

Helping Learners build Innovative Solutions in the LLC

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Background Context

The work in this study aligns with the creation of excellent school library learning commons. *To be successful learners today and in the future all students need an excellent physical and virtual school library learning commons to ensure they have equitable access to active learning experiences: Designed to infuse inquiry learning approaches, evolving technologies and best resources as well as foster a love of reading and life-long learning. In the library learning commons everyone is a learner, and learning experiences empower intellectual, cultural and personal growth* (Excellent School Libraries, n.d.).

Thus, I have brought together past work and experiences to examine: **How might we help modern learners build innovative solutions in the LLC?** I look into factors that contribute to having students and educators become active participants on a local and global level as inventors, *changemakers*, disruptors and innovators.

To set the stage, an explanation of existing conditions in the LLC is important to understand how results with progressive models of learning were obtainable. In all instances, every effort was made to establish a modern learning culture that promoted an *invent for good* stance, looking at the UN Sustainable Development Goals and culturally responsive practices to help steer inspiration to pursue learning. A learning environment built around a wide variety of flexible furniture and accessible technology was in place. Equitable access to a wide range of high-tech and low-tech tools was an important part of this journey, either through materials on hand or through central lending libraries. The final measure put in place was open-ended design experiences that were constructed to nurture global competencies while practicing and applying hard-skills using technology and tools on hand [[click here for samples - 1 2 3](#)].



(Photographs by Kristofor Schuermann, LLC MakerLab, 2016)

Examining Models of Learning

With the modern learning strategy above in place, approaches to using progressive models of learning could be considered. The hope was various *models of learning would provide multiple means of*

representation to enable students to learn with increased agency and ownership over the learning process, honour their lived experiences, and link their passions to the learning journey in the LLC (Peel District School Board - EML Team, 2021). I was able to employ three models with students over the last 8 years in a variety of situations, all of which were based on a variety of insights through professional workshops and readings, collaborating with colleagues, and practical experience. I will give a brief overview of pathways and interpretations I followed under each model, knowing that working with students in the LLC is always a journey, and precise adherence to any given model is not realistic, thus, frequently resulting in a slight blend.

Inquiry

Inquiry gives students a chance to make choices about their learning, both at the outset & throughout the process. Modern learners engage in a controlled, guided or open experience which builds on their natural curiosity, while educators act as a guide & partner in the process who is adept at noticing & naming curriculum connections. Students will develop their critical thinking skills, literacy skills, abilities as a 21st century consumer & maker, and communication skills. As modern learners investigate and make sense of their world, this will breed new questions to pursue both in academic settings & independently (Ontario Library Association, n.d.) (Ontario Ministry of Education, 2011).

Through experience, I found this model allowed students to engage in solution building that ranged from realistic to imaginative and could be ongoing and long term if properly facilitated. Variations of 'controlled inquiry', 'guided inquiry' and 'open inquiry' were needed depending on the ability of the co-teaching partner's capacity to support, the level of experience students had using this model and the willingness of the community to support. I developed this graphic organizer to help facilitate this model - <https://bit.ly/inquiry-canvas> .

Engineering Design Process

The engineering design process is an iterative process that learners can use to guide them through solving a problem. The model calls on participants to ask questions, imagine solutions, plan & create models, test solutions, make improvements & share outcomes. This is a linear process that has a start & end point, with the communication of discoveries amounting to a range of polished inventions to details around the learner's journey (NASA, n.d.).

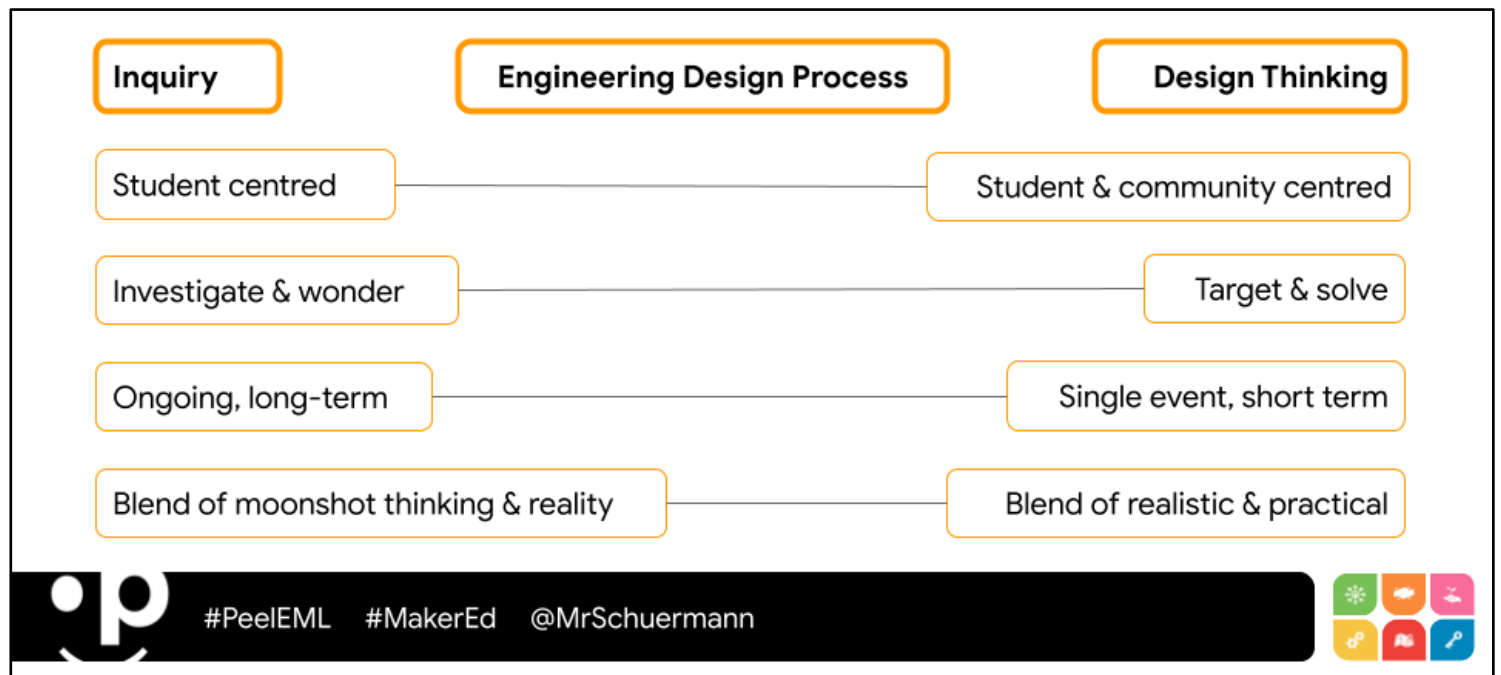
Through experience, I found this model allowed students to engage in a wide-range of problem solving that could be targeted towards realistic or theoretical solutions. The ability to have a more fixed timeline, and the more structured beginning to this model with the more open-ended section in the final phases made it appealing to many co-teaching educators I collaborated with. I developed this graphic organizer to help facilitate this model - <https://bit.ly/engineering-design-canvas> .

Design Thinking

Design thinking is a cognitive, strategic and practical approach by which human-centred solutions are developed through an empathy lens. Learners can begin the process with open questions, or educators can supply students with a theme, idea and/or overall learning goal. Then, learners can follow the pathway of gathering inspiration to create, generating ideas, creating prototypes, testing & reflecting,

and sharing their discoveries. There can be a wide range of interesting outcomes, such as forward thinking anti-oppressive action plans, persuasive & disruptive multi-media campaigns, helpful software solutions, or innovative inventions. Throughout, educators will act as a guide & partner in the process who is adept at noticing & naming curriculum connections. The best part is, whether learners reach their goal or have a series of mis-steps, this multi-day pathway will present countless opportunities for student agency, acquisition of transferable skills & development of a growth-mindset (IDEO,org, n.d.).

Through experience, I found this model allowed students to engage in targeted, human-centred solution building that had realistic and practical outcomes. This model was most effective with students from grade 6 and up, since the community-centred approach requires a great deal of flexibility on the part of the learner to respond to the 'client' and be less concerned with having a personal footprint on the eventual solution. I developed this graphic organizer to help facilitate this model - <https://bit.ly/design-thinking-canvas-pdf> .



(Chart built by Kristofor Schuermann, learning journey expectations of each model, 2021)

Examples in Action

Inquiry

A strong example of inquiry in the LLC occurred with myself in collaboration with the teacher-librarian [Mark Uriarte], classroom teachers and students at an elementary school in Peel District School Board in Q1/Q2 of 2022. We focused on the provocation of **“How might we feed a growing population equitably and sustainably?”** as a starting point. After investigations into UN Sustainable Development Goals number 2, 10, 12, 13, 14, and 15, the grade 1 we were working with decided to focus on pollinators [due to their connection to food production] and the grade 5 class decided to focus on decolonizing agriculture.

Grade 1 students co-created the main idea of **“How might we welcome back our fluttery friends?”** We worked to understand how the natural landscape had changed with human interaction in Minecraft Education Edition, we looked into displaced pollinators for our region and other regions in North America, and students formed smaller groups to focus explicitly on specific animals and insects of their interest. Smaller groups investigated how they could mimic a dwelling [bee hotels, butterfly gardens, bat boxes, bird houses] or provide sanctuary for their chosen animal or insect, and then pursued a solution. Some students chose to design and construct a prototype home [which educators later rebuilt using wood to setup outside for long-term observation], while some choose to advocate to stakeholders for a change in landscape.



(Photographs by Kristofor Schuermann, inquiry work, 2022)

Grade 5 students co-created the main idea of **“How might we decolonize agriculture?”** Early on in this process, we began collaborating with Afro-Indigenous knowledge keeper, Isaac Crosby, who played a large role in this inquiry. Students investigated how to use legacy crops, improve the watershed, maintain healthy soil, welcome biodiversity and communicate with plants. Learners did a critical analysis of school space, developed plans for spiral mounds and other solutions, cultivated plants and worked on the land in collaboration with Isaac.



(Photographs by Kristofor Schuermann, inquiry work, 2022)

Engineering Design Process

A strong example of the engineering design process in the LLC occurred with myself as teacher-librarian, in collaboration with classroom teachers and students at a K to 8 elementary school in Peel District School Board in Q1/Q2 of 2018. The two grade 2 & grade 3 split classes I was working with were focusing on the provocation **“How could we make a pinball machine?”** in order to explore

connections to the *Structures and Mechanisms & Matter and Energy* areas of the Ontario Science Curriculum.

These primary students investigated links and collected ideas to simple machines & forces at work in pinball machines through print and digital resources, as well as physically constructing pinball machine components using cardboard, wood, and other low-tech materials. Individuals or pairs of students brainstormed and created preferred designs based on their audio, video, print and physical making explorations. We asked students to try and link their designs to their preferred graphic novels to provide a theme, but to also show their understanding of the story by making protagonists the positive elements of the game and making antagonists the traps in their machine. Students proceeded to go through the cycle of building, testing, gathering feedback, revising and optimizing their designs. Several grade 3 students were able to take on a more high-tech challenge by adding *LEGO robotics* and *LittleBits* prototyping modules to their pinball machines, adding sound and light effects, score counters, and other SFX. Collