

Open learning design for using open educational practices in high school learning contexts and beyond

Open learning
design

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Abstract

Purpose – There is a need for research that examines how digital networks can support all learners in open access to people, resources and experiences that were previously inaccessible in K-12 learning contexts. This study aims to examine the potential of open education theories and open practices in high school learning environments.

Design/methodology/approach – Using a design-based research approach, this study used the open learning design intervention framework to examine the experiences of a researcher, a teacher and Grade 10 students who expanded their learning from formal to informal learning environments by integrating open educational practices (OEP). The research occurred through three specific phases with iterative cycles that were responsive to research participants and data analysis at each phase.

Findings – The key findings suggest that open learning in high school is dependent upon opportunities for learners to co-design personally relevant learning pathways. The emerging design framework highlighted the need to emphasize the complexity of the students' lived experiences in connection with the curriculum (formal learning environments) to promote a diversity of perspectives and shared connections (in informal learning environments). Second, learners need the opportunity to share their learning experiences collaboratively and individually by transparently demonstrating their learning processes in relevant ways and open practices provide the digital and community spaces to share knowledge. Finally, open learning occurs through stages and continuums and is a personal learning experience that transcends the boundaries of formal learning environments.

Originality/value – This study expands the current conceptual framework of open learning design by contributing a K-12 lens from which to consider the potential of OEP to promote personal learning pathways. Although the research considered a K-12 context, the OLDI Framework can be extended upon and used in any open learning design context including higher education.

Keywords High School, Secondary School, Open educational practices, Open learning design

Paper type Research paper

Open learning design for open educational practices in high school learning environments

Transformed pedagogical designs for open and online education in K-12 are called for to move schooling from formal and standardized structures into expanded participatory networks and ecosystems in which learners freely access and interact with diverse people, content and ideas. Contemporary research demonstrates that deep learning expands beyond schooling and classrooms and includes collaborative learning design, supporting digital literacies for digital technology integration, encouraging students to be producers and



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creators rather than consumers of knowledge and linking formal and informal learning opportunities (National Academies of Sciences, Engineering, and Medicine, 2018). Deep learning engages learners in knowledge building and idea improvement in community (Scardamalia and Bereiter, 2014). Within a global learning ecosystem, learning can occur in a variety of ways, including through communities, networks inside and outside formal classroom walls (Siemens, 2005) and can go well beyond formal learning environments (Paniagua and Istance, 2018). Digital learning ecosystems also provide multiple entry points for diverse learners to have access to and choice in learning opportunities and a voice in how they learn, when they learn and with whom.

Transformed pedagogical designs for open and online education in K-12 are called for to move schooling from formal, standardized structures into expanded participatory networks and ecosystems in which learners freely access and interact with diverse people, content and ideas. The opportunities to expand and connect with others outside of classroom walls using open educational practices (OEP) can provide students with the opportunities to fully reflect upon the complexity of their lived experiences in connection to the world around them for students to see themselves as part of the global learning community. Higher education research has provided indicators of the potential of OEP (Bali *et al.*, 2020; Paskevicius and Irvine, 2019; Cronin, 2017); however, there is a paucity of research yielding indicators of OEP in K-12 contexts and limited focus on the potential of open educational resources (OER) instead (Blomgren, 2018; Blomgren and McPherson, 2018). Jenkins *et al.* (2016) continue to advocate for participatory research to bridge the research–practice gap to connect informal and formal learning environments which can be reflected in open pedagogy literature. The anticipated benefits of OEP may be referenced in such studies (Blomgren, 2018; de los Arcos *et al.*, 2016; Hegarty, 2015; Kimmons, 2015; McGreal, 2017). However, the design and use of OEP in K-12 learning contexts is less studied, especially in equity and social justice-based contexts. The purpose of this paper is to describe the experiences of students and their teacher in a design-based research (DBR) study using OEP in an alternative high school setting.

Literature in open learning in K-12 educational learning contexts

Literature in open learning often includes OER, OEP and open learning designs. However, current research in open education has been dominated by a pervasive focus in two areas:

- (1) OER; and
- (2) on topics that can relate to or connect with OER research.

Open educational resources

OER are as follows:

[...] learning, teaching and research materials in any format and medium that reside in the public domain or are under copyright that have been released under an open license, that permit no cost access, reuse, repurpose, adaptation and redistribution by others. (UNESCO, 2018)

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. Blomgren's (2018) summary of K-12 OER research also affirms McGreal's (2017) summary that identifies a potential activity gap in the use of K-12 OER in Canadian contexts.

Open educational practices

K-12 educators are exploring the learning possibilities that multimodal, complex and networked digital learning environments can provide for learners, such as OEP as an emerging pedagogical approach. OEP has been defined as:

[...] 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)

Some OEP definitions have expanded to include educators focusing on practice and student created content enabled by OER (Wiley and Hilton, 2018; Wiley *et al.*, 2017). Other OEP definitions have expanded a focus on open pedagogy (Hegarty, 2015) power relations and inequality in open learning (Bali *et al.*, 2020; Czerniewicz *et al.*, 2017), and Cronin (2017) has suggested that OEP is highlighted by a focus on the open learning process which may or may not include OER. As de los Arcos *et al.* (2016) document, K-12 educators have difficulty in defining OER, open education and sharing their awareness of open practices. However, OEP have the potential to provide connections to the informal learning that takes place in communities and families outside of classrooms to reconceptualize online learning to expand learning boundaries that personalize and make learning equitable (Lee, 2018).

Open learning designs

Some of the current research in open learning designs has included creating and examining OER (Blomgren, 2018; de los Arcos *et al.*, 2016; Kimmons, 2015), learning in participatory culture which includes informal learning contexts (Jenkins *et al.*, 2016) and collaborative knowledge building (Scardamalia and Bereiter, 2014). In addition, other researchers have focused on learning designs using clusters of innovative pedagogies (Paniagua and Istance, 2018) practices that support integrating social media (Greenhow and Askari, 2017) and learning designs that encourage sharing using OER's and participatory practices (Conole, 2013; Hegarty, 2015).

Conceptual framework for open learning designs in K-12

A contemporary construct of open learning 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 (Siemens, 2005; Weller, 2011). 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 outside of formal learning contexts, facilitated by the teacher (Couros and Hildebrandt, 2016; Jordan *et al.*, 2017). Most importantly, 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 equity, collaboration and interactions between learners, mentors and other nodes of learning (Bali *et al.*, 2020; Barth, 1969; Cronin, 2017; Jordan *et al.*, 2017; Paniagua and Istance, 2018). t cultural perspectives (Roberts, 2019).

Open learning design intervention

The contemporary construct of OEP in K-12 learning contexts inspired the Open Learning Design intervention (OLDI) framework which promotes:

- the development of building relationships;
- an emphasis on the development of digital literacies;
- an opportunity to interact, connect and collaborate with other nodes of learning will lead to the development of; and
- a personal learning network and an understanding of the potential of open learning for themselves.

Study and method

DBR was the methodological approach used given the emphasis on researcher-practitioner collaboration, the progression of inquiry through iterative phases to evaluate a specific intervention that impacts local practice and the commitment to providing theoretical insights to expand educational theory (McKenney and Reeves, 2012). The study explored how open educational practice (OEP) can expand learning opportunities for K-12 learners through student, teacher and researcher perspectives using OLDI in a high school learning environment. The intervention involved a choice of lessons and activities that were co-designed by the researcher and teacher through four learner pathways in which they scaffolded and supported Grade 10 (15- and 16-year-old) students.

The research process included three phases:

- (1) the analysis and exploration phase;
- (2) the designing and construction phase; and
- (3) the evaluation and reflection phase.

Figure 1 is an adaptation of McKenney and Reeve’s (2012, p. 78) generic model for DBR and provides an overview of the micro, meso and macro cycles of this study that were included in each of the three macro phases.

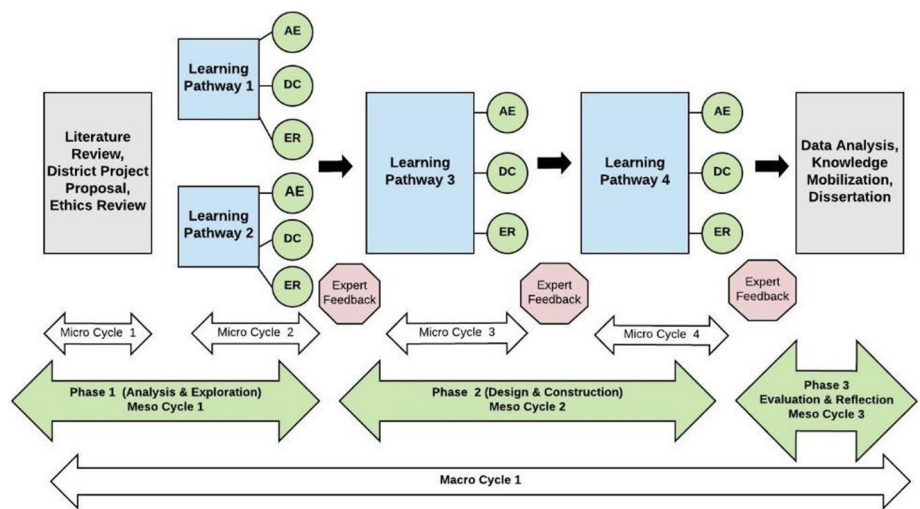


Figure 1.
OLDI DBR
methodological
approach models

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Within meso phase one, the first iteration of OLDI was used as a framework to inform the development of open learning via learner pathways. Phase one included two initial prototypes (using the OLDI framework), which were called Learning Pathway 1 (LP1): Searching Online and Learning and Pathway 2 (LP2): Data and Privacy. Within Phase 1, students were introduced to different pedagogical approaches (like inquiry and design thinking) to learn how to find information and complete projects without direct teacher instruction. To create and share digital artifacts, students were encouraged to learn about digital literacies, citizenship, networking, information literacy, student data privacy and security by actively learning by doing. Within each learning pathway, the DBR process was also followed using micro versions of analysis and exploration phase, the designing and construction phase and the evaluation and reflection phases as highlighted in [Figure 1](#). In Meso phase 2, two complete micro cycles of DBR research were completed called Learning Pathway 3 (LP3): Solving a Community Problem and learning Pathway 4 (LP4): Storytelling and Perspectives. In LP3, students were asked to complete a networked digitally based project that made a difference in their community, guided by municipal city employees. For LP4, students were asked to explore their unconscious bias by learning about storytelling from multiple perspectives and mediums. Finally, within Meso phase 3, the data analysis from all the phases was compared and contrasted and a revised OLDI framework was developed.

Participants

The research participants included one high school teacher, one researcher and 23 Grade 10 students in a high school alternative cohort program, in a Canadian school district. The teacher had been teaching the alternative 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 participated in the study and one student who self-identified as other.

The participants were all part of the alternative program which offered an interdisciplinary integration of core high school courses while building a house at an on-site location. Students applied and were interviewed to participate in the program prior to researcher involvement. The application process ensured that students with a wide variety of academic skills and abilities from multiple high schools within the district with multiple cultural and socioeconomic backgrounds were included in the program. Students spent part of everyday building and working with local tradespeople as well as completing core courses (English language arts, social studies, mathematics and science) and option courses. The participating teacher chose to integrate OEP into his learning design. The researcher co-designed the course with the teacher and all students in the class. The large school jurisdiction had a *bring your own device policy* which meant that all students had some kind of digital device to use for learning or the teacher would provide a digital device for them.

The integration of OEP provided the teacher and students an opportunity to be active and collaborative participants in the DBR research process and to highlight key principles to consider when designing learning using OEP. The OLDI expanded on the teacher's previous learning design by encouraging the students to use nodes of learning, which may include people, digital communities and digital resources ([Johnson, 2008](#); [Siemens, 2005](#)) the use of multiple digital platforms, choice of digital tools, social media presence, community experts, student digital artifacts and student presentations. The connections between the nodes supported connections and interactions with outside the formal classroom networks, as they contextually pertained to each cycle's focus. The participants contributed to data collection and were active in guiding and influencing the OLDI as a result of their feedback and engagement in the research process.

Data collection and analysis

In this DBR study, multiple forms of data were collected, including student, teacher and researcher reflections, classroom observations and Visitor and Resident maps (VandR maps) (White and LeCornu, 2017). Given the specific nature of the OLDI and the context for this research, in a K-12 school jurisdiction, additional attention was paid to student privacy and confidentiality. The students and parents self-selected if they wanted to consent to be a part of the research study or not, and this consent was communicated and clarified throughout the process. All students and parents (whether the students gave consent to the research or not) were included in a robust communication plan that included additional resources and learning about digital privacy, safety, citizenship and literacies. Parents were often asked to come into the class, or through take home activities to give them the opportunity observe and participate in the learning process firsthand.

Table 1 highlights the variety of data collected throughout the research.

Participant reflections and classroom observations enabled the researcher to capture perspectives on and experiences with open learning and document how learning expanded beyond formal learning environments into informal participatory networks. Each form of data was coded and organized, then triangulated by comparing and contrasting the reflections, observations and digital artifacts in light of the extant literature and research questions. The student reflections, the formative assessment provided to the students throughout classroom observations and project completion, the final projects and the V and R maps, provided the researcher with multiple perspectives to consider when designing with OEP in high school contexts. The data collection was consistently shared with participants then analyzed after each learning pathway which ensured that the OLDI changed and was iterated as each learning pathway was completed, then analyzed using Hegarty's (2015) Principles of Open Pedagogy as a lens.

	LP1	LP2	LP3	LP4	Totals
Student written reflections	61	21	75	20 final Reflections 31 activity Reflections	208 reflections
Digital artifacts (including final project presentation links and videos)	5 final project links	10 final project links 10 digital activities	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 edits 10 digital activities 44 paragraph summaries
V and R Maps	17	17	16	12	62 V& R Maps
Teacher reflections	5	3	1	1	10 teacher interviews
Classroom observations	5	6	8	9	28 classroom observations
Other engagement with participants and research partners (over 1 hour) (e.g. field trips, meetings, presentations)	3	1	1	9	14 "Other" engagements with participants
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Table 1.
Data collection
tracking sheet LP1-
LP4

Preliminary findings from phases

Based on the synthesis of data from reflections, classroom observations and V and R maps, the findings were distilled to capture students' and teachers' perspectives of and experiences with open learning.

Developing an awareness of open learning

This quote illustrates a students' perspective on open learning experiences:

[...] 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 (Student E).

Emerging principles of open learning design

The data collection included teacher, student and researchers notes and reflections which helped to identify the teacher's perceptions of how the OLDI encouraged the students to make learning relevant for themselves. As the teacher reflected:

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".

Similarly, the student reflections revealed how the learning design encouraged the students to expand their learning beyond their previous learning experiences and contexts:

For me the main difference is flexibility in being able to choose how and what to learn. 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 - 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 have never known much about before (Student E).

An emerging theme described by the students and teachers throughout LP1, LP2 and LP3 was the opportunity to hear, listen and consider different perspectives. This was described because of the interactions, collaborations and connections within the class and outside the classroom with different peers, adults, content and social media:

Throughout all three projects we began to branch out more and more to different people with different views. In our first project we didn't make any community connections, then in our second project we reached out exclusively to the youth of (city), then finally in our third and final project we were able to make connections with all sorts of people. With those who we were close with and with some who we had never even heard the names of before (Student I).

Development of an open learning design framework

The distinct equity-focused data emerged from the fourth iteration or Learning Pathway 4 (LP4). Originally, the DBR study was designed for three iterations or learning pathways with the students. The decision to design for another learning pathway was made by the teacher and the researcher for closure because the teacher and researcher still had open learning design questions they wanted to answer after the original completion of LP3. The teacher had a desire to design for learning that connected to community, but not necessarily through digital communities and networks. The researcher was curious about how the OLDI framework could be applied by connecting digital networks, people, ideas, resources and communities. A few of the students had also questioned the connections to Alberta

curriculum in LP3 during the classroom observations, as such, the teacher and researcher collaborated to design for a learning pathway that focused on integrating with language arts and social studies curriculum learning outcomes. Due to the findings, which had highlighted the emphasis on different perspectives in LP1-LP3, LP4 was designed as an integration of two interdisciplinary units, the short story unit from English and a social studies unit that focused on how contemporary society responds to the legacies of historical globalization.

It was essential that the learning design clearly connected the curriculum outcomes with the concept of multiple perspectives. A change to the design was the amount of people included in the design of this learning pathway, compared to the other three. When the teacher decided to extend the research project for another learning pathway, the researcher started to connect with other school districts specialists to ensure some additional expertise in perspectives, specifically Indigenous knowledge and literacy.

In LP4, instead of using google classroom, the students were introduced to an open digital project management platform to share resources and ideas between the students, parents, fellow educators, Indigenous Elders and the community to provide a way in which to watch over the learning to ensure authentic and meaningful knowledge sharing. The students were asked to examine the provincial collaboratively designed Indigenous Literature Kits for K-12 as short story resources instead of the traditional textbook short stories from Grade 10. They were introduced to Canadian history and storytelling through Elders stories and by attending a multi-media professional play about the key themes in the history of Canada. The students also learned about the Industrial Revolution and its impact on Canada from an Indigenous perspective by listening to an Elder walk them through the blanket activity which is designed to be used as a lens to consider our shared history as Indigenous and non-Indigenous people in Canada.

The researcher notes documented the design changes in her observations:

The way in which students connected and interacted with others outside the classroom also had to be reconsidered. The teacher and researcher would use the OLDI framework to expand the learning beyond the classroom walls by inviting a wide variety of experts, knowledge builders and knowledge keepers into the classroom, in face to face contexts and digital contexts by focusing on building relationships with people and other nodes of learning. The immediate family of the students, teachers and researchers were invited to attend all learning activities where outside experts were invited into the classroom or on field trips outside the classroom.

Initially, the researcher reflections demonstrated a change in student engagement between LP3 and LP4. The researcher reflections noted the evidence of student engagement:

I left the class wondering how they could have come so far in just 4 days. The student engagement, willingness to contribute to the discussion, to share, to think about different perspectives was evident in so many different ways – by so many different students. (*Researcher reflections*)

Open educational practices and open learning design

The following student reflections highlight an increase in understanding which identified alternative perspectives and empathy for others. In the reflections, the student comments had transitioned from learning how to expand their learning from the classroom to the outside community in LP3 using their shared experiences, to transforming the way they had previously been thinking and experiencing their learning in LP4:

[...] this experience gave me a deeper understanding of what it's really like. During the field trip, I realized how quick we are to judge people who we don't even know. We make assumptions

about people based on the clothes they wear, the way they walk and talk, etc. We do this without knowing anything about who they are or what kind of life they have had (Student D).

Originally it was a lot to take in, but this time around I noticed I was more drawn to the reactions of those around me. I found it interesting to see how each individual was influenced, especially when hearing their personal and sensitive thoughts out loud. Even the simplistic body language, and tone of voice affected the energy in the room, which seemed all at once. For me personally, being able to walk around the city I call home, and to be shown the history and parts of it through a different lens was incredible. Learning something that relates back to me is so much more powerful than reading from a textbook, or even hearing it from a speaker first hand. I found myself engaged and at parts taken aback (Student G).

By the end of LP4, students were able to use their personal learning experiences with their peers in connection with the prescribed curriculum. When they were asked why sharing their stories, and not just listening to stories was so important for learning the students answered:

“It might help someone else’s perspective”. (Student A)

“People telling stories – explaining how it was bad and now it is better gives hope to others”. (Student C)

Final project data analysis

At the completion of each of the four learning pathways, the researcher did a full data analysis that started by reviewing all data sources within each learning pathway, then coding, comparing and contrasting findings between learning pathways, and then synthesizing findings across pathways in relation to the research questions. Key findings were compared and contrasted using [Hegarty’s \(2015\)](#) eight attributes of open pedagogy as well as the contemporary construct of open learning in high school from the literature review. The comparative analysis revealed many similarities between study findings and the eight attributes of open pedagogy. However, the data-informed examples from high school open learning contexts were more inclusive of socio-constructivist, student-centered, participatory and networked pedagogical practices. Further, findings emphasized the learning process and open learner readiness, rather than emphasizing the use or creation of OER content. The learning expanded between personal informal spaces and institutional formal learning spaces. By using [Hegarty’s \(2015\)](#) attributes of open pedagogy to analyze the research findings from this project, the research provided new insights from open learning in high school learning contexts that can be added to the current research base in open learning. The following text describes some of the ways in which [Hegarty’s \(2015\)](#) attributes of open learning were similar and different in the present research findings.

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 among learners. The differences emerged through participatory communities and participant understanding and readiness of whom to participate with to learn. The opportunity for students to expand from formal into informal learning environments to connect and interact with different groups of people (and nodes of learning) was also dependent on the learner competency and confidence in digital literacies. As such, to design for the use of open participatory technologies, high school teachers need to consider how to develop and support student competency and skills in digital literacies. The evidence of the development and use of digital literacies 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).

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](#)). Student participants demonstrated their trust with others by building a variety of learning relationships. First, the learners demonstrated that they needed to trust themselves to develop the confidence to learn with others and be able to contextualize the personal connections of their learning opportunities. Then, the learners started to build relationships with their immediate community which included their teacher, peers and family. Next, they started to build relationships by connecting and interacting with others outside of their immediate community. For high school students, many preferred to take this step as a group rather than individually (e.g. they initially preferred creating social media identities as groups rather than as individuals). Finally, the learners considered building personal learning relationships with those in outside networks (for example when they connected with Elders and community programs to complete their projects). As the learners expanded their learning environments, they also expanded the variety and number of relationships for learning. As the participants connected and interacted with other people and other nodes of learning they highlighted the opportunities to hear and discover multiple perspectives in their reflections.

Attribute 3: innovation and creativity. In the present study, participants described similarities to aspects of innovation described by [Hegarty \(2015\)](#), in addition to creative innovations in pedagogy, specifically in formative assessment and learning design. [Scardamalia and Bereiter's \(2014\)](#) knowledge building principles best describe the importance of embedded, concurrent and transformative assessment as a more accurate description of the assessment practices that emerged in the research study. For students to develop a clear understanding of how to expand their learning into open learning environments, they needed feedback from multiple forms of assessment which included reflective feedback loops. These forms of assessment included teacher and peer feedback, co-designing learning pathways and clear learning pathways criteria as well as an open learning readiness assessment (self-assessment and teacher assessment) and a final summative assessment.

The innovation and creativity findings also expanded upon the idea of co-designing learning which 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 with others. The learners were an active and engaged part of their personal learning process.

Attribute 4: sharing ideas and resources. The participants highlighted an emphasis on how to co-design to share learning ideas ([Conole, 2013](#)). Evidence was found of the teacher and learners adapting rather than adopting OER ([de los Arcos et al., 2016](#)). There was an emphasis on the learning process rather than the adoption, adaption or creation of specific OER which connects well to [Scardamalia and Bereiter's \(2014\)](#) Knowledge Building theory. In particular, some of the students described a change in their understanding between finishing a project and constantly changing, improving and updating an idea in a project, in order to expand on the original idea or to create something new. The participants described a change in their ways of sharing, experiencing, and describing learning as they built upon and expanded previous ideas or alternatively changed their perspectives completely.

Attribute 5: connected community. The participants described how and why they connected with community (closed and networked digital communities) to expand their learning. The findings indicate that students developed personal learning environments (PLEs) (Drexler, 2014). 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 digital and face-to-face open learning examples.

Attribute 6: learner-generated. Similar to other descriptions of open pedagogy attributes, the present findings highlighted that the students moved beyond demonstrating learner generated content (or product focused open learning), but also engaged in the "opening" up process that empowered them to take the lead, solve problems, and work collectively to produce artifacts that they shared, discussed and remixed. Tonks *et al.* (2013) identified the connection between OER and student empowerment which was also apparent in the project findings. However, Hegarty's (2015) learner-generated attribute did not account for the present findings which demonstrated the essential elements of open learner awareness in high school. These essential elements include connections to personal learning contexts, epistemological choice, and learner responsibility. Student participants highlighted different ways to describe authentic personal connections to learning. They described an awareness that there is more than one way to learn (epistemological choice). The students demonstrated ownership of their learning as described through freedom and control. Specifically, the findings describe how the students co-designed their learning pathways through goal setting, being empowered to describe how they understand what they are learning, considering strategies to extend their learning and most importantly how they felt challenged, proud and confident of their learning. The participant descriptions can be understood by considering Scardamalia and Bereiter's (2014) knowledge building principles that connect to the findings of freedom and choice, which are principles of epistemic agency and democratizing knowledge.

Attribute 7: reflective practice. It was more difficult to make connections between Hegarty's (2015) description of reflective practice and the present research findings. Hegarty's attribute seven considers the reflection that occurs because of collaboration, creation, remixing and use of OER as well as feedback from colleagues. 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 and considering multiple perspectives. The majority of student 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 study, 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, instructor, research and community feedback. 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 highlighted the value and sense of responsibility students felt for their collective community knowledge regardless of the use or adaptation of OER.

Attribute 8: peer review. Giving and receiving feedback about learning from others became as 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 characteristics of peer review in high school open learning contexts.

The comparison of the findings in this research study to [Hegarty's \(2015\)](#) attributes contributed to the final version of the OLDI framework ([Roberts, 2019](#)). By extending upon [Hegarty's \(2015\)](#) attributes of open pedagogy, the research provides a new lens from which the contextualization of open learning in high school learning contexts is an original contribution to open learning research.

The similarities and differences that emerged from the analysis using [Hegarty's \(2015\)](#) attribute provides an expanded focus on high school student perceptions of the impact of open learning, along with informing how the OLDI can provide a framework to highlight how to design for open learning that promotes multiple perspectives and can contextualize lived learning experiences. The summary of the findings informed the final iteration of the OLDI framework which can guide future research which considers open learning in other learning contexts.

The open learning design intervention framework

The expansion of open learning depends upon designs that account for personally relevant learning pathways. Based on this study, the updated OLDI framework, described in more detail in [Roberts \(2019\)](#), includes four stages that are supported by constant reflective practice ([Figure 2](#)).

From this study, a definition of OEP in K-12 learning contexts, as an intentional approach to design that expands learning opportunities for all learners from formal to informal learning environments based on learner readiness, emerges. Based on study findings, I contend the OLDI framework demonstrates that open learning is a highly contextual social constructivist learning process that is dependent on learners to connect

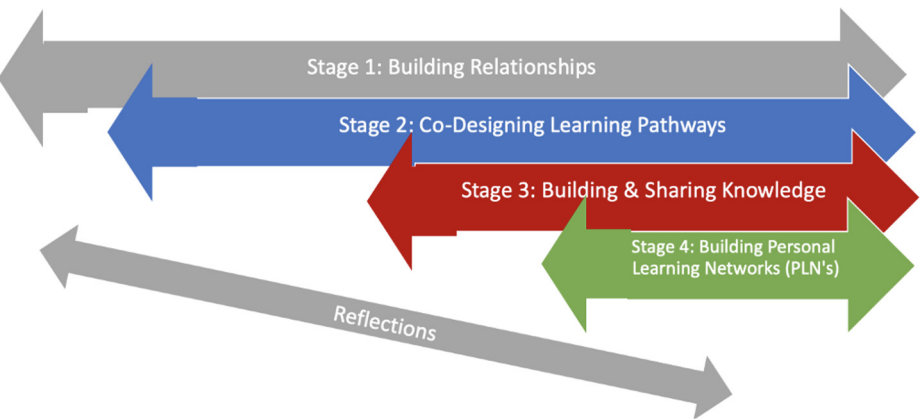


Figure 2.
Open learning design
intervention (OLDI)
framework

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and interact with other nodes of learning to expand their PLEs beyond formal learning contexts.

After four iterations, in which the researcher, in collaboration with the practitioner, considered multiple pedagogical perspectives and differentiated nodes of learning, the following four stages of the OLDI framework were established:

- (1) Stage 1: *Building relationships* includes developing relationships between all participants and creating safe learning spaces.
- (2) Stage 2: *Co-designing learning pathways* negotiate the personal learning context and ways of knowing in open high school learning environments.
- (3) Stage 3: *Building and sharing knowledge* demonstrates participant open readiness by sharing their learning with the community and networks.
- (4) Stage 4: *Building Personal Learning Networks* provides connections from learning pathways to lifelong learning opportunities.

Learner reflection is also an essential aspect of the OLDI framework that is demonstrated throughout each stage. It is through the student (and personal) reflections, that a teacher is able to determine the open readiness of each learner.

Stage 1: building relationships

In this stage, participants choose to build relationships with each other, which can include teacher–student relationships and student–student relationships, through communicating interests and passions. To develop learner-focused relationships, the relationships need to be supported throughout a learning experience. The relationships were dependent upon the safe learning spaces described in student reflections as spaces where student choices, voices and perspectives are promoted, supported through relationships, resources, feedback and time.

Stage 2: co-designing learning pathways

The learner relationships initially focused on students developing self-awareness about self as a learner, communicating their passions and interests and having the opportunity to integrate personal and meaningful learning opportunities into the learning design through co-design. In this stage the learner and teacher (facilitator) negotiate how to co-design their learning pathway to meet the student's learning needs in order to ensure that the curriculum is covered. Co-designing learning involves negotiating personal learning contexts that encourage students to consider pedagogical delivery, learning pathway criteria, identification of learning roles and personal learning accountability and responsibilities. The student needs to be engaged in the learning process that is developed through agency and transparency in the teacher's practice. Co-designing includes helping the student to make connections to how the learning concept or idea is personally relevant and engaging through formative assessment and multiple feedback loops to guide the personalized learning pathways.

Stage 3: building knowledge and sharing learning openly

As part of the co-design of learning processes, teachers and students negotiate multiple ways in which to demonstrate their learning openly by communicating evidence of their learning process. 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.

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) by demonstrating evidence of their learning in multiple ways.

Stage 4: expanding personal learning environments

A PLE is defined as a combination of tools, sources of information, connections and activities each person uses regularly to learn (Adell and Castañeda, 2010, p. 23). Every learner develops their own PLE in their own unique way. It is up to the teacher to support the learner in expanding their PLE from a teacher-centric classroom community to a potential global network, depending on the open readiness of the learner. Expanding PLEs 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.

Discussion

This study describes how the researcher used a DBR approach to collaborate with a high school teacher and students to design for open learning networks by using OLDI framework. Original to this study is how it expands upon current open learning contexts by distinguishing how high school students and a high school teacher experienced open learning. An outcome of this study through learning from the teacher and students' experiences was the development of a field tested, OLDI framework that can be used or easily adapted to inform design in other open learning contexts.

This research distinguishes itself from current open learning literature in Higher Education by using Hegarty's attributes of open learning to contextualize and differentiate meaningful, relevant and authentic open learning in high school learning environments. It also provides an alternative to product rather than process focused open learning literature by building upon sociocultural constructivist theory to demonstrate how open learning expands from formal into informal learning spaces in order to promote multiple student perspectives.

In addition, this study provides the research informed OLDI framework and open learning design principles to describe the impact of expanded learning experiences and environments on student learning to promote equity and personalized learning opportunities. OEP are an emerging pedagogical approach that warrants research attention. This research contributes both theoretical and practical insights and findings on open learning and OEP in high school learning contexts by amplifying the importance and potential of the open learning process for high school students as active participants in lifelong learning ecosystems. Most importantly, this research demonstrates how an emerging pedagogy, like open learning, can promote the integration and scaffolding of multiple pedagogical approaches that are responsive to individual student learning needs by connecting formal and informal learning contexts.

This DBR contributes to research on open learning and OEP providing a K-12 lens while contributing to the emerging research in OEP by providing considerations which to support open learning design. The following principles of open learning design in any learning context can be considered:

- Open learning is dependent upon the opportunity for learners to co-design personally relevant learning pathways.

- 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.
- Learners need to *transparently demonstrate their learning in personally meaningful ways* that integrate curriculum and competencies.
- *Open learning occurs through stages and continuums and is a personal learning experience* that transcends formal learning environments.
- Open learning *emphasizes the learning process to build upon and share community knowledge* (Roberts, 2019, p. 263).

Conclusion

OEP are an emerging pedagogical approach that warrants research attention. This study expanded on the literature in OEP by documenting and analyzing experiences of high school students and their teacher in an alternative high school learning context. In addition, this study provides a research informed OLDI framework and open learning design principles. This research contributed both theoretical and practical insights and findings on open learning, OEP and open learning design in high school learning contexts by amplifying the importance and potential of the open learning process for high school students as active participants in lifelong learning ecosystems. Most importantly, this research demonstrated how an emerging pedagogy, like open learning, can promote the integration and scaffolding of multiple pedagogical approaches to be responsive for individual student learning needs.

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