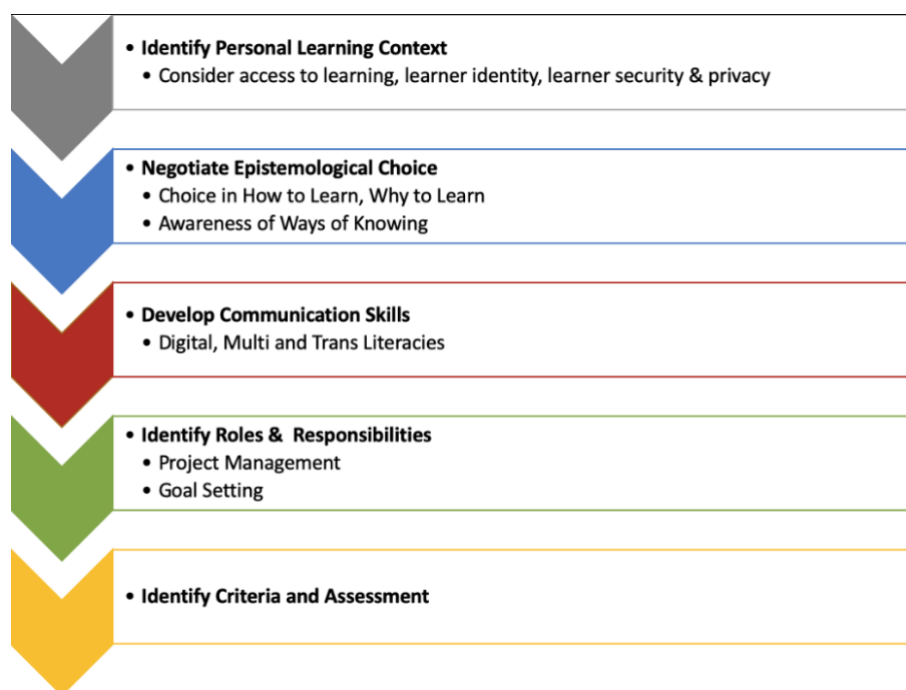


Figure 6.5: Considerations for Co-Designing Learning in High School Open Learning Environments

The teacher needs to support the learner in understanding their personal learning context. This support includes helping the student to make connections to how the learning concept or idea is personally relevant and engaging. In addition, the teacher needs to discuss how the learner

can access resources and nodes of learning, which identity they choose to identify as, in addition to considering student security and privacy. While some of these considerations will have been addressed in stage one by building relationships and/or through legislation and school policies, it is essential that the learners also understand how they will be communicating their identity within the learning contexts. The students will have the opportunity to develop digital, multi and trans-literacy skills in order to have a choice in how they want to learn. In order to provide structure, clear criteria must also be negotiated during the co-design process which will include identifying roles and responsibilities in the learning process (especially if group work is a consideration) as well as goal setting, project management skills and assessment criteria. As such, co-designing learning includes open educational practice which negotiates the personal learning contexts, ways of knowing, pedagogical delivery, learning pathway criteria, identification of learning roles and responsibilities and the development of communication skills in open high school learning environments.

Stage 3: Building knowledge and sharing learning openly. As part of the co-designing of learning processes, teachers and students negotiate multiple ways in which to demonstrate their learning openly. When co-designing learning pathways, students are offered a choice about how they can learn which includes connections to curriculum and competencies and an explanation of why they are learning about a particular learning concept, context or idea. There is no summative assessment connected to this stage, only formative and open learning readiness (self-assessment and teacher assessment). Stage three provides the space for the students to demonstrate their open learning understanding and readiness to share at macro, meso, micro and nano levels (Cronin, 2017). These levels are identified through personal reflection and evidence of learning as students consider the following questions: will I share with others, who will I share

as/with, what will I share, where will I share it and how will I share it. The following table uses the key themes from the open learning rubric described in Chapter 5, as a means to accentuate how high school learners demonstrate open learning readiness.

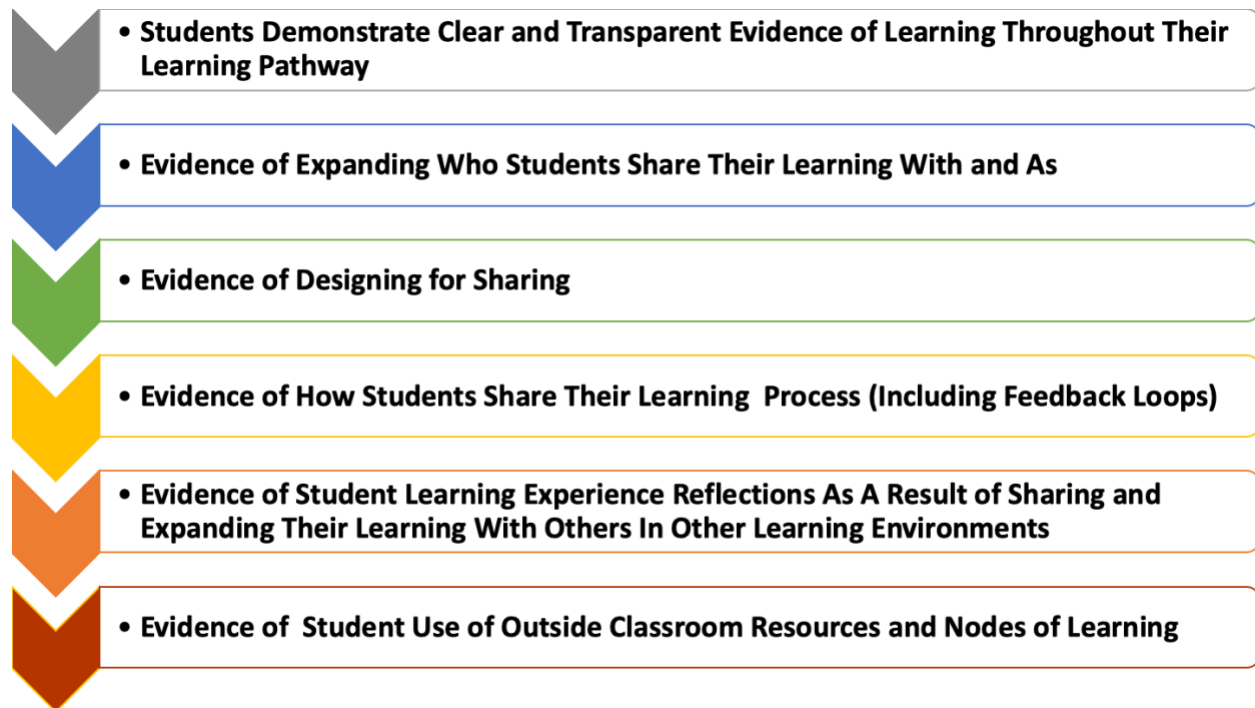


Figure 6.6: Demonstration of Open Learning Readiness in Open High School Learning Environments

It is important to note that learners always have the choice to demonstrate their learning in continuums of openness. For example, they can share their learning with their immediate learning community, family, or share their learning with their geographic community privately or share their learning through networks in public spaces. OLDI stages two and stage three balance each other by focusing on two aspects of open learning design. While stage two focuses on co-designing learning, stage three emphasizes how evidence of the learning, understanding and thinking will be demonstrated and shared. As such, Building Knowledge and sharing learning openly encourage the learner to demonstrate their open readiness by contributing their learning to the community and network with whom they feel most comfortable.

Stage 4: Expanding personal learning environments. Every learner develops their own personal learning environment, whether they are aware of it or not. A personal learning environment is defined as a combination of tools, sources of information, connections and activities each person uses regularly in order to learn (Adell & Castaneda, 2010, p. 23). In order to build and share knowledge (stage 2), a learner must use their multiliteracies to learn about new things and ideas, they must use their multiliteracies to share their learning about their new ideas and they must reflect upon the how the news ideas connect and interrelate and consider the feedback and perspectives of others through expanding their personal learning environment. In formal learning environments, teachers can design for student-centered learning environments that are open to expanding beyond the walls of the classroom in multiple ways by considering an open learning continuum for K-12 learning contexts. The following table was created based on these research findings and demonstrates how all K-12 learners can expand their personal learning environment, based on their relationship with their teacher. It was adapted and remixed based from a previous version of K-12 Open Learning Continuums (Roberts, 2013).

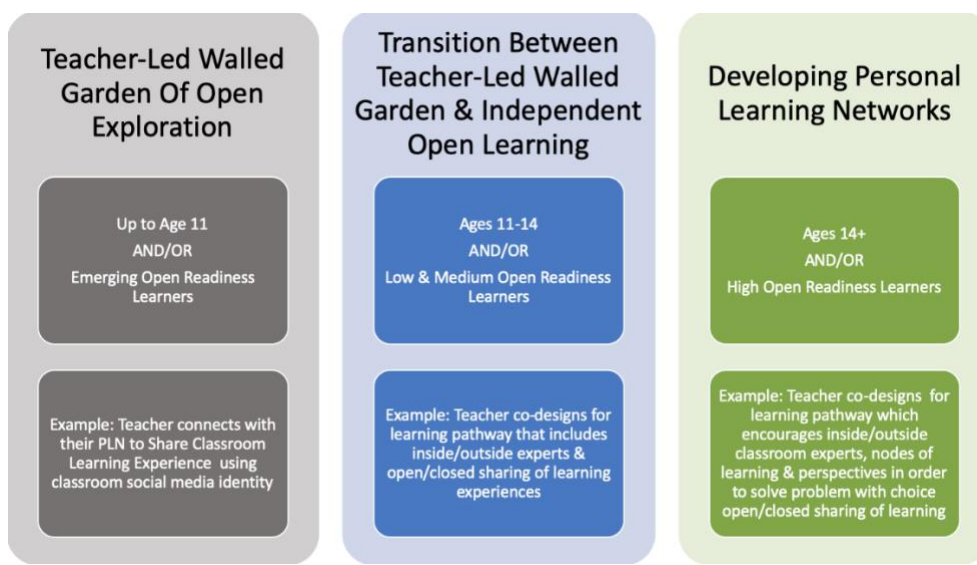


Figure 6.7: K-12 Open Learning Continuum

In Stage 1, the students develop relationships, based on their developmental ability or open readiness. The teacher recognizes the type of relationship and designs for open learning to support individual learners. In stages 2 and 3 students have demonstrated competency in multiliteracies, epistemological choice and awareness about who they share with and who they share as. The demonstration of these competencies will also determine how a teacher designs for expanded open learning opportunities. Stage 4 can be explored by a student in collaboration with a teacher or peer, or independently. As each individual develops their personal learning network, in their own time and in their own way, they also expand their personal learning environment. This stage also emphasizes the importance of the concept of sustainable learning opportunities which can be started and continued throughout multiple learning pathways. In addition, stage 4 describes how learners develop awareness of value and importance within learning ecosystems in digital and face to face learning contexts. As such, expanding personal learning environments is a life-long process in which OEP, in high school learning contexts, can provide the opportunity for students to develop awareness about unlimited learning potentials and their place within a supportive and sustainable learning ecosystem. The following figure provides a model of how the open learning process and the OLDI framework interconnect to provide a description of high school open learning environments.

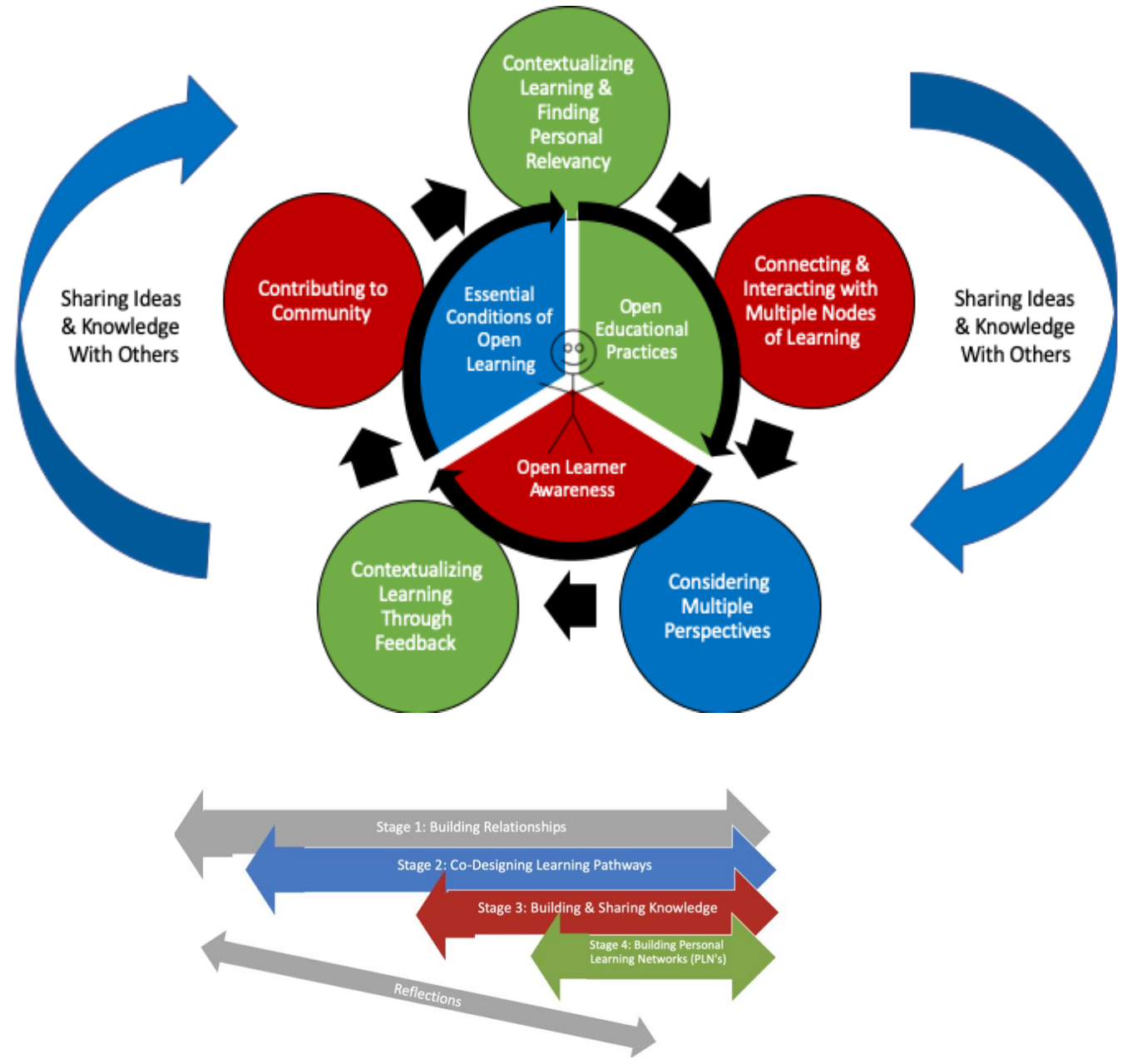


Figure 6.8: High school open learning cycle: The integration of emerging themes and the open learning cycle with the student in the center and OLDI as a framework for open learning design

Summary

This chapter has provided an analysis and discussion of how OEP can support teachers and students as they expand their learning environments into open learning opportunities. The

comparison of open pedagogy attributes to the research literature and study findings considered how the research project built and extended upon current open learning theoretical frameworks. The three themes that emerged from this comparative analysis, which include essential elements of open learning, OEP and open learner awareness, provides an extension of open learning theory in high school learning contexts. The final description of the OLDI provides a framework for future educators to consider how to integrate OEP and expand from formal into informal learning contexts. Overall, this chapter provided a balance of the theory and practice to inform future research in open learning contexts.

Chapter 7: Conclusion

This chapter summarizes one macro cycle of DBR that considered perspectives about open learning in a high school learning environment. The research examined how OEP can be integrated to intentionally design for expanded learning experiences that connect classrooms to communities and open learning networks. The OLDI framework helped to support the researcher and teacher to design for learning using an OEP lens. The stages of design-based research and reflections on learning encouraged all participants to transparently document, share and demonstrate evidence of their perspectives and experiences with open learning. As a result, this research builds upon prior research and practice, and provides an extension to the literature on open learning by providing a learner-centric, contextual, evidence informed description of open learning in a high school learning environment, a comparative analysis of open learning in high school with current literature in open learning, and the open learning design intervention (OLDI) framework that can support educators as they design for learning using OEP in any K-12 context.

This chapter concludes one macro cycle of the design-based research and describes potential next steps and future research opportunities arising from this research. The chapter begins with the limitations of the study. Then the recommendations for future research are considered. Finally, the implications for theory, policy, pedagogy and open scholarship are examined.

Limitations of the Study

The limitations of a study describe the real and perceived boundaries that the researcher set around the research context. The limitations need to be described in order to consider the

conditions which may weaken the research (Rallis & Rossman, 2012). There were numerous limitations due to the new innovative pedagogical nature and research topic context.

Researcher bias. As identified in DBR and qualitative research literature, the bias of the researcher can be considered a limitation of the research process. At the start of this research, the researcher identified her stance as an open learning advocate and her epistemological belief in sociocultural theory. In this research, the researcher considered how the iterative DBR process promoted collaboration between the researcher and participants in order to ensure a flexible research process that included participant voices. The researcher ensured that there were multiple member check-ins throughout the research in order to ensure the researcher's personal educational beliefs did not sway or overly influence the research findings. Member check-ins included the daily participant feedback, the iterative data analysis at the completion of each learning pathway, the co-designing of learning pathways with the participants as well as the guidance and challenges presented by the researcher's supervisor and committee members. The Design-Based Research Collective suggests that DBR researchers will feel and face tension "by trying to promote objectivity while attempting to facilitate the intervention, design-based researchers regularly find themselves in the dual intellectual roles of advocate and critic" (2003, p.7). The researcher remained well aware of the potential for bias as a limitation of the research throughout, and to alleviate and intentionally address this potential limitation, the researcher designed for member check-ins and extra accountability to validate the data analysis, emerging insights and findings.

Completing research in a K-12 context that could be publicly accessed. In order to complete research on open learning environments, the researcher completed institutional and procedural ethics, and also focused on ethics in practice (Guillemin & Gillam, 2004). The

difference between consent for research and consent to learn in open learning spaces was explained to the teacher and the students, and there was extensive clarification to identify why consent is needed for the research. These identity issues could be considered what Simons, (2009) calls an ethical dilemma in that part of the research asked the participants, “Who gains and who loses by the release of this information? (Simons, 2012, p.3). Part of learning in the open includes reflecting upon and asking oneself, ‘what can others learn by having access to this information?’ Open learners must also always consider the risk to sharing knowledge with others. K-12 open learning environments ensure that teachers consider the risk to their students and themselves. The open readiness (Cronin, 2017) of all of the participants was considered throughout the research to ensure they received the support and guidance they needed in deciding when and what is openly shared with others. For example, the LP1: Searching Online and LP2: Data & Privacy learning design focused on how to develop choice and voice in online learning environments. In LP3: Community Problem, the students were introduced to learning design that encouraged them to demonstrate the ideas and concepts of online choice and voice in their own ways. LP4 clarified that sharing is a gift and learners always have a choice when sharing their learning and setting personal boundaries around who teachers can share their learning with.

Although there are possible harms that were considered in assessing the risks of this research, such as the risk of connecting with others in open learning environments, there were also benefits that were anticipated for the researcher, the teacher and the student participants. For example, in addition to encouraging voice and choice in LP3: Community Problem, the learning design also integrated a daily learning journal for updates about the daily activities, especially email communication, and the teacher and researcher tracked all the project social media project sites and interactions. There were no examples of inappropriate or unsafe learning experiences

in open learning environments based on student reflections, discussions with all the participants, classroom observations or in digital or face to face spaces.

Limited district policies for open learning Within this school district, teachers are expected to use the digital tools used on the acceptable use list. In addition, the district social media policy only encourages teachers to use classroom based social media identities in their practice. In this study, the teacher and researcher had permission to use whatever digital and social media tools that were needed in order to support student learning, as long as the district and parents were informed.

As the participants considered how they could expand their learning environments into public and open learning networks, they considered the persona in which they choose to participate as. The K-12 district technology infrastructure, policies and procedures provided a safe walled garden that shielded the participants from some data security and privacy issues. However, the students reflected upon how many learning experiences they had, in formal and informal contexts, that they had not considered before as a result of this research and learning opportunity. The students appreciated and were aware of the district walled garden but were also aware that they needed to learn about creating a safe learning environment for themselves in order to continue learning in open contexts. As the learning was expanded beyond the safety of the district walled gardens, parents and students were updated about the potential issues that can be present when learning in open environments while at the same time they were provided with links to student digital artifacts so parents could also be a part of learning experience. A limitation included some student and parent mindsets that expanding learning beyond classroom unnecessary and more teacher-centric pedagogical approaches were more appreciated. Although the research project had ethical permission to expand learning beyond classroom walls, not all

students and their parents were ready to consider how learning could be expanded into open learning environments regardless of the research walled gardens and transparency in communication.

Limited Current Research in Open Educational Practice (OEP) The limited examples of current research which considered open learning from a sociocultural lens meant that there were limited methodological approaches and tools to use to compare and contrast this research study's findings.

Using the V&R mapping tool for data collection. The researcher intentionally chose methodological tools, like the V&R maps, which have been previously used in open education research as part of the disciplined inquiry which considered how learners are choosing and finding their digital resources (LeCornu & White, 2018). The researcher built upon the knowledge already supported by open learning research by using a similar methodological process to ensure participant safety, security and understanding of learning in open environments.

However, student feedback during classroom discussions and the number of completed V&R maps revealed that the students considered the V&R maps to be a low priority, and some found them to be confusing. Given the inconsistency in completion and use, the V&R maps did not prove to be a consistent data analysis tool for a longitudinal study of learning spaces in this study. As such, the V&R maps can only be used as a means to provide additional clarification and support to expand upon other forms of data collection, such as the student reflections. The use of V&R maps in a future study on open learning with high school students may be more successful if the tool is used twice, once at the beginning and once at the end. An interview or online survey would also be included with the V&Rmap, to ensure that there is clarity and

understanding about why the participants chose to include their specific information. The researcher used the reflections to check for accuracy, but the students did not always reflect upon the V&R maps. In addition, the tool was also used by the students to describe how their learning expanded to people and nodes of learning that are found in face to face learning spaces. So rather than only identifying digital learning spaces, the tool could be used as a means to describe all learning spaces and nodes of learning. The student feedback was most obvious and forthcoming with the initial use (as mentioned in the analysis in chapter 4). The tool was effective to develop awareness about the spaces in which students learn, which is how the tool was used for this research project.

Using Hegarty's (2015) attributes of open pedagogy for data analysis. In addition, in the analysis and discussion, the researcher used Hegarty's (2015) attributes of open pedagogy as a lens in which to compare and contrast the research findings for the final research analysis. This comparative analysis resulted in the three final research themes and changes and additions to the final version of the OLDI framework. As a result of the limitations of considering an emerging research topic, the researcher built upon the knowledge already supported by research by using a similar methodological process to ensure participant safety, security and understanding of learning in open environments. Considering an emerging research topic, the researcher ensured additional participant safety and security in multiple learning environments and comparisons to current open literature in open pedagogy.

DBR as a methodological approach. Multiple DBR research summaries have considered the limitations of DBR as a methodological approach (Kennedy-Clark, 2013; McKenney & Reeves, 2012; Goff & Getenet, 2017). The balance between theory and practice

ensures that the pragmatic and authentic realities of everyday learning environments are represented and considered throughout a DBR research study.

Dependency on communicative relationships. In this research study, there was a dependency between all participant relationships in order for DBR research to develop throughout the research project. The researcher was dependent upon the participants in order for the data collection to be completed, and the participants (teacher and students) became dependent upon the researcher to help design the learning pathways, consider resources and connect with outside the classroom experts in order to support expanded learning opportunities. This dependency included clear communication that described participant roles and expectations as well as constant feedback and check-ins to ensure participant voices were heard and valued. The level of commitment of the participants greatly influenced the role of the researcher, and as such, the researcher often took on multiple roles in order to complete the research project. The research process dependency required extensive organization and strong relationships. The organization ensured there was a flexible plan and the relationships needed constant work. Like any relationships, there were moments of amazing collaboration and other moments of tension. The data collection for DBR was extensive, as such, the researcher and participants had to work together throughout the research, to ensure consistency and completion. Due to the participatory nature of this DBR study, and the opportunity for participants to take on multiple roles in different contexts, the methodological processes afforded the flexibility and authenticity to balance theory and practice well. However, it is important to consider how the development of strong relationships, active participation, data collection support and communication played essential roles in the completion of this study.

Complex methodological approach for new researchers and doctoral research. The amount of research project organization, data collection, data analysis and expectation to model and take on multiple research project roles can be a daunting and overwhelming task for new DBR researchers. In most DBR studies, there are multiple people who take on research and support roles to complete the iterative and multi-faceted research pathways. “Creating complex interventions with practitioners in real-world contexts is a challenging activity” (Goff & Getenet, 2017, p. 118). In this case, there was only the main researcher who was a doctoral student with limited research experience. However, using DBR provides the flexibility for new researchers to consider an emphasis to improvement of practices and student learning, over a description of practices, and the abundance of data and multiple roles also provide extensive practice for new researchers. As mentioned above, strong relationships are essential in order to encourage active and engaged research participants who can support doctoral students with the vast amount of work required to complete iterative and pragmatic DBR studies. Having a committed and experienced doctoral supervisor and committee and having the opportunity to complete a research collaborative course while completing the data collection and analysis, was instrumental in the success of this research project. Focusing on the research questions, considering time restraints and being prepared for the possible overwhelming nature of the process, also ensured the completion of one macro phase of DBR study.

Unique high school learning environment. DBR posits that educational research should occur in natural learning environments and not in artificial learning environments. Another limitation to the research was the Building Futures Airdrie learning environment and program itself. The choice of the BFA learning environment was informed by the clear connections to foundational open learning principles and evidence of open learning practice. However, the

interdisciplinary nature of the BFA program and connection to authentic learning opportunities (like building a house as the students complete their core courses), consistent connections to community partners, and the cohort model made BFA an innovative and unique learning environment in any high school context. As such, it became essential that the research continuously focused on and described the potential for OLDI to apply to any K-12 learning context, rather than limiting the focus to BFA itself.

Brown (1992) described the potential of DBR to consider the balance between the theoretical and practical aspects of educational research. “We must operate always under the constraint that an effective intervention should be able to migrate from our experimental classroom to average classrooms operated by and for average students and teachers, supported by realistic technological and personal support” (p. 143). As Brown suggests, the initial learning problem was a concern for BFA teachers, which as a result of our project work has also been considered by other teachers in the district. The opportunity to initially experience a district pilot project, then complete a research study, gave the BFA teacher and the researcher time to share our ideas develop a framework and present emerging research based on one context. It is important to note that while the program and context may have been initially perceived as a limitation, many of the ideas from the research are being adopted across the district in K-12 and high school only contexts. High school teachers and administrators were introduced to the initial OLDI (Roberts, 2018) at the beginning of the research project when considering how to scaffold and support digital literacies for high school students. Most recently, the teacher and research co-facilitated a professional learning session on how to transition the BFA student back into their local high school environments and used the OLDI framework as a lens for the workshop’s learning design. Similarly, the students who participated in the research used many of the open

learning strategies they had adopted in the research project in multiple leadership class projects. The adoption and adaptation of the ideas is a great example of how practice can support theory and theory can support practice.

Recommendations for Further Research

This design-based research is emerging research which examines and describes the potential for OEP in K-12 learning environments and extends upon previous literature in open learning. The following recommendations describe opportunities to expand upon this new research and can all be connected to the original conceptual framework (see chapter 1) which guided this research. The recommendations can be considered for any future open learning research projects, in any learning context.

Expand upon open learning research that considers the open learning process.

Traditionally, open learning research in K-12 contexts and higher education had been focused on OER. As a result, the first recommendation is to expand and continue to research on open learning in K-12 contexts with an emphasis on pedagogy and learning process by considering student perspectives of open learning and how to teach using OEP. The current research on OEP in K-12 and specifically high school learning environments is limited due to an emphasis in higher education and open learning theoretical alignment with more constructivist, product creation focused research on open education which most often examines the impact of open educational resources (OER) on learners. In this research study, the literature review of historical contexts of open learning and similar research in K-12 informal learning environments, reframed the focus of this research in order to consider sociocultural constructivist theory which describes the interactions of learners with other people and nodes of learning as an essential element in order to learn. This study emphasized how human collaboration, cultural contexts and student

use and choice of digital tools can influence the expansion of learning environments and open learning experiences, which is not usually an emphasis for open education research. As a result of this study, there are multiple opportunities to consider extensions to current open learning research with an emphasis on how open learning impacts students and how to design for open learning opportunities.

Consider researching open learning in digital and face to face contexts. From the beginning of the research, the participants naturally integrated face to face and digital communities and networks when expanding learning from formal into open learning environments. The student descriptions of how they perceived the process of the transition between environments included sociocultural aspects that had been missing in open learning literature. This research described how participatory culture, co-design learning pathways safe learning spaces were elements in formal and informal learning environments that were included by students as they expanded their learning from classroom to community to networks. The serendipitous and responsive nature of the researcher and teacher integrated current and authentic topics from media and society in order to support designing for personal learning pathways. By designing for student-centered learning opportunities, high school open learning provides the opportunity to connect personally relevant and influential informal learning opportunities that happen in face to face and digital contexts. Future research that compares and contrasts K-12 digital and face to face open learning is highly recommended.

Consider alternative open contexts to expand upon the use of the OLDI framework. In addition to the focus on the process of open learning, further research which considers OEP in any context could also be compared and contrasted to the design of the OLDI framework which was developed as a result of this research study. The OLDI framework was developed based on

historical pedagogical theory that considered how to design for open learning that encourages innovative practice while encouraging multiple perspectives as a result of intersecting formal and informal learning environments. Recent research by Stracke (2019) considers that, “It seems that those who support learning innovations do not want to refer to theories of the past, and that the authors of learning history do not want to recognise global changes.” (p.7) Stracke’s (2019) writing also advocates for quality learning frameworks and learning design for open education that considers macro, meso and micro levels of open education. Future research which considers how the OLDI framework can be designed and used in micro, meso and macro levels of open education in order to impact learners at all levels within learning ecosystems would be highly recommended.

Consider V&Rmaps as a tool to examine perspectives of open learning in digital and analog learning environments. Two themes arose within this research project that connected to the conceptual framework, but were very detailed and call for further research. First, the V&Rmaps were used to describe a different concept of open learning in high school than what was described in previous research (White and LeCornu, 2017). When the researcher examined the student V&Rmaps, Student F chose to add information all over the map. Based on White and LeCornu’s research (2017), the image below is an example how a mature learner engaged with the web.

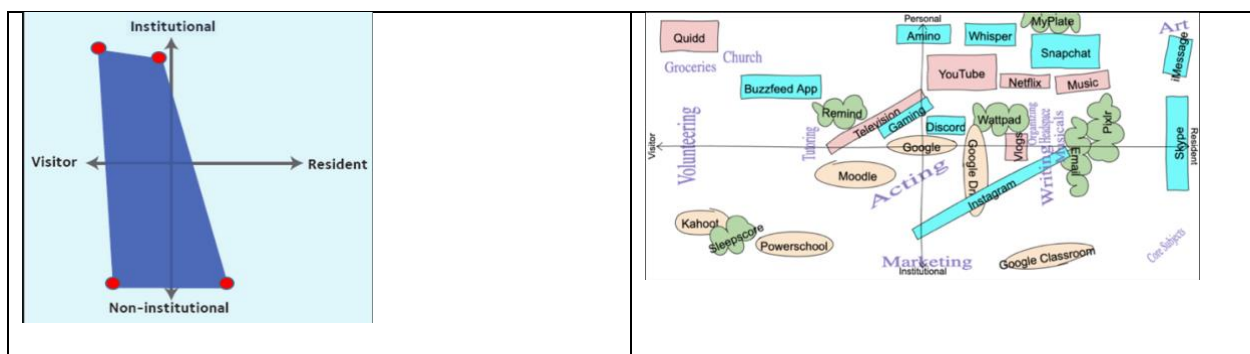


Figure 7.1: Map of how mature distance learners engaged with the Web (White and LeCornu, 2017) compared to Student F, LP1's V&Rmap

From the beginning of the research study, one particular student described and exemplified (through personal reflections and classroom observations) what the teacher and researcher described as open learning in high school learning contexts. What made their maps different was the use of space, and the locations where the student added their digital tools and where they perceived their learning to be happening. Specifically, Student F's V&R map used the entire space (and this pattern emerged with others students by the end of the research) and compared with White and LeCornu's (2017) example, Student F's map was much more focused on the right than the left side which indicated that the student perceived that they had multiple spaces, and places to develop a digital identity and personal learning environment. White and LeCornu's (2017) example suggests digital identity is developed without a perception of developing a residency in a place or space, or digital identity. As a result, future research using V&R maps should be considered to examine the shapes and perceptions of how high school learners engage with different learning spaces and places.

Consider the potential for the development of digital literacies. In the initial use of the V&R mapping tool, the students were asked to draw their perceptions of where they learn, how they learn and what nodes of learning they learn with. In partners, they were then asked to switch maps, and describe how they saw their partner's learning based on their drawing. By asking someone else to describe what they saw, the V&R tool provided an opportunity for students to communicate meaning through a narrative data visualization process. This data visualization process went beyond a text or specific language text or representation. When this process was described at a recent conference, an organization that supports alternative programs for refugee learners asked to use this alternative method of using the V&R tool because it gave their learners

an opportunity to draw their perspective of where and how they have learned, without an emphasis on a specific language or learning space. By valuing where are and how the learners describe their learning contexts, the alternative use of the V&R map, could describe the importance of considering formal and informal learning in previously inconceivable contexts. Although this use of the tool was not previously considered by White and LeCornu (2017), this extension provided an example of how the students were using and considering multi and trans literacies in order to communicate and demonstrate their learning from the beginning of the research study.

In addition, the original OLDI described the development of digital literacies to support learners in expanding into open learning environments. In this research, the emerging research described a transfer that exemplified a focus on digital literacies which developed into multiliteracies. This emphasis on the ability to use informational and expressive media in alternative ways was identified as a potential area for future research by Scardamalia and Bereiter (2014). These findings from this research project also suggest further exploration and research on knowledge building in open learning spaces should be considered.

The use of V&R maps in different and alternative ways provided a means for learners to describe their perceived learning spaces in formal and informal learning environments. The integration of Indigenous Ways of knowing provided an opportunity to connect oral storytelling with digital storytelling which integrated place based open learning in analog contexts with digital open learning. The flow of learning between learning from the land, through the individual learner's context and into digital networks described learning ecosystems in different and unique ways. These continuums of openness create an opportunity for multiple new lenses in which to consider open learning research.

Consider open scholarship by modelling open learning throughout the research process. Finally, research that considers OEP and open learning often also supports the potential for open scholarship. Within this research project, the co-presentations made between the researcher, teacher and students provided initial examples of open scholarship. The ideas from this project are already being adopted and adapted in practice by teachers across the partner learning district and will be used in future Faculty of Education courses. Similarly, the LP4 learning design and OLDI framework is being used as an OER project and was presented at the UNESCO Open Education for a Better World Conference in Slovenia (Roberts, 2019). The learning design and resources have the potential to be used for future practice and research. In ways that this study emulated, learning can happen in all spaces and places, and the potential to expand upon open scholarship is also a recommendation for future research.

Implications for Policy and Pedagogy

Contribution to open learning policy. The findings from this research have multiple implications to inform policy at the jurisdiction level, including the development of digital literacy strategies, choice of digital platforms and tools, teacher and student use of digital tools, sharing of digital artifacts including lesson plans and resources, using social media tools in the classroom, amplifying voice and choice for high school learners, and the sharing of learning processes using technology. In addition, as a result of the research, possible policy considerations could support designing for sharing and collaborating with others outside the classroom and outside the immediate school district, an increased understanding of privacy and data collection, the development and sharing of OER, and increasing understanding of real and perceived barriers to create safe learning spaces. Most importantly, school district policies (and in many

cases any institution policies) need to consider continuums of openness, rather than open & closed boundaries when considering open learning policy.

From a provincial policy perspective, in current Canadian educational policy contexts, there is some debate between the emphasis on perceived traditional educational methods versus more research informed progressive and emerging pedagogical approaches. OEP would be described as an emerging pedagogical approach. This research demonstrated how emerging pedagogy, like open learning, integrates multiple pedagogical approaches (including traditional approaches) in order to meet the needs of students. For example, in LP2, the students examined data analytics and expanded their learning (and the teacher's learning) by expanding their numeracy skills beyond the basic curriculum focused on globalization. As the students used personal examples to compare and contrast data from historical contexts, they connected with other nodes of learning in order to graph, analyze and critically examine data. As their interest in the topic increased, they had to go back and relearn basic numeracy skills in order to expand and connect more complicated skills to complete the learning analytics activities. Similarly, as the students described their learning throughout LP1-LP4, they were encouraged to transparently demonstrate their learning in their Google folders or through individually chosen digital tools. As they demonstrated how they learned, the different and personalized learning became evident which emphasized their learning strategies which included traditional, inquiry, emerging and indigenous ways of knowing. As such, further research that considers provincial educational policy that advocates for an integration of multiple research based pedagogical approaches should also be considered.

Finally, from an educational global policy perspective, at a recent UNESCO presentation that described the guidelines for open policy when using OER, Orr (2019) proposed that there is a need to transition from an emphasis on open content to open learning and process-centric initiatives, especially when integrating the UNESCO Sustainable Development Goal (SDG) number 4, “Ensure inclusive and equitable quality education and promote lifelong learning” (UNESCO, 2019, p.30) . The presentation suggested a need to consider adaptable, flexible and contextualized learning content which supports transformation and change in teaching practices and consider formalized learning pathways that integrate formal curriculum and informal skills, abilities and informal learning experiences. The OLDI framework, based on the research informed feedback provides a model that has the potential to be used in global learning contexts as an example of how to integrate sustainable development goals.

Contribution to open educational practice (OEP) and theory. This design-based research makes a substantial contribution to open learning and OEP as one of the first studies to emerge within a K-12 lens. The three themes of open learning in high school contexts which include, essential elements of open learning, OEP and open learner awareness provide a comparison for future research in a specific area of open learning research. The OLDI framework also contributes to the emerging research in OEP by providing a lens in which to support open learning design. The work expands upon the original theoretical framework which was founded on the work of Vygotsky (1978), Dewey (1913) and Barth (1969) by integrating the work of Scardamalia and Bereiter (2014). As emphasized in previous sections, the research also substantially extends current open theoretical research by emphasizing the importance of social constructivism, human interaction and nodes of learning in open learning research. Based on this research, OEP in K-12 learning contexts can be defined as an intentional design that expands

learning opportunities for all learners from formal to informal learning environments. The expansion of learning is dependent upon designing for personally relevant learning pathways where learners can collaboratively and individually share their learning experiences, that encourages communication of meaning through multiliteracies, that blends curriculum and competencies and that promotes community and networked interactions with other learners and nodes of learning from multiple cultural perspectives in digital and analog contexts.

Based on the research findings and iterative analysis in this macro DBR study, the following principles of open learning design in high school learning contexts can be considered:

- High school open learning is dependent upon the opportunity for learners to co-design personally relevant learning pathways
- High school learners collaboratively and individually share their learning experiences through open and closed feedback loops that include multiple people, spaces, perspectives, experiences and nodes of learning
- High school learners need to transparently demonstrate their learning in meaningful ways that integrate curriculum and competencies
- High school open learning occurs through stages and continuums and is a personal learning experience that transcends formal learning environments
- High school open learning emphasizes the learning process in order to build upon and share community knowledge

Although the research was intentionally designed to support a micro learning context, the OLDI framework and research emphasis on how to expand learning into open learning contexts has been considered in meso and macro contexts including the SUNY University OEP integration project, Slovenian Ministry of Education and Colorado State Higher Education. This

research represents a possible change to the open learning research mindset from a product focused emphasis with a dependency on open educational resources to a process focused open learning research mindset with a focus on human interaction, multiple perspectives, alternative assessments and the integration of open learning continuums represented by formal and informal learning environments, competencies and curriculum and digital and analog learning spaces. In addition, this research provides a model to further exemplify open scholarship and the importance of transparently demonstrating evidence of learning, the need to consider open learner readiness when asking learners to share their learning with others in emerging open educational practices, and it expands upon open learning theory.

Conclusion

Open pedagogy provides the conditions for changes to learning in high school learning environments. Open learning paves the way for future research opportunities as an emerging pedagogical approach that promotes equity and access to learning for all learners by considering the role of the learner in building and sharing their knowledge, through the encouragement of developing open educational practices and expanding K-12 learning environments to epitomize lifelong learning opportunities. There are few examples within current research on open learning that describe examples of practice that uses an intentional intervention and learning design that expands learning opportunities for all learners beyond classroom walls by collaboratively and individually sharing and building knowledge and encouraging networked participation by interacting with other nodes of learning from multiple cultural perspectives. This research demonstrates the need for students to feel confident as individual learners, in a community of learners and in learning networks. As teachers develop the relationships with the students they are able to clarify what stages the learners are at in terms of who they share their learning with

and as. Recognizing these stages, or comfort zones, can help provide a framework that describes how far students are willing to expand their learning environments. In addition, being aware of learner stages of open readiness provide valuable insights for teachers as they design for flexible, accessible multi-access learning pathways for all learners to encourage them to consider and choose how and why to expand their personal learning environments. As the learners openly and transparently share their learning to communicate how they learn and what they are learning, teachers are more able to support the learners in finding and connecting with outside nodes of learning that can inspire the individual learners in different and unique ways. Open learning provides the opportunity to integrate multiple learning pathways and supports the concept of lifelong learning which integrates formal and informal learning from the day each learner is born throughout their formal learning experience and beyond.

The theoretical integration of different learning environments to intentionally interact with others as described by Vygotsky (1978) and practice which designs for expansive open learning environments has much potential to be explored in K-12 learning environments. As K-12 school districts consider how to expand learning environments in order to connect, collaborate, and create new learning with others, the OLDI framework provides consideration for designing for open educational practice. The emphasis on relationship building, co-designing learning pathways and demonstrating evidence of their learning creates personalized learning opportunities for all learners which integrates formal and informal learning. The integration of digital tools and multiple nodes of learning ensure that all learners can have access to learning spaces, places and people they need in which to expand their learning potential. An emphasis on learning how to learn, as opposed to learning content, is not limited by the boundaries of a teacher, a policy or a curriculum. Learning has no boundaries, and OEP encourages teachers to

design for learning opportunities that bridge and challenge previously conceived learning boundaries.

This research provides authentic examples that model open educational practice for other educators, the research also contributes to the ecological web of learning by building upon previous research in open education and sharing participant narratives that describe the new perceptions of open educational practice for educators and learners by exemplifying how to integrate OEP into K-12 learning designs. In addition, this research has built upon sociocultural constructivist theory by emphasizing the potential of open educational practice in expanding learning environments by demonstrating how open learning opens the doors of previously closed formal classroom by expanding from formal into informal learning spaces. Most importantly, this research provides an example of how to provide sustainable individual learning pathways for all high school students, stemming from formal learning contexts, which connect to lifelong learning experiences and opportunities.

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Appendix A

The stages of OLDI occur in iterative cycles:

Stage 1: Focus on Learner Context – Build Relationships

Stage 2: Development of Digital Literacies

Stage 3: Find Your Yoda

Stage 4: Be a Yoda

Focus on Learner Context – Revisit Relationships

In order to consider how to support Open Educational Practice in K-12 learning contexts by developing pivots in our classrooms, I have been working in collaboration with teachers in my K-12 school district. We have been creating a learning design that describes how to bridge from formal to informal learning environments.

The first stage is all about developing relationships between all learners which includes student-teacher and student-student relationships.

The second stage includes a wide variety of activities to develop digital skills, abilities and knowledge with a focus on digital literacies. The topics ranged from basic digital skills like [building and adding artifacts into Google folders](#) , completing the [Power Searching with Google](#) Course, [webconferencing with the Centre for Global Education](#), completing the [MediaSmarts lesson on Online Relationships: Respect and Consent](#) and examining digital privacy by searching for holiday presents on [Mozilla’s privacy not included list](#).

The third phase has focused on interactions, collaborations and connections between the learners and informal learning contexts (like building a house with tradesmen, community partners, connecting with other students around the world, connecting with other teachers, and talking to family members and other community experts). We like to call this phase the [“Find your Yoda” phase](#), where students look out beyond their formal classroom learning environment to find and connect with people and other learning opportunities that are authentic to them.

The last phase (...of this iteration because you never stop learning).... is an opportunity for students to reflect upon their learning pathway, and give back to others. This phase is called “Be a Yoda”. In this stage, the student will focus on exchanging, sharing and collecting learning artifacts and supporting other learners while [building a sustainable Personal Learning Network/Environment](#).

This summary of the four original stages of OLDI was retrieved from Proposing OLDI (Version 1): An Open Learning Design Intervention for K-12 Open Educational Practice Roberts (2018) Retrieved from <http://www.openclassroomonline.com/proposing-oldi-version-1-an-open-learning-design-intervention-for-k-12-open-educational-practice/>

Appendix B

LP1: Learning Pathway 1

Relationship Building (Stage 1)	<ul style="list-style-type: none"> ● Students were facilitated through the process of inquiry using a structured inquiry approach (Fichtman, 2011) ● Students were encouraged to work in groups to answer their inquiry questions using a controlled inquiry approach (Fichtman, 2011) ● Students were encouraged to ask the teacher and/or the researcher questions during classroom observations 					
Developing Digital Literacies (Stage 2)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td data-bbox="690 714 1425 850"> <ul style="list-style-type: none"> ● Students were guided through the essential elements of using inquiry-based questions in order to find out information for themselves </td> </tr> <tr> <td data-bbox="690 850 1425 987"> <ul style="list-style-type: none"> ● Students were given a rubric to remix and collaboratively identify how they would be assessed </td> </tr> <tr> <td data-bbox="690 987 1425 1207"> <ul style="list-style-type: none"> ● Students were given a list of resources, then asked to create inquiry questions guided by the concept of FOMO (Fear of Missing Out) ● Student resources/links to support questions about LP2 were added to Google Classroom </td> </tr> <tr> <td data-bbox="690 1207 1425 1386"> <ul style="list-style-type: none"> ● Students were asked to brainstorm then create their own inquiry questions based on their lessons (that they had completed in Google.docs) and online links/resources </td> </tr> <tr> <td data-bbox="690 1386 1425 1564"> <ul style="list-style-type: none"> ● Students were asked to present group presentations that answered their inquiry questions to the class as a digital artifact of their choice. </td> </tr> </table>	<ul style="list-style-type: none"> ● Students were guided through the essential elements of using inquiry-based questions in order to find out information for themselves 	<ul style="list-style-type: none"> ● Students were given a rubric to remix and collaboratively identify how they would be assessed 	<ul style="list-style-type: none"> ● Students were given a list of resources, then asked to create inquiry questions guided by the concept of FOMO (Fear of Missing Out) ● Student resources/links to support questions about LP2 were added to Google Classroom 	<ul style="list-style-type: none"> ● Students were asked to brainstorm then create their own inquiry questions based on their lessons (that they had completed in Google.docs) and online links/resources 	<ul style="list-style-type: none"> ● Students were asked to present group presentations that answered their inquiry questions to the class as a digital artifact of their choice.
<ul style="list-style-type: none"> ● Students were guided through the essential elements of using inquiry-based questions in order to find out information for themselves 						
<ul style="list-style-type: none"> ● Students were given a rubric to remix and collaboratively identify how they would be assessed 						
<ul style="list-style-type: none"> ● Students were given a list of resources, then asked to create inquiry questions guided by the concept of FOMO (Fear of Missing Out) ● Student resources/links to support questions about LP2 were added to Google Classroom 						
<ul style="list-style-type: none"> ● Students were asked to brainstorm then create their own inquiry questions based on their lessons (that they had completed in Google.docs) and online links/resources 						
<ul style="list-style-type: none"> ● Students were asked to present group presentations that answered their inquiry questions to the class as a digital artifact of their choice. 						
Intentional Interactions/ Collaborations and Connections (Stage 3)	<ul style="list-style-type: none"> ● Students were asked to find content online, connect with their peers in class and trusted family/friends and possible outside online experts when finding the answers to their inquiry questions 					

Building Personal Learning Networks (Stage 4)	None
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Appendix C

Learning Pathway 2 (LP2):

Relationship Building (Stage 1)	<ul style="list-style-type: none"> ● Students were encouraged to work in groups to answer their inquiry questions using a controlled inquiry approach (Fitchman, 2011) ● Students were encouraged to ask the teacher and/or the researcher questions during classroom observations
Developing Digital Literacies (Stage 2)	<ul style="list-style-type: none"> ● Building Futures Google Site created by teacher: https://sites.google.com/rvschools.ab.ca/bfcommunitypage/home ● Students were encouraged to create their own Google sites to share their learning with others in a public and open way and/or Google folders to collect their digital artifacts and reflections in a private space ● Student resources/links to support questions about LP2 were added to Google Classroom
	<ul style="list-style-type: none"> ● Students were asked to complete specific lessons based from creative commons licensed, open educational resources (OER) on data analysis from Chapter 4, Big Data and Privacy in AP Computer Science Principles (CODE, 2018). Students were given the lessons in the form of a Google.doc that they could add to their LP2 Google folder.
	<ul style="list-style-type: none"> ● Students were introduced to specific videos about digital privacy and data (also listed in the LP2 student resources) by watching the videos together as a class, then discussing them together as a class. ● The teacher facilitated group discussions using www.gapminder.com to model data analysis. Students also experimented with the gapminder data analysis tool individually and Google trends.
	<ul style="list-style-type: none"> ● Students were asked to brainstorm then create their own inquiry questions based on their

	<div data-bbox="690 205 1421 310" style="border: 1px solid black; padding: 5px;"> <p>lessons (that they had completed in Google Docs) and online links/resources</p> </div> <div data-bbox="690 317 1421 451" style="border: 1px solid black; padding: 5px;"> <ul style="list-style-type: none"> • Students were asked to present individual presentations that answered their inquiry questions to the class as a final presentation. </div>
<p>Intentional Interactions/ Collaborations and Connections (Stage 3)</p>	<ul style="list-style-type: none"> • Students were asked to find content online, connect with their peers in class and trusted family/friends and possible outside online experts when finding the answers to their inquiry questions • Students were introduced to outside experts through online web conferencing (closed to public)
<p>Building Personal Learning Networks (Stage 4)</p>	<ul style="list-style-type: none"> • Students were encouraged to figure out how to connect with outside experts that they did not know before this activity, to answer their questions

Appendix D

Learning Pathway 3 (LP3):

Relationship Building	<ul style="list-style-type: none"> ● Students were encouraged to consider their digital privacy and security when they considered how to connect and communicate as they developed relationships and connected with other people. ● The topics were chosen so that students could make personal connections to the topics ● Students could choose to complete the learning pathway as a group or as individuals. ● Students were encouraged to connect with others (inside and outside the classroom experts) and build relationships in order to gain support to complete LP3. ● Teacher connected and co-designed with outside community partner before LP3 was introduced to students 						
Clear Connection to Curriculum Criteria & to Digital Literacies	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td data-bbox="690 1003 1421 1150"> <ul style="list-style-type: none"> ● Building Futures Community Site created: ● https://sites.google.com/rvschools.ab.ca/bfcommunitypage/home </td> </tr> <tr> <td data-bbox="690 1150 1421 1360"> <ul style="list-style-type: none"> ● Students were asked to consider the three community problems: youth engagement, mobility/transportation and business that were connected to Alberta curriculum learning outcomes in Language Arts and social studies </td> </tr> <tr> <td data-bbox="690 1360 1421 1539"> <ul style="list-style-type: none"> ● Students were asked to brainstorm possible questions they would like to consider in order to solve the questions using a design thinking approach. </td> </tr> <tr> <td data-bbox="690 1539 1421 1686"> <ul style="list-style-type: none"> ● Students were asked to use a design thinking approach to solve a community problem in a group or as an individual. </td> </tr> <tr> <td data-bbox="690 1686 1421 1791"> <ul style="list-style-type: none"> ● Student resources/links to support questions about LP3 were added to Google Classroom </td> </tr> <tr> <td data-bbox="690 1791 1421 1864"> <ul style="list-style-type: none"> ● Assessment: </td> </tr> </table>	<ul style="list-style-type: none"> ● Building Futures Community Site created: ● https://sites.google.com/rvschools.ab.ca/bfcommunitypage/home 	<ul style="list-style-type: none"> ● Students were asked to consider the three community problems: youth engagement, mobility/transportation and business that were connected to Alberta curriculum learning outcomes in Language Arts and social studies 	<ul style="list-style-type: none"> ● Students were asked to brainstorm possible questions they would like to consider in order to solve the questions using a design thinking approach. 	<ul style="list-style-type: none"> ● Students were asked to use a design thinking approach to solve a community problem in a group or as an individual. 	<ul style="list-style-type: none"> ● Student resources/links to support questions about LP3 were added to Google Classroom 	<ul style="list-style-type: none"> ● Assessment:
<ul style="list-style-type: none"> ● Building Futures Community Site created: ● https://sites.google.com/rvschools.ab.ca/bfcommunitypage/home 							
<ul style="list-style-type: none"> ● Students were asked to consider the three community problems: youth engagement, mobility/transportation and business that were connected to Alberta curriculum learning outcomes in Language Arts and social studies 							
<ul style="list-style-type: none"> ● Students were asked to brainstorm possible questions they would like to consider in order to solve the questions using a design thinking approach. 							
<ul style="list-style-type: none"> ● Students were asked to use a design thinking approach to solve a community problem in a group or as an individual. 							
<ul style="list-style-type: none"> ● Student resources/links to support questions about LP3 were added to Google Classroom 							
<ul style="list-style-type: none"> ● Assessment: 							

	<ul style="list-style-type: none"> ● Students were expected to review, remix and sign a group contract that described basic groupwork guidelines. Students were told they would be assessed based on: ● Daily Personal Learning Journal updates (in Google.docs) ● Final presentation (On a Google site (could be open/private) ● Final individual reflections ● Group Google site to present LP3 process throughout project (reflections/learning journals etc) (open to public, no personal reflections)
Intentional Interactions/ Collaborations and Connections	<ul style="list-style-type: none"> ● Students were asked to connect with whomever they needed, however they needed to, in order to use design thinking strategies to problem solve. ● All interactions needed to be included in their Learning Journals. ● Teacher and Researcher gave regular and timely feedback to groups to ensure teacher knew who students were interacting with and to ensure students were clear in their project completion
Building Personal Learning Networks	<ul style="list-style-type: none"> ● Students connected with a wide variety of people and examined public online content in order to solve their problems ● choice to build their networks using their “group” identity or their individual “real” identity. ● Students began to demonstrate differences between learning communities (Friends/Family, Classroom, Immediate Community, School District, Inclusive digital communities and public networks) ● Some students willing to integrate own PLN into their learning environment, not use the PLN of the teacher/researcher

Appendix E

Table E1
Learning Pathway 4 (LP4): LP4 timeline: 8 weeks

Week	Topics	Activities	Assessment	Community Partners
Jan 7-11 (Week 1)	What are stories? What is the importance from story from Indigenous lens? What are components of stories?	Daily Reading – Indigenous Literature kits Perspective Reflection Activities Watching movie: PASS System	Formative: Daily Reflections RVS Literacy Assessment (formal)	Working in collaboration with an Elder and Indigenous knowledge keeper on a variety of activities to consider Indigenous storytelling perspective and historical perspectives
Jan 14-18 (Week 2)	Types of Stories Legacies of historical globalization	Daily Reading - Lit Kits Perspective Reflection Activities Different Types of Storytelling	Formative: Daily Reflections RVS Literacy Assessment (formal)	Elder Visit Blanket Exercise (Family Invited)
Jan 21-25 (Week 3)	Personal Stories/ Connections to Perspectives Types of Stories cont.	Daily Reading - Lit Kits Lit Perspectives Perspective Reflection Activities Watching movie: Indian Horse/Angry Inuk Personal Story - start	Formative: Daily Reflections	Documentary Filmmaker Visit Field Trip with Elder Downtown, Museum & Indigenous Friendship Centre
Jan 28-Feb 1 (Week 4)	Multiple Perspectives - in perspective	Lit Perspectives COMPLETED Perspective Reflection Activities Personal Story - continue to work on it	Formative: Daily Reflections Summative: Types of Storytelling - Prez	Field Trip: Play about Storytelling (Family Invited)
Feb 4-8 (Week 5)	Communicating a position (Essay)	Perspective Reflection Activities & Teacher directed (groups) How to write an essay/report Research collection: Essay/Reports	Formative: Daily Reflections Peer feedback - personal stories	District Specialist - Help With Making Digital Stories for Presentation to New Teachers
Feb 11-15 (Week 6)	Communicating a position	Essay/Reports (completed) Perspective Reflection Activities	Summative: Essay/Reports	Presenting Personal Stories to Class
Feb 18-23	Presenting /Sharing Learning with Others	Presentation to University of Calgary	Formative: Presentation prep/feedback	University of Calgary, Werklund School of Education
Feb 25 Week 8	What is My Story? What Did I Learn and How do I Learn?		Summative and Formative Collection of Evidence of Learning	Final Reflections Collecting and Updating learning portfolios

Table E2

Learning Pathway 4 (LP4): Stages of OLDI

The learning design for conceptual understanding learning and the timeline was connected to the OLDI framework in the following ways:

<p>Stage 1: Relationship Building</p>	<ul style="list-style-type: none"> ● Students were encouraged to build relationships with trusted adults outside and inside the classroom in face to face and digital environments ● Students were encouraged to consider how their relationships impacted others, the time spent on developing relationships and any protocols/rules/traditions when considering relationships in different cultural contexts ● Students were encouraged to consider how relationships with others can impact their learning and lives ● Researcher and teacher connected with District learning specialists and Indigenous Elders to design LP4 				
<p>Stage 2: Clear Connection to Curriculum Criteria & Connection to Literacies</p>	<table border="1" style="width: 100%;"> <tr> <td data-bbox="688 1150 1421 1329"> <p>Learning Pathways Open Trello Board was Created: https://trello.com/b/sewK2OJC/stories-perspectives-grade-10</p> </td> </tr> <tr> <td data-bbox="688 1329 1421 1507"> <p>Student introduced to the school district Indigenous Literature Kits for K-12. The kits provided a wide variety of resources for the students to consider in groups.</p> </td> </tr> <tr> <td data-bbox="688 1507 1421 1749"> <p>Students were split into groups with specific “editors” as key group leaders. The groups split up all the literature between all the students in the group. The entire group was expected to complete the summaries of the literature, based on their personal perspectives, as a group activity.</p> </td> </tr> <tr> <td data-bbox="688 1749 1421 1900"> <p>Students were asked to use a specific template to help guide their summaries.</p> </td> </tr> </table>	<p>Learning Pathways Open Trello Board was Created: https://trello.com/b/sewK2OJC/stories-perspectives-grade-10</p>	<p>Student introduced to the school district Indigenous Literature Kits for K-12. The kits provided a wide variety of resources for the students to consider in groups.</p>	<p>Students were split into groups with specific “editors” as key group leaders. The groups split up all the literature between all the students in the group. The entire group was expected to complete the summaries of the literature, based on their personal perspectives, as a group activity.</p>	<p>Students were asked to use a specific template to help guide their summaries.</p>
<p>Learning Pathways Open Trello Board was Created: https://trello.com/b/sewK2OJC/stories-perspectives-grade-10</p>					
<p>Student introduced to the school district Indigenous Literature Kits for K-12. The kits provided a wide variety of resources for the students to consider in groups.</p>					
<p>Students were split into groups with specific “editors” as key group leaders. The groups split up all the literature between all the students in the group. The entire group was expected to complete the summaries of the literature, based on their personal perspectives, as a group activity.</p>					
<p>Students were asked to use a specific template to help guide their summaries.</p>					

	<div data-bbox="691 205 1417 275" style="border: 1px solid black; height: 33px;"></div> <div data-bbox="691 275 1417 373" style="border: 1px solid black; padding: 5px;"> <p>Student resources/links to support questions about LP4 were added to Google Classroom</p> </div> <div data-bbox="691 373 1417 806" style="border: 1px solid black; padding: 5px;"> <p>Assessment: Students were expected to review, remix and sign a group contract that described basic groupwork guidelines. Students were told they would be assessed based on:</p> <ul style="list-style-type: none"> ● Activity reflections (For example, reflections included personal reflections to movies they watched and reflections about “expert” class visits and field trips) ● Digital story presentation ● Final individual reflections </div> <p>Students were asked to consider their <i>Sharing Learning Experiences</i>:</p> <ul style="list-style-type: none"> ● Sharing as yourself ● What to Share ● When to Share ● Why to Share ● Where to Share
<p>Stage 3 Intentional Interactions/ Collaborations and Connections</p>	<ul style="list-style-type: none"> ● Students were asked to connect with whomever they needed, however they needed to, in order to use Indigenous ways of knowing to critical consider cultural perspectives and storytelling ● All interactions needed to be included in their Learning Journals. ● Teacher and Researcher gave regular and timely formative feedback to groups to ensure teacher knew who students were interacting with and to ensure students were clear in their project completion
<p>Stage 4 Building Personal Learning Networks</p>	<ul style="list-style-type: none"> ● Students interacted connected with a wide variety of people , expanded their learning spaces outside classroom walls on field trips and examined public online content in order to solve their problems. ● Many students began to demonstrate differences between learning communities (friends/family/ classroom, immediate community, school district, Inclusive digital communities and public

	<p>networks)</p> <ul style="list-style-type: none">● More students willing to integrate own PLN into their learning environment, not use the PLN of the teacher/researcher
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Appendix F

LP1 Resources:

Retrieved from:

<https://docs.Google.com/document/d/1jVwSspnoe4j5RdbDSfx8KT48TFXIsJZONiCANxTNQDw/edit#heading=h.lpgk6pnhicz>

LP1 Student Resources: (Make a Copy)

Assessment: (Found in Appendix M and N)

In groups- review the resources.

Create a digital artifact that describes answers to your questions about how we find and communicate online:

LP1: (Searching Online/How to Communicate Online/ Finding Credible Content)

Emergency everything is here link: <https://www.commonsense.org/education/digital-bytes>

Learning Pathway Activities	Possible Resources
How to Find What you Need and FOMO	<p>What is FOMO?</p> <p>The Science of FOMO</p> <p>How to Find Out What is Really Going on...and skip the stuff that doesn't really matter....</p> <p>How to Search and Find What you need:</p> <p>Power Searching with Google</p> <p>How to Search Wiki</p>

	<p>Student Voice and Choice:</p> <p>Twitter Chat Summary https://blog.newsela.com/blog/2018/4/25/newselachat-recap-voice-choice</p> <p>Commonsense Media https://www.commonsense.org/education/digital-bytes</p>
Filter Bubbles	<p>The Power of the Algorithm</p> <p>https://www.ted.com/talks/andreas_ekstrom_the_moral_bias_behind_your_search_results?referrer=playlist-how_to_pop_our_filter_bubbles</p> <p>https://www.ted.com/talks/eli_pariser_beware_online_filter_bubbles?referrer=playlist-how_to_pop_our_filter_bubbles&language=en</p>
Popping Filter Bubbles	<p>TED Talk playlist</p> <p>https://www.ted.com/playlists/470/how_to_pop_our_filter_bubbles</p>
Online Communication (How to Communicate/Treat Each Other in Online Spaces)	<p>MediaSmarts- Online Relationships Lesson</p> <p>Cyberbullying Toolkit - Common Sense Media</p> <p>My Friends Are only Online - Online Q/A Thread (Check the responses)</p> <p>Trolling - What is Trolling?</p> <p>You Can't Use my Photo - http://cogdogblog.com/2014/10/no-you-cant-use-my-photo/</p>

	<p>Commonsense Media https://www.commonsense.org/education/digital-bytes</p> <p>Question- How do you use your voice to influence others in online enviros?</p>
<p>Finding Credible Sources - Fake News</p>	<p>Media Bias Chart</p> <p>MediaBiasFactCheck.com</p> <p>How Do We Teach Students to Identify Fake News?</p> <p>Verification Websites:</p> <ul style="list-style-type: none"> • FactsCan, Snopes, and Hoax Slayer) and tools like Google's "search by image" feature or the VerificationHandbook.com resource. <p>Publics Globally Want Unbiased News Coverage, but Are Divided on Whether Their News Media Deliver</p> <p>Fake News Lesson 1</p> <p>Fake News Lesson 2</p> <p>How to Find Fake News article</p> <p>10 Questions to Help Students spot fake news Article</p> <p>The News Literacy Project</p> <p>http://www.thenewsliteracyproject.org/sites/default/files/GO-TenQuestionsForFakeNewsFINAL.pdf</p> <p>Citizen Journalism</p> <p>Possible Digital Artifact? - Mozilla Activity- Hack the News</p> <p>Beyond Fake News: A News & Media Literacy Toolkit for Educators</p>

	<p>Examples:</p> <p>Muslim Sister's Project</p> <p>Why 2018 Will Be the Year of Indigenous Youth</p> <p>Bots, trolls and Fake News- US Elections</p>
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Appendix G

LP2 Resources:

LP2: Who is My Online Audience? **(Make a Copy)**
(Data Security/ Privacy/ Digital Mapping/ Data Analysis)

Data Visualization Introduction:

TED Talk - [The Best Stats You've Ever Seen](#)

[https://www.gapminder.org/tools/?from=world#\\$chart-type=bubbles](https://www.gapminder.org/tools/?from=world#$chart-type=bubbles)

Activities : <https://curriculum.code.org/csp-18/unit4/1/>

Big Data - Unit 4

[The Future of Big Data](#)

Emergency Everything Link: [TED Talks Playlist: Making Sense of Too Much Data](#)

Learning Pathway Activities	Possible Resources
Student Privacy	<p>Read: Students Care About Privacy</p> <p>7 Reasons to Care about Online Privacy for Kids</p> <p>Mozilla “Privacy Not Included” List: https://advocacy.mozilla.org/en-US/privacynotincluded</p> <p>4 Ways Instagram is Spying on You</p> <p>Big data knows you are pregnant (and that’s not all)</p> <p>Open with Risk Assessment (Big and Small)</p> <ul style="list-style-type: none"> • What are you trying to keep private? • From whom are you trying to keep it private? • What are the consequences if the protections fail? • Do the consequences change or shift over time (short-, medium-, long-term)? <p>Web USers Get as Much as they Give Privacy Policies</p>
Tracking Data/Encryption	<p>Mozilla - Encryption lessons/ Advocacy</p> <p>Media Smarts: Student Cyber Security</p>

	<p>Osler Report - Canadian Privacy Laws</p> <p>Ghostery https://chrome.google.com/webstore/detail/ghostery-%E2%80%93-privacy-ad-blo/mlomiejdfofcolichcflejclcbmpeanij?hl=en</p> <p>Firefox Lightbeam https://addons.mozilla.org/en-US/firefox/addon/lightbeam/</p> <p>Amiunique.org https://amiunique.org/</p>
Sharing Data	<p>Dirk Meyer : Open Data (RVS Blog) Open Data 101 What is Open Data?</p> <p>Edmonton Open Data Portal</p> <p>Mozilla - Web Chef Sharing Activity</p> <p>Editing Wikipedia 101</p> <p>Bloggng - Build YOUR Digital Footprint</p> <ul style="list-style-type: none"> • Student Blogs to Check Out • Starting Your Own Blog in High School <p>YouTuber: Youtuber Course How to be a Successful YouTuber</p>
Data and Equity	<p>Digital Redlining & Privacy</p> <p>Friction Free Racism</p> <p>Travel and Data Privacy</p> <p>https://course.oeru.org/lida102/learning-pathways/societal-issues-and-the-internet/digital-redlining/</p> <p>When Your Boss is an Algorithm</p> <p>Global Footprint Network</p>
Data Visualization Tools:	<p>Timelines: https://timeline.knightlab.com/</p> <p>Images and Video Annotations: https://www.thinglink.com/</p> <p>Infographics:</p>

	<ul style="list-style-type: none">• Daily Infographic: http://www.dailyinfographic.com/• Infographics Archive: http://www.infographicsarchive.com/• https://piktochart.com/• Canva• https://venngage.com/
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Appendix H

LP3 Resources:

Design Thinking

How Are We Going to Solve Problems and get real feedback?

Use The Design Thinking Process

Four members from the City of Airdrie gave background information to some of the issues they face working in their departments.

Students were introduced to the Design Thinking Process.

Students worked through the steps of the Design Thinking Process.

Continuous feedback was given throughout the whole process.

Students present their findings on December 20, 2018 back to the experts from the City of Airdrie

Support Resources

Open Data Resources from the City of Airdrie

Economic Strategy video, full report and printable report:

<https://www.airdrie.ca/index.cfm?serviceID=1277>

Business Satisfaction Survey, highlights and presentation:

<https://www.airdrie.ca/index.cfm?serviceID=766>

Economic Development Stats & Facts (Updated yearly, next update scheduled January):

<https://www.airdrie.ca/index.cfm?serviceID=412>

o If you are looking for a specific stat or a different year over year comparison, these are easy for us to pull so feel free to ask!

Citizen Satisfaction Survey: <https://www.airdrie.ca/index.cfm?serviceID=1084>

Building Permit Statistics: <https://www.airdrie.ca/index.cfm?serviceID=156>

City of Airdrie Open Data: <http://data-airdrie.opendata.arcgis.com/>

City of Airdrie Address and Land Use Search Map:

<https://airdrie.maps.arcgis.com/apps/webappviewer/index.html?id=a4c7977a2acb44ad9018ba8e7974e424>

Airdrie's Economic Strategy Report & Video - <https://www.airdrie.ca/index.cfm?serviceID=1277>

Linked Land Use Bylaw - <https://www.airdrie.ca/getDocument.cfm?ID=5714>

Interactive Land Use Map -

<https://airdrie.maps.arcgis.com/apps/webappviewer/index.html?id=a4c7977a2acb44ad9018ba8e7974e424>

Airdrie Citizen Satisfaction Survey 2018- <https://www.airdrie.ca/getDocument.cfm?ID=5784>

Appendix I

Trello Board for LP4 resources

Retrieved from: <https://trello.com/b/sewK2OJC/stories-perspectives-grade-10>

This screenshot shows a Trello board titled "Stories & Perspectives Grade 10". The board is public and contains five columns of cards. Each card has a progress bar at the top and various icons for actions like commenting and sharing. The columns are:

- Perspectives Activities:** Cards for dates: January 7, 2019; Jan 8, 2019; January 10; Jan 14; January 16; January 18; January 21.
- Storytelling Perspectives Community Project:** Cards for "Indigenous Literature Kit:", "Sharing Through Story - Resources", "Guiding Voices website", "Personal Responses to Texts", "Parts of a Story :", "What is Theme?", and "Making Thinking Visible".
- Indigenous Knowledge:** Cards for "Indigenous Canada", "Walking Together", "Truth & Reconciliation", "Art", "The Secret Path", "Elder - Randy Bottle", and "Indigenous Peoples Atlas".
- Industrial Revolution - Imperialism - Colonialism:** Cards for "SS 10-1: Exploring Globalization Overview", "Agriculture", "Industrial Revolution", and "Imperialism".
- Digital Storytelling:** Cards for "Examples of Personal Digital Stories", "RVS Stories", "Building Futures Stories", "Digital Storytelling Resources", and "Matt Embry - Documentary/Film Maker".

Each card includes a progress bar and icons for sharing, commenting, and other actions. The board interface includes a top navigation bar with "Boards", "Trello", and "VR" icons, and a bottom navigation bar with "Personal", "Public", "VR", "MT", "A", and "Invite" options. A "Google Drive" integration is also visible.

Appendix J

Classroom Observation Protocol

Date:

Group:

Topic/Activity:

Researcher:

Location:

Teacher's Name:

Research Questions:

- RQ1: To what extent does OEP expand learning opportunities for K-12 learners?
- RQ2: How does an open learning design intervention (OLDI) support teachers in designing for open learning?
- RQ3: What are students' and teachers' perspectives of open learning experiences?

Choose a Learning Space: Classroom or Online (Circle One)

Student Groupings and Interactions:

Describe the students use/distinction between students organized in different groupings and interactions

- Group work – interacting with students in class (Non-digitally)
- Group work – interacting with students (Digitally)
- Group work – interacting with students and others outside classroom environment (Digitally)
- Working independently (Not-digitally)
- Working independently (Digitally – using a technology tool)
- Working independently (Digitally - communicating/networking with others)

Field Notes:

Environments in Which Learners are Learning :

Describe the students use/distinction between the environments in which they are learning:

- Online (Cloud)
- Blended (Digital and Face to Face)
- Networked (In a network – including social media – open to public)

- Online community (Exclusive membership)
- Face to face (Distinguish between Face to face in classroom and online)
- Working on own computer

Field Notes:

Student Use of Digital Literacies

Describe the students use/distinction between using digital literacies supported during the OLDI

- Creating digital content (individually)
- Co-creating digital content (with others)
- Remixing digital content
- Considering persona data or security
- Developing social digital identity
- Communicating and connecting with others online

Field Notes:

Digital Tools used to Learn:

Describe the students use/distinction between open and closed digital tools.

- Students using closed digital tools (Google Classroom, Google docs, LMS)
- Students using open digital tools (Social media, Wikipedia, blogging)

Please list the open and closed tools being used by the students:

Field Notes:

Cognitive Level of Student Knowledge Work

Characterize the intellectual challenge involved in the student knowledge work in the class.

Nature of Intellectual Challenge in Tasks	Frequency
Knowledge Acquisition and Performative Tasks	
Gathering new information.	
Remembering or reviewing old information.	
Performing routine procedural or decoding tasks.	
Repetition work.	
Understanding and Knowledge Production Tasks	
Problem solving	
Problem posing	
Idea integration	
Idea improvement	
Creating new works or creative work with ideas	
Remixing an idea into a new idea	
Examining underlying concepts	
Making connections	
Knowledge manipulation	
Knowledge critique	
Knowledge claim supported by reasons	
Knowledge as contestable	

Scoring Task Challenge Interaction:

Thinking:

- Lower order thinking (LOT) occurs when students are asked to receive or recite factual information or to employ rules and algorithms through repetitive routines.

- Higher order thinking (HOT) requires students to manipulate information and ideas in ways that transfer their meaning and implications. This transformation occurs when students combine facts and ideas in order to synthesize, generalize explain, hypothesize or arrive at some conclusion or interpretation.
- When students engage in HOT, an element of uncertainty is introduced into the instructional process and makes instructional outcomes not always predictable; i.e., the teacher is not certain what will be produced by students.

Deep Knowledge:

- Knowledge is shallow, thin or superficial when it does not deal with significant concepts or central ideas of a topic or discipline. Knowledge is also shallow when important, central ideas have been trivialized by the teacher or students, or when it is presented as non-problematic.
- Evidence of shallow understanding by students exists when they do not or cannot use knowledge to make clear distinctions, arguments, solve problems and develop more complex understanding of other related phenomena.
- Knowledge is deep or thick when it concerns the central ideas of a topic or discipline because such knowledge is judged to be crucial to a topic or discipline.
- For students, knowledge is deep when they develop relatively complex understandings of these central concepts. Instead of being able to recite only fragmented pieces of information, students develop relatively systematic, integrated or holistic understanding. Mastery is demonstrated by their success in producing new knowledge by discovering relationships, solving problems, constructing explanations, and drawing conclusions.

Adapted and used with permission from 2008-2015 Galileo Educational Network
Adapted and used with permission from *Observation Tools for School Observers*
From State Educational Technology Directors Association (SETDA/Metiri)

Appendix K

LP1 and LP2 Student reflection template (Week 1 example)

NAME

Key Theme/Topic for Week (write a brief description)

How did the V&R map activity help you think about...

where do you learn?

what you were learning?

how I learned it (online, in the classroom, outside the classroom, social media networks, what digital tools you used (Drive, Word etc...))

and who I learned with (this can include face to face and online people, places and things like Wikipedia and internet websites)

A challenge or problem I faced was.....

and this is how I overcame the challenge/problem OR

and this is how I am working on overcoming the challenge/problem

Something I created/remixed this week that helped me learn was

Here it is: OR

Here is the link to

**Something I will do the same next week
is...**

**Something I will do differently next week
is...**

**One observation I have regarding the use
of technology in learning is...**

Appendix L

LP3 Student reflection templates

Reflection #1

Community Project - Final Reflections

Please Make a Copy of this Reflection Guide and add it to Your Community Google Folder

Please add your project blog link url to the following class Google.doc
(link)

Please add your email link to the following class V&R map #3 spreadsheet:
(link)

REFLECTION QUESTIONS:

1. Make a copy of the following fill in the blank sentences in your community Google folder.

Please fill in the following fill in the blanks about your Community Project:

Empathy:

I discovered that ...

I struggled with ...

A strategy I used was

I learned that

Ideate:

I discovered that ...

I struggled with ...

A strategy I used was

I learned that

Define:

I discovered that ...

I struggled with ...

A strategy I used was

I learned that

Prototype/Test

I discovered that ...

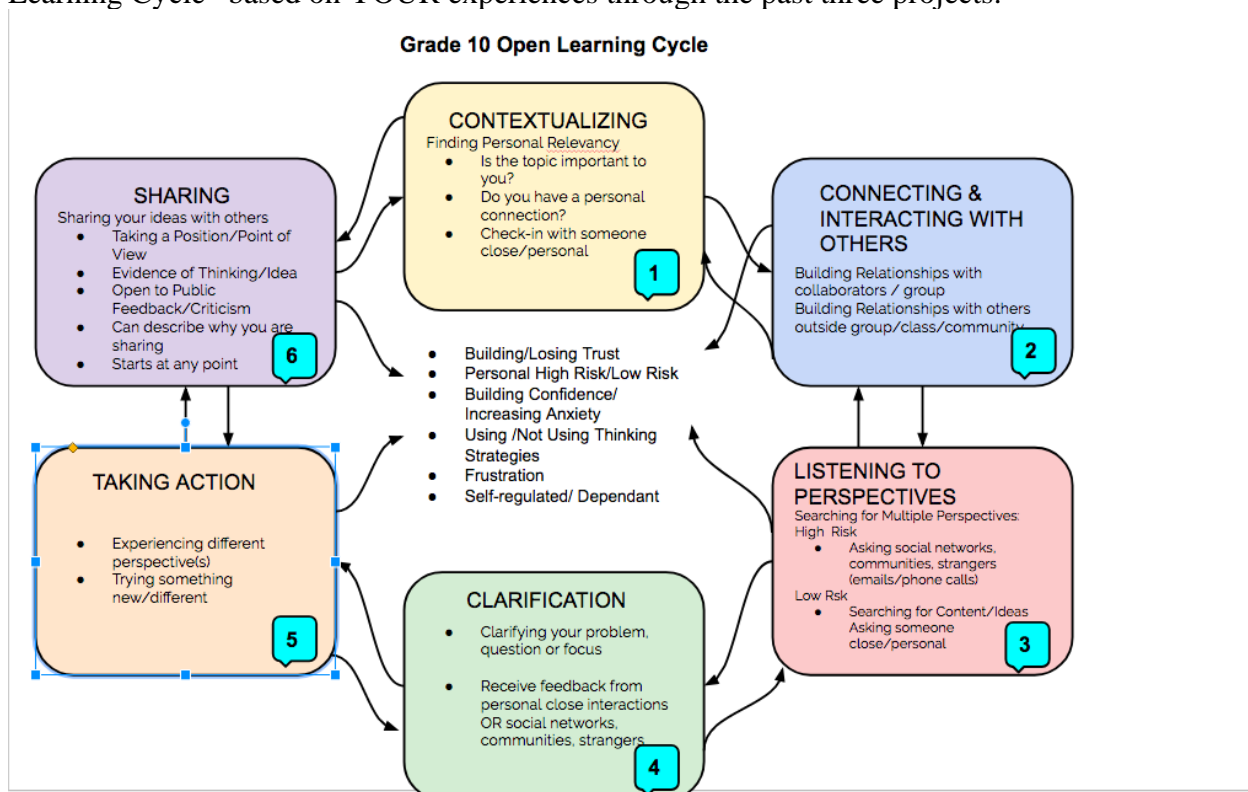
I struggled with ...

A strategy I used was

I learned that

2. Copy the following cycle into your community Google folder:

In your copy, add notes/comments about if you agree or disagree with the “Open Learning Cycle” based on YOUR experiences through the past three projects.



3. Throughout the this project, what have you learned about yourself about how you learn?

4. In what ways do you consider yourself a “weak” or “strong” learner – what are indicators (things you do or say) to demonstrate if you are a weak or strong learner?

5. What does it look like when you are “more” or “less” willing to take risks to learn? What are some examples of risk taking that you took or could have taken during this project? What were the consequences of the risks?

6. How is your BFA classroom “safe to learn in”? What are some words that you would use to describe a safe learning environment? When you connected with other people in this project (in social media , sending emails, making phone calls, writing on your blog) - what strategies did you use to feel safe enough to connect with others?
7. How did you know you were succeeding throughout this project?
8. Did this project engage you more as a learner, why? Would you have preferred another way to learn? Can you describe how you would have liked to learn instead?
9. How did connecting with others increase or decrease your success as a learner?
10. How did you know that you were/were not engaged with the project?
11. Did you connect and interact with others outside the classroom in order to complete this project? Who did you connect with? How did you connect with them? Why did you connect with them? What happened if you could not connect with them? In your opinion, was it essential for you to connect with others outside of the classroom, in order to complete this project?

Reflection #2

Reflection Questions: Digital Literacies Unit

Curriculum Connections:

SS 10-1:

[Exploring Globalization Overview](#) (Click on Prologue)

We have been working on SS 10-1 Program of Studies, [Related Issue #1: To What Extent Should Globalization Shape Identity?](#)

Preparing for: [Position paper](#)

ELA 10-1:

Program of Studies Focus:

- Students will listen, speak, read, write, view and represent to explore thoughts, ideas, feelings and experiences.
- Students will listen, speak, read, write, view and represent to comprehend literature and other texts in oral, print, visual and multimedia forms, and respond personally, critically and creatively
- Students will listen, speak, read, write, view and represent to manage ideas and information.

- Students will listen, speak, read, write, view and represent to create oral, print, visual and multimedia texts, and enhance the clarity and artistry of communication.
- Students will listen, speak, read, write, view and represent to respect, support and collaborate with others

[Personal Responses to Texts](#)
[Rubric for Personal Response Assessment](#)

Please write 2-3 paragraphs for each question. Hints on How to Write a Great Paragraph [HERE](#)

LP1: Asking Questions/Searching and Communicating

LP1 Focused on inquiry - asking questions about a topic, learning how to find the answers and how to communicate those answers. Using examples from your LP1 folder as a guide, describe how your learning about questions, searching online and communicating with others, helped you as a learner. Most importantly, how did LP1 connect to your personal real life examples or contexts?

LP2: Tracking Who Our Audience Is

LP2 Focused on thinking strategies - how do you make your thinking visible? Some of the topics covered were data visualization, taking notes, thinking maps. Using examples from your LP2 folder as a guide, describe how learning data visualization, taking notes and thinking strategies helped you as a learner. Most importantly, how did LP2 connect to your personal real life examples or contexts?

LP3: Community Engagement Project - Learning in action

The Community project focused on design based thinking as a way to solve problems in your community by creating a prototype or designing a possible solution. The stages of design thinking are:

Using examples from your Community project folder as a guide, describe how your learning about the design thinking stages, helped you as a learner. Most importantly, how did the community project connect to your personal real life examples or contexts?

Presentations:

Presentation Reflection #1:

Compare and contrast 2 LP2 presentations from your peers. Write a reflection about what you learned about as a result of watching your peers. Give specific examples and details about what you liked and did not like based on changes you might make to your future projects OR comparisons you made between your presentation and those of your peers. Add some questions that you may have as a result of watching the presentations.

Fill in the chart to compare and contrast your two peer presentations. Then write 3 paragraphs about your peer's presentations.

	Presentation 1 (Name)	Presentation 2 (Name)
How did they present? (Did they present by reading from a ppt, notes, memorization, video, visuals?, webs? Graphs? ?)		
Did they clearly state your question(s) to solve?		
Did they clearly state their point of view or action that they would take to solve your question?		
What tools did they use to present? (Were they new to you or ones commonly used by peers?)		
What kind of project did they do ? (An experiment? A search? A story ?)		
How did they search/find information (did they use the class resources or did they use other resources - why?,		
Did they show connections with anyone outside/anything (websites/social media outside the classroom?		
Did they connect their project to something personal and relevant to themselves?		
Did they make any connections to the community?		

Presentation Reflection #2

Compare and contrast **your** three presentations. Discuss your strengths and weaknesses in note form in the chart below.

Fill in the chart to compare and contrast your three presentations. Write 3 paragraphs about how your presentations evolved and improved and how that connected to your personal learning.

	Presentation 1	Presentation 2	Presentation 3
How did you Present? (Did you present by reading from a ppt, notes, memorization, video, visuals graphs, webs?)			
How did the activities in class help you prepare for the presentation? Which activities were most helpful?			
Did you clearly state your question(s) to solve?			
Did you clearly state your point of view or action that you would take to solve your question?			
What tools did you use to present? (Were they new to you or ones you always use?)			
What kind of project did you do ? (An experiment? A search? A story ?)			
How did you searched/found			

information (did you use the class resources or did you use other resources - why?,			
Did you work with anyone? Why or Why not? How did they help or hinder your learning?			
Did you you connect with anyone outside/anything (websites/social media outside the classroom			
Did you connect your project to something personal and relevant to you?			
Did you make any connections to the community?			
Did you make any global connections?			
Did you make any changes to your presentations as your progressed? Why or Why not?			

Resources:
[English 10-1 Course Website](#)
[SS 10-1 Website](#)

Appendix M

LP4 Student reflection questions

Final Reflections Section One is your Reflections about the Storytelling and Perspectives Unit

Section One is your Reflections about the Storytelling and Perspectives Unit, Section two is a final reflection about All your Projects since LP1.

What story structure did you use (Eg. Traditional, Indigenous, Japanese..) and WHY did you choose that structure for your story?
(50 words)
Your answer

How did your story integrate some of the main themes/ideas of Storytelling and Perspective? (50 words)
Your answer

Which guests speakers/ experts most influenced your learning for this unit, and why?
Your answer

On the final day, you were asked to share your story with the class, describe your experience. How easy or difficult was it for you was it for you to share with others? In your opinion, what are the benefits first of sharing your stories/ process/ watching others stories?
Your answer

Is it easier to share with your classmates or with others online/ in social media - why ?

Part 2: **Final Reflections - Projects**

What is the link to your Final Visitor and Resident Map? Link to Map App: <http://experimental.worldcat.org/V&Rmapping/signIn> (You will have to copy/paste that link)
Your answer



Part 3: Consider LP1, LP2, the Community Project and the Storytelling project for the following questions

Which projects encouraged you to learn with others outside of your classroom and why? “Others” can include people/ social media/ community partners anyone/anything.
Your answer

In your opinion, how does learning and interacting with others (or other things like social media/community partners/ experts) outside of your classroom help your learning and why?
Your answer

In your opinion, what are two things that you have been able to do or learn because you able to learn “outside classroom walls” ?
Your answer

In your opinion, based on your previous learning experiences, what are the main differences between learning in a traditional way and learning by connecting and interacting with others outside a classroom?
Your answer

How have the last 4 projects helped you as a learner? Have they helped you develop a personal passion, think about learning in a different way or consider different perspectives?

Appendix N

Table N1
Original LP1 and LP2 Open Readiness Assessment Rubric

Does the Student demonstrate competency in the skill, knowledge without any interaction with anyone else (teacher, peers, outside support)		Student demonstrates skills with no interactions		Does not demonstrate skills without some kind of interaction
Levels of Openness	Concrete Experience	Observations & Reflections	Development of Ideas	Testing Ideas in Practice
Level 1: Does the student Imitate Mentor Interaction? The student demonstrates competency by: Filling in the Blanks Cutting and Pasting Memorizing and Repeating	Student demonstrates a learning experience	Student demonstrates reflective observations of experience	Student demonstrates Abstract conceptualization (Learning from experience)	Student demonstrates active experimentation and evidence of designing/planning for a change in experience based on reflection
Level 2: As a result of interaction, the student demonstrates a remixed Imitation of interaction. The student has remixed the original concept/idea into an extended or modified version of the original idea	Student demonstrates a learning experience	Students demonstrates reflective observations of experience	Student demonstrates Abstract conceptualization (Learning from experience)	Student demonstrates active experimentation and evidence of designing/planning for a change in experience based on reflection

<p>Level 3: As a result of interaction, the student has created something new (possibly previously inconceivable) with evidence of the original idea ?</p>	<p>Student demonstrates a learning experience</p>	<p>Students demonstrates reflective observations of experience</p>	<p>Student demonstrates Abstract conceptualization (Learning from experience)</p>	<p>Student demonstrates active experimentation and evidence of designing/planning for a change in experience based on reflection</p>
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Table N2
Open Readiness Assessment Rubric

Indicators of Open Learning	Emerging	Low	Medium	High
<p>Student learning pathways are transparent and clear through a demonstration of evidence of learning</p>	<p>Student shares limited examples of their learning activities, lessons, projects with the teacher only or following the exact teacher guidelines. (Eg. Makes a copy of a Google.doc and fills in answers). Adds to Google Classroom or ePortfolio</p> <p>Students may repeat teacher expectations verbatim or ask for clarification of criteria/ expectations. Content and ideas are copy and pasted (Limited digital literacy)</p>	<p>Student shares multiple examples of their learning activities, lessons, projects with the teacher and the parent only. (Eg. Student takes a picture of their chemical reaction, then writes up experiment). Adds to Google folder or ePortfolio</p> <p>Limited remixing of ideas or content: Remixes content or ideas by rephrasing, but does not add new elements, new perspectives or new mediums. (Digital literacy)</p>	<p>Student shares multiple examples of their learning activities, lessons, projects with whomever they choose in an open way (public community or open network) BUT their work is display only (Eg. Students creates a video, but takes off comments) Student also adds to Google folder or ePortfolio</p> <p>Demonstration of remixing of different learning mediums, some different perspectives and - mostly digital mediums (Multiliteracy)</p>	<p>Student shares their learning activities, lessons, projects outside of class in public (communities and open (networked based) learning spaces. (Eg. Blogs about writing from class in open community of writers). Student also adds to Google folder or ePortfolio.</p> <p>Demonstration of remixing of different learning mediums in digital and face to face contexts with multiple cultural perspectives and protocols considered, digital and face to connections, multi-modal, new previously inconceivable means of communication (Transliteracy)</p>

<p>Evidence of Expanding Who Students Share their Learning with and as</p>	<p>Shares evidence of learning with Teacher as Individual</p> <p>Evidence of limited understanding of digital privacy, security and data accessibility and cultural protocols that consider sharing concepts, ideas or content</p>	<p>Shares evidence of learning with and receives feedback from Teacher(s) Peers, family as an individual</p> <p>Evidence of some understanding of digital privacy, security and data accessibility and cultural protocols that consider sharing concepts, ideas or content</p>	<p>Shares and receives feedback from Teacher (s) Peers, family Community (Personal Relationship) OR Social Media (As Anonymous Identity or Group Identity)</p> <p>Evidence of understanding of digital privacy, security and data accessibility and cultural protocols that consider sharing concepts, ideas or content</p>	<p>Shares and receives feedback from Teacher (s) Peers, family Community (Personal Relationship) OR Social Media (As Anonymous AND/OR Public Identity)</p> <p>Evidence of understanding of digital privacy, security and data accessibility and cultural protocols that consider sharing concepts, ideas or content</p> <p>Models understanding of how to share with others</p>
<p>Evidence of Designing for Sharing</p>	<p>Evidence of: Learning focus is on product or artifact not on process of learning with no intention for others to remix or build upon the product.</p> <p>Shared product/artifact cannot be remixed and does not consider opening licensing and/or ensures technical restrictions which inhibit remixing and building new content.</p>	<p>Evidence of: Learning focus is on digital artifact with limited awareness on process of learning with no intention for others to remix or build upon the product.</p> <p>Shared product/artifact may be limited in the ability to be remixed including limited open licensing considerations or technical restrictions.</p>	<p>Evidence of: Learning focus is on the process of learning by sharing learning artifacts with others with the intention for others to remix or build upon the product.</p> <p>Shared product /artifact may be limited in the ability to be remixed including limited open licensing considerations or technical restrictions.</p>	<p>Evidence of: Learning focus is on the process of learning by sharing learning artifacts with others with the intention for others to remix or build upon the product.</p> <p>Shared product /artifact is not limited in the ability to be remixed including open licensing considerations or technical access.</p>

<p>Evidence of How Student Shares their learning process</p>	<p>Limited demonstration of student competency in: Intentionally Choosing learning partners to complete task, or promoting individual student strengths when deciding roles</p> <p>Communication with group members.</p> <p>Giving and Receiving Feedback</p> <p>Listening to others in their group</p> <p>Speaking up when student has a concern or issue</p> <p>Demonstrating compassion, empathy and caring by building relationships with members of the group</p>	<p>Some demonstration of student competency in: Intentionally Choosing learning partners to complete task, or promoting individual student strengths when deciding roles</p> <p>Communication with group members.</p> <p>Giving and Receiving Feedback</p> <p>Listening to others in their group</p> <p>Speaking up when student has a concern or issue</p> <p>Demonstrating compassion, empathy and caring by building relationships with members of the group</p>	<p>Multiple demonstrations of student competency in: Intentionally Choosing learning partners to complete task, or promoting individual student strengths when deciding roles</p> <p>Communication with group members.</p> <p>Giving and Receiving Feedback</p> <p>Listening to others in their group</p> <p>Speaking up when student has a concern or issue</p> <p>Demonstrating compassion, empathy and caring by building relationships with members of the group</p>	<p>Demonstrates leadership and depth of clear competency in: Intentionally Choosing learning partners to complete task, or promoting individual student strengths when deciding roles</p> <p>Communication with group members.</p> <p>Giving and Receiving Feedback</p> <p>Listening to others in their group</p> <p>Speaking up when student has a concern or issue</p> <p>Demonstrating compassion, empathy and caring by building relationships with members of the group</p>
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<p>Evidence of How Student Reflects Upon Their Learning Experience s Sharing and Expanding Their Learning With Others and in Other Spaces</p>	<p>Limited demonstration of student competency in:</p> <p>Describing how they experienced learning through reflections or abstract conceptualization of learning from the experience and then active experimentation and evidence of designing/planning for a change in experience based on their reflection</p>	<p>Some demonstration of student competency in:</p> <p>Describing how they experienced learning through reflections or abstract conceptualization of learning from the experience and then active experimentation and evidence of designing/planning for a change in experience based on their reflection</p>	<p>Multiple examples demonstrated of competency in:</p> <p>Describing how they experienced learning through reflections or abstract conceptualization of learning from the experience and then active experimentation and evidence of designing/planning for a change in experience based on their reflection</p>	<p>Demonstrates leadership and depth of clear competency in:</p> <p>Describing how they experienced learning through reflections or abstract conceptualization of learning from the experience and then active experimentation and evidence of designing/planning for a change in experience based on their reflection</p>
<p>Evidence of Student Use of Outside the Classroom Resources and Nodes</p>	<p>Uses a textbook or teacher resources to find answers/solutions .</p> <p>Resources often from one perspective.</p> <p>Asks people in the classroom (peers/teacher) for clarification.</p>	<p>Uses Wikipedia content or digital resources found in a limited basic Internet search.</p> <p>Resources used often from one perspective.</p> <p>Asks people in the classroom (peers/teacher) and parents/ family for</p>	<p>Uses Wikipedia links and citations and or digital resources found in a more advanced basic Internet search.</p> <p>Resources often from multiple perspectives.</p> <p>Asks people in the classroom (peers/teacher) and parents/ family, unknown and known people from the Internet in social media discussions.</p>	<p>Uses Wikipedia links and citations and or digital resources found in advanced Internet searches.</p> <p>Uses online curation tools for searches. Uses folksonomy (hashtags) to curate/search for resources.</p> <p>Resources are all from multiple perspectives.</p>

	<p>Finds and uses public content from the Internet</p> <p>Demonstrates no awareness of open licenses or open educational resources (OER)</p> <p>No attributions</p>	<p>information & clarification.</p> <p>Will consider some perspectives by unknown people from the Internet in discussion forums/social media.</p> <p>Finds and uses public content from the Internet, does not attribute or cite the source in class activities</p> <p>Demonstrates some awareness of open licenses or open educational resources (OER)</p> <p>Uses OER or openly licensed content with no remix or changes.</p>	<p>Remixes other student/teacher/content/resources</p> <p>Need to see exemplar/model before creation. (Needs OER to remix into new product)</p> <p>Demonstrates some awareness of open licenses, publicly licensed content or open educational resources (OER)</p> <p>Remixes open content and sometimes will attribute or create a creative commons license.</p>	<p>Asks people in the classroom (peers/teacher) and parents/ family, unknown and known people from the Internet in social media discussions/interactions</p> <p>Remixes and creates new exemplars (Eg. Creates OER without example).</p> <p>Personalizes OER for learning context.</p> <p>Adds a Creative Commons license</p>
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Appendix O

Open Learning Summative Assessment Rubric

Evidence of Learning (Below)	Emerging – Limited Attempts to Demonstrate Metacognitive strategies	Low - Evidence of Some Metacognitive strategies	Medium - Evidence of Metacognitive strategies	High - Evidence of Multiple Metacognitive Strategies
<p>Type of Reflection</p> <p>Based on Vygotsky’s (1978) Zone of Proximal Development described in Kozulin and Chaiklin (2003)</p>	<p>The student demonstrates basic competency by:</p> <ul style="list-style-type: none"> • Filling in the Blanks • Cutting and Pasting • Memorizing and Repeating • No explanation in their reflections 	<p>The student demonstrates basic competency by:</p> <ul style="list-style-type: none"> • Filling in the Blanks • Cutting and Pasting • Memorizing and Repeating • Provides an attempt at an explanation or a simple explanation in their reflections 	<p>As a result of the activity, the student demonstrates a remixed imitation of interaction with person or content/resource This could include reflections about watching others present first, or seeing what others are doing.</p> <p>Student provides detailed explanation of their reflections and have begun to evaluate personal assumptions/understanding of the topic.</p>	<p>As a result of the reflection, the student has created something new (possibly previously inconceivable) with evidence of the original idea/concept. The student has provided a detailed explanation of their new idea through process based reflections.</p> <p>Student has begun to evaluate personal assumptions/understanding of the topic, remixing how the topic could be explained/interpreted and contributing to new ideas about the topic)</p>
<p>Evidence of Personal Connection to Context</p>	<p>Limited ability to connect concept or idea to personal context</p>	<p>Some evidence of connection to concept or idea to personal context in some kind of description</p>	<p>Clear and concise connection(s) of concept or idea to personal context in some kind of description</p>	<p>Connects concept or idea to personal context in multiple ways Considers how concept or idea can extend own learning</p>

Recognition of Perspectives	Generates irrelevant questions at factual level from one perspective. Answers own questions from one perspective.	Generates relevant questions and answers but most are at factual level and from one perspective. Answers own and other questions from one perspective but accepts there may be more perspectives.	Open to other opinions and perspectives, they clarify and check to ensure perspectives are accurate. Student describes other perspectives with some connection to personal context.	Open to other opinions and perspectives. With empathy and respect, listens to and asks questions about different perspectives by developing relationships. Can change personal opinions when connected to personal context.
Student demonstration & description of strategies to support their own learning	The student is able to identify possible learning strategies to complete task (orally or through a text reflection), but cannot apply the strategies to their own context	The student is able to identify, act upon and/or describe some possible learning strategies to complete a task, and apply the strategy to their own context. They will describe the strategy, then describe their failure without taking next steps to continue with another strategy.	The student is able to identify, act upon and describe multiple learning strategies to complete a task, and apply some of them to their own context and completing the task in a partial or incomplete manner, often only one time.	The student is able to identify, act upon and describe multiple learning strategies to complete a task, and apply some of them to their own context and completing the task one or more times to ensure completion or new idea.

Appendix P



WERKLUND SCHOOL OF EDUCATION



September 3, 2018

Research study: Expanding K-12 Learning Environments through Open Educational Practice (OEP)

Investigator: Verena Roberts

Supervisor: Dr. Michele Jacobsen

Dear Parents and/or Guardians,

My name is Verena Roberts and I am an Ed.D. student at the University of Calgary Werklund School of Education in the Learning Sciences. I am conducting design-based research which examines how grade 10 Building Futures, Airdrie (BFA) students can expand their learning between closed classroom environments and open digital learning environments using open educational practice. The results of my study will be used to inform the design and experience of future open educational practice in K-12 learning contexts.

The main purposes of this research are to a) examine how open educational practice expands learning environments for grade 10 students b) consider how the open learning design intervention supports teachers in designing for open educational practice and c) to describe and examine student and teacher experiences and perceptions of learning as a result of open educational practice.

The research will integrate directly with the current BFA program and the consent to participate means consent for the researcher to collect and analyze student evidence of learning which includes digital artifacts and digital text summaries, group and personal reflections. I will also be observing the class during face to face instruction time and online and taking field notes to describe how and where students are learning as they expand their learning environments. As a part of the study, I am collecting samples of student work as artifacts of teacher learning in the program. If your child wishes to participate in the research, I will ask you to sign a consent form to use their work in the study. Their name will not be attached to their work and they will remain anonymous. Permission will also be sought from your child to include their work.

There are no risks involved in participation. Consent is voluntary and individual. We kindly ask that consent forms be signed and returned by [DATE], 2018. If you agree to participate in the study, you have the right to remove yourself at any time without any consequence until one month after the last day of data collection.

This study has been approved by the University of Calgary Conjoint Faculties Research Ethics Board. If you have any questions regarding this study or the informed consent, please contact me.

Thank you for your consideration.
Sincerely,

Verena Roberts

Appendix Q



Name of Researchers, Faculty, Department, Telephone & Email:

Verena Roberts, Doctoral Candidate, Werklund School of Education,

Supervisor:

Dr. Michele Jacobsen, Professor and Vice Dean, Werklund School of Education,

Title of Project: Expanding K-12 Learning Environments through Open Educational Practice (OEP)

This consent form, a copy of which has been given to you, is only part of the process of informed consent. If you want more details about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The University of Calgary Conjoint Faculties Research Ethics Board has approved this research study.

Participation is completely voluntary, anonymous and confidential. You and your child are free to discontinue participation at any time during the study.

Purpose of the Study:

Open educational practice (OEP) is an emerging approach to learning and teaching within K-12 learning environments which can connect multiple learning environments like those inside and outside the traditional classroom learning spaces. Instead of being limited to learning within classroom walls, OEP provides learners with the opportunity to expand their learning environments through digital and online connections that can enable access to other learners and digital content inside and outside classroom walls. The learning inside the classroom walls is referred to as formal learning and the learning outside of classroom walls is informal or non-formal learning.

OEP has the potential to provide expanded access to learning for all students as teachers design for multiple opportunities for students to connect to learning networks made up of formal, informal and non-formal learning environments.

The proposed design-based research will include the collaboration of researchers, teachers and students in examining the effects of open educational practice on learners and learning. By participating in an innovative learning experience as a result of their teachers' use of open educational practice, Building Futures, Airdrie (BFA) high school students will have the opportunity to expand their learning environments beyond the classroom by connecting, interacting and communicating with others through learning networks, and thus build new knowledge and new learning experiences.

The main purposes of this research are to a) examine how open educational practice expands learning environments for grade 10 students b) consider how the open learning design intervention supports teachers in designing for open educational practice and c) to describe and examine student and teacher experiences and perceptions of learning as a result of open educational practice.

What Will Your Child Be Asked to Do?

The proposed research is based on a digital open learning extension to the learning which is already a part of the current practice within the Building Futures, Airdrie (BFA) program. As such, the research data will be collected throughout the "yet to be titled" project which will begin in October, 2018.

The BFA teacher and the researcher, Verena Roberts, doctoral candidate, will be designing for an inquiry project which will connect your child with local community experts. In groups, your child will solve community problems with the support of community experts in online and face to face contexts. In the past, this project has been limited to community partners within the BFA community. For this project, the project is designed for the connections beyond the local community by giving your child the opportunity to expand their learning environments into digital learning networks. Your child will be supported in expanding their learning environments by completing additional basic digital activities like creating google folders and saving digital artifacts as well as learning about digital citizenship, online data and privacy and social media networking. The risks and benefits of learning in expanded learning environments will be emphasized throughout the project. For example, your child will expand their digital literacy skills by learning how to connect with others in open digital spaces by finding and evaluating digital content and/or social media platforms and communicating effectively in digital environments by considering online social reputation and identity.

As a student in the BFA program your child will be completing all parts of the project as part of their regular learning program. Participation in the research does not alter or change a student's access to any part of the regular learning environment. As a research participant, you and your child are being asked to give consent for the researchers to analyze and examine activities and outcomes from the learning environment that they will complete whether or not they participate in the research which include:

- a) the digital visitor and resident maps your child will create to describe their learning environments,
- b) the digital artifacts your child's group creates while completing their project,
- c) the group reflections that your child's group posts on the group blog (google site) while completing the project,
- d) your child's personal learning reflections that describe how their learning environments have expanded,
- e) consent to observe and write field notes about your child's face to face and online learning spaces (during regular class times or online) and
- f) consent to interview your child at the BFA location should clarification be needed about evidence of your child's expanded learning environments (anticipated time 5 – 10 minutes)

Your child's research participation and collection of research data is completely voluntary. Your child may refuse to participate in the research altogether, may refuse to participate in parts of the study, may decline to answer any and/or all questions associated with the research, and your child may withdraw from the study at any time without any influence on their engagement in the regular BFA program.

What Type of Personal Information Will Be Collected?

Your willingness to allow the educational researcher to collect information about your child during their engagement in Building Futures as part of this study will be documented with this consent form.

There are several options for you to consider if you decide to provide consent for your child to contribute to this research. You can choose all, some, or none of them. Please review each of these options and choose Yes or No:

The data will be stored and examined using a pseudonym.

I grant permission for the following data from my child to be analyzed and examined:

Visitor and resident maps	Yes: ___ No: ___
Group digital artifacts (eg. videos, google.docs, infographics, images)	Yes: ___ No: ___
Project group google site posts/reflections	Yes: ___ No: ___
Personal reflections	Yes: ___ No: ___

I grant permission for anonymous observation and field notes to be collected of my child's learning environment (classroom and online learning spaces).

Yes: ___ No: ___

I grant permission for clarification interviews

Yes: ___ No: ___

Are there Risks or Benefits if Your Child Participates?

The benefit of participating in this study is that your child will contribute to helping teachers learn how to expand learning environments using open educational practice beyond classroom walls and how to support high school students in developing the skills and knowledge to consider how to expand their learning environments.

Learning and participating in online environments and networks does carry the risk of influencing your child's digital identity and social reputation. Part of the intention of this research is to ensure that all students develop the digital literacy skills, knowledge and competency to develop positive digital identities and strengthen their social reputation. As such, the participating teacher and researcher will ensure the research design includes multiple opportunities to develop digital literacy skills as an essential element of open educational practice. All digital content will be accessible and editable by the teacher and the researcher.

All information collected will remain confidential by the researcher. As part of the design-based research process, the BFA teacher and the researcher will be reviewing and analyzing the data throughout the project to ensure that your child has timely feedback and support. The decision to participate or not participate will have no bearing on your child's participation and learning opportunities as a Building Futures student. This research offers no paid compensation or credit for participation, and you will incur no cost to participate. There is no negative impact of electing to not participate in the research. Your child's teacher will not know which parents or students have given consent or assent to the research at any time during the research.

What Happens to the Information I Provide?

The information provided will be kept confidential and will have no individual student names attached. All online digital content and digital tools are district and FOIP approved and have gone through a privacy impact evaluation by district staff.

The field notes and interview transcripts which will be stored on a password protected computer in word documents. The data analysis and findings will be secured and stored on password protected computer. These will be destroyed 5 years after the completion of the project.

Participation in the study is voluntary and you and your child may withdraw from the study at any time until one month after the end of the study has been completed. Only educational researchers from the University of Calgary who are involved in this study will have access to the data gathered for this study. The project google site will be licensed under a Creative Commons license and will be accessible after the completion of the project. The results of this study will be shared with other educational researchers through papers and professional conferences. If you are interested in the publications of this study, you may contact the researchers for a copy of the study once it has been published.

Understanding of participation and consent:

I understand that:

- ✓ there are no negative consequences for participating or not participating in the study.
- ✓ interviews will be audio recorded and transcribed. I will have the chance to review the transcription for accuracy before it is included in the research.
- ✓ information I provide will remain confidential.
- ✓ My child may withdraw my data from the study at any time until one month after the data collection has been completed.

Signatures

Your signature on this form indicates that 1) you understand to your satisfaction the information provided to you about your child's participation in this research project, and 2) you agree to your child's participation in the research project.

In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. Your child is free to withdraw from this research project at any time. You should feel free to ask for clarification or new information throughout your participation.

Participant's Name: (please print) _____

Parent/Guardian Name: (please print) _____

Parent or Guardians Signature: _____ Date: _____

Researcher's Name: (please print) _____

Researcher's Signature: _____ Date: _____

Questions/Concerns

If you have any further questions or want clarification regarding this research and/or your participation, please contact:

Verena Roberts, Werklund School of Education

Supervisor: Dr Michele Jacobsen

If you have any concerns about the way you've been treated as a participant, please contact the Research Ethics Analyst, Research Services Office, University of Calgary. A copy of this consent form has been given to you to keep for your records and reference. The investigator has kept a copy of the consent form.

Appendix R



Name of Researchers, Faculty, Department, Telephone & Email:

Verena Roberts, Doctoral Candidate, Werklund School of Education,

Supervisor:

Dr. Michele Jacobsen, Professor and Vice Dean, Werklund School of Education,

Title of Project: Expanding K-12 Learning Environments through Open Educational Practice (OEP)

This consent form, a copy of which has been given to you, is only part of the process of informed consent. If you want more details about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The University of Calgary Conjoint Faculties Research Ethics Board has approved this research study.

Participation is completely voluntary, anonymous and confidential. You are free to discontinue participation at any time during the study.

Purpose of the Study:

Open educational practice (OEP) is an emerging approach to learning and teaching within K-12 learning environments which can connect multiple learning environments like those inside and outside the traditional classroom learning spaces. Instead of being limited to learning within classroom walls, OEP provides learners with the opportunity to expand their learning environments through digital and online connections that can enable access to other learners and digital content inside and outside classroom walls. The learning inside the classroom walls is referred to as formal learning and the learning outside of classroom walls is informal or non-formal learning.

OEP has the potential to provide expanded access to learning for all students as teachers design for multiple opportunities for students to connect to learning networks made up of formal, informal and non-formal learning environments.

The proposed design-based research will include the collaboration of researchers, teachers and students in examining the effects of open educational practice on learners and learning. By participating in an innovative learning experience as a result of their teachers' use of open educational practice, Building Futures, Airdrie (BFA) high school students will have the opportunity to expand their learning environments beyond the classroom by connecting, interacting and communicating with others through learning networks, and thus build new knowledge and new learning experiences.

The main purposes of this research are to a) examine how open educational practice expands learning environments for grade 10 students b) consider how the open learning design intervention supports teachers in designing for open educational practice and c) to describe and examine student and teacher experiences and perceptions of learning as a result of open educational practice.

What Will You Be Asked to Do?

The proposed research is based on a digital open learning extension to the learning which is already a part of the current practice within the Building Futures, Airdrie (BFA) program. As such, the research data will be collected throughout the "yet to be titled" project which will begin in October, 2018.

The BFA teacher and the researcher, Verena Roberts, doctoral candidate, will be designing for an inquiry project which will connect you with local community experts. In groups, you will solve community problems with the support of community experts in online and face to face contexts. In the past, this project has been limited to community partners within the BFA community. For this project, the project is designed for the connections beyond the local community by giving you the opportunity to expand your learning environments into digital learning networks. You will be supported in expanding your learning environments by completing additional basic digital activities like creating google folders and saving digital artifacts as well as learning about digital citizenship, online data and privacy and social media networking. The risks and benefits of learning in expanded learning environments will be emphasized throughout the project. For example, you will expand your digital literacy skills by learning how to connect with others in open digital spaces by finding and evaluating digital content and/or social media platforms, considering the personal data you may be sharing online and communicating effectively in digital environments by considering online social reputation and identity.

As a student in the BFA program you will be completing all parts of the project as part of your regular learning program. Participation in the research does not alter or change your access to any part of the regular learning environment. As a research participant, you are being asked to give assent for the researchers to analyze and examine activities and outcomes from the learning environment that you will complete whether or not they participate in the research which include:

- a) the digital visitor and resident maps you will create to describe their learning environments,
- b) the digital artifacts your group creates while completing their project,
- c) the group reflections that your group posts on the group blog (google site) while completing the project,
- d) your personal learning reflections that describe how their learning environments have expanded,
- e) consent to observe and write field notes about your face to face and online learning spaces (during regular class times or online) and
- f) consent to interview you at the BFA location should clarification be needed about evidence of your child's expanded learning environments (anticipated time 5 – 10 minutes)

Your research participation and collection of research data is completely voluntary. You may refuse to participate in the research altogether, may refuse to participate in parts of the study, may decline to answer any and/or all questions associated with the research, and you may withdraw from the study at any time without any influence on their engagement in the regular BFA program.

What Type of Personal Information Will Be Collected?

Your willingness to allow the educational researcher to collect information during their engagement in Building Futures as part of this study will be documented with this consent form.

There are several options for you to consider if you decide to take part in this research. You can choose all, some, or none of them. Please review each of these options and choose Yes or No:

The data will be stored and examined using a pseudonym. The pseudonym I choose for myself is:

I grant permission for the following data to be analyzed and examined:

Visitor and resident maps	Yes: ___ No: ___
Group digital artifacts (eg. videos, google.docs, infographics, images)	Yes: ___ No: ___

Project group google site posts/reflections
 Personal reflections

Yes: ___ No: ___

Yes: ___ No: ___

I grant permission for anonymous observation and field notes to be collected of my learning environment
 (classroom and online learning spaces)

Yes: ___ No: ___

I grant permission for clarification interviews

Yes: ___ No: ___

Are there Risks or Benefits if I Participate?

The benefit of participating in this study is that you will contribute to helping teachers learn how to expand learning environments using open educational practice beyond classroom walls and how to support high school students in developing the skills and knowledge to consider how to expand their learning environments.

Learning and participating in online environments and networks does carry the risk of influencing your digital identity and social reputation. Part of the intention of this research is to ensure that all students develop the digital literacy skills, knowledge and competency to develop positive digital identities and strengthen their social reputation. As such, the participating teacher and researcher will ensure the research design includes multiple opportunities to develop digital literacy skills as an essential element of open educational practice. All digital content will be accessible and editable by the teacher and the researcher.

All information collected will remain confidential by the researcher. As part of the design-based research process, the BFA teacher and the researcher will be reviewing and analyzing the data throughout the project to ensure that your child has timely feedback and support. The decision to participate or not participate will have no bearing on your participation and learning opportunities as a Building Futures student. This research offers no paid compensation or credit for participation, and you will incur no cost to participate. There is no negative impact of electing to not participate in the research. Your teacher will not know which parents or students have given consent or assent to the research at any time during the research.

What Happens to the Information I Provide?

The information provided will be kept confidential and will have no individual student names attached. All online digital content and digital tools are district and FOIP approved and have gone through a privacy impact evaluation by district staff.

The field notes and interview transcripts which will be stored on a password protected computer in word documents. The data analysis and findings will be secured and stored on password protected computer. These will be destroyed 5 years after the completion of the project.

Participation in the study is voluntary and you and your child may withdraw from the study at any time until one month after the end of the study has been completed. Only educational researchers from the University of Calgary who are involved in this study will have access to the data gathered for this study. The project google site will be licensed under a Creative Commons license and will be accessible after the completion of the project. The results of this study will be shared with other educational researchers through papers and professional conferences. If you are interested in the publications of this study, you may contact the researchers for a copy of the study once it has been published.

Understanding of participation and consent:

I understand that:

- there are no negative consequences for participating or not participating in the study.

- interviews will be audio recorded and transcribed. I will have the chance to review the transcription for accuracy before it is included in the research.
- information I provide will remain confidential.
- I may withdraw my data from the study at any time until one month after the data collection.

Signatures

Your signature on this form indicates that 1) you understand to your satisfaction the information provided to you about your participation in this research project, and 2) you agree to participate in the research project.

In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from this research project at any time. You should feel free to ask for clarification or new information throughout your participation.

Participant's Name: (please print) _____

Participant's Signature: _____ Date: _____

Researcher's Name: (please print) _____

Researcher's Signature: _____ Date: _____

Questions/Concerns:

If you have any further questions or want clarification regarding this research and/or your participation, please contact:

Verena Roberts, EdD Candidate, Werklund School of Education

Email:

Supervisor:

Dr. Michele Jacobsen, Professor and Vice Dean, Werklund School of Education,

If you have any concerns about the way you've been treated as a participant, please contact the Research Ethics Analyst, Research Services Office, University of Calgary. A copy of this consent form has been given to you to keep for your records and reference. The investigator has kept a copy of the consent form.

Appendix S



Name of Researchers, Faculty, Department, Telephone & Email:

Verena Roberts, Werklund School of Education,

Supervisor:

Dr. Michele Jacobsen, Associate Dean, Graduate Programs in Education, Werklund School of Education,

Title of Project: Expanding K-12 Learning Environments through Open Educational Practice (OEP)

This consent form, a copy of which has been given to you, is only part of the process of informed consent. If you want more details about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

The University of Calgary Conjoint Faculties Research Ethics Board has approved this research study.

Participation is completely voluntary, anonymous and confidential. You are free to discontinue participation at any time during the study.

Purpose of the Study:

Open educational practice (OEP) is an emerging approach to learning and teaching within K-12 learning environments which can connect multiple learning environments like those inside and outside the traditional classroom learning spaces. Instead of being limited to learning within classroom walls, OEP provides learners with the opportunity to expand their learning environments through digital and online connections that can enable access to other learners and digital content inside and outside classroom walls. The learning inside the classroom walls is referred to as formal learning and the learning outside of classroom walls is informal or non-formal learning.

OEP has the potential to provide expanded access to learning for all students as teachers design for multiple opportunities for students to connect to learning networks made up of formal, informal and non-formal learning environments.

The proposed design-based research will include the collaboration of researchers, teachers and students in examining the effects of open educational practice on learners and learning. By participating in an innovative learning experience as a result of their teachers' use of open educational practice, Building Futures, Airdrie (BFA) high school students will have the opportunity to expand their learning environments beyond the classroom by connecting, interacting and communicating with others through learning networks, and thus build new knowledge and new learning experiences.

The main purposes of this research are to a) examine how open educational practice expands learning environments for grade 10 students b) consider how the open learning design intervention supports teachers in designing for open

educational practice and c) to describe and examine student and teacher experiences and perceptions of learning as a result of open educational practice.

What Will You Be Asked to Do?

The proposed research is based on a digital open learning extension to the learning which is already a part of the current practice within the Building Futures, Airdrie (BFA) program. As such, the research data will be collected throughout the "yet to be titled" project which will begin in October, 2018.

With the researcher, you will be designing for an inquiry project which will connect BFA students with local community experts. In groups, the students will solve community problems with the support of their community experts in online and face to face contexts. In the past, the project has been limited to community partners within the geographic area of BFA. For this project, the teacher will design for the connection between students beyond the local community by giving the students the opportunity to expand their learning environments into online learning networks. Students will be supported in this expansion of learning environments by completing additional basic digital activities like creating google folders and saving digital artifacts as well as learning about digital citizenship, online data and privacy and social media networking. The risks and benefits of learning in expanded learning environments will be emphasized throughout the project. Students will expand their digital literacies by learning how to connect with others in open digital spaces through developing curation skills like finding and evaluating digital content and social media and communicating effectively in digital environments by considering online social reputation and identity.

Your research participation and collection of research data is completely voluntary. You may refuse to participate altogether, may refuse to participate in parts of the study, may decline to answer any and all questions, and you may withdraw from the study at any time.

What Type of Personal Information Will Be Collected?

Your willingness to allow the educational researcher to collect information about you during this study will be documented with this consent form.

There are several options for you to consider if you decide to consent for your child to take part in this research. You can choose all, some, or none of them.

Please review each of these options and choose Yes or No:

I grant permission for the following data to be analyzed and examined:

Visitor and resident maps	Yes: ___ No: ___
Personal reflections	Yes: ___ No: ___

I grant permission for observation and field notes of my learning environments (classroom and online learning spaces)

Yes: ___ No: ___

I grant permission for clarification interviews

Yes: ___ No: ___

I grant permission for weekly meetings (based on my schedule)

Yes: ___ No: ___

Are there Risks or Benefits if I Participate?

Learning and participating in online environments and networks has the risk of influencing your digital identity and social reputation. Part of the intention of this research is to ensure that all participants develop the digital literacy skills, knowledge and competency to develop positive digital identities and strengthen their social reputation.

All information collected will remain confidential by the researcher. This research offers no paid compensation for participation, and you will incur no cost to participate.

The benefit of participating in this study is in helping teachers learn how to expand learning environments using open educational practice beyond classroom walls and how to support students in developing the skills and knowledge to consider expanding their learning environments.

What Happens to the Information I Provide?

The information provided will be kept confidential. All online digital content and digital tools are district and FOIP approved and have gone through a privacy impact evaluation by district staff.

The field notes and interview transcripts which will be stored on a password protected computer in word documents. The data analysis and findings will be secured and stored on password protected computer. These will be destroyed 5 years after the completion of the project.

Participation in the study is voluntary and you may withdraw from the study at any time until one month after the end of the study. Only educational researchers from the University of Calgary who are involved in this study will have access to this information. The project google site will be licensed under a Creative Commons license and will be accessible after the completion of the project. The results of this study will be shared with other educational researchers through papers and professional conferences. If you are interested in the publications of this study, you may contact the researchers for a copy of the study once it has been published.

Understanding of participation and consent:

I understand that:

- ✓ there are no negative consequences for participating or not participating in the study.
- ✓ interviews will be audio recorded and transcribed. I will have the chance to review the transcription for accuracy before it is included in the research.
- ✓ information I provide will remain confidential.
- ✓ I may withdraw my data from the study at any time until one month after the data collection.

Signatures

Your signature on this form indicates that 1) you understand to your satisfaction the information provided to you about your participation in this research project, and 2) you agree to participate in the research project.

In no way does this waive your legal rights nor release the investigators, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from this research project at any time. You should feel free to ask for clarification or new information throughout your participation.

Participant's Name: (please print) _____

Participant's Signature: _____ Date: _____

Researcher's Name: (please print) _____

Researcher's Signature: _____ Date: _____

Questions/Concerns

If you have any further questions or want clarification regarding this research and/or your participation, please contact:

Verena Roberts, Werklund School of Education

Email:

Supervisor:

Dr. Michele Jacobsen, Associate Dean, Graduate Programs in Education, Werklund School of Education,

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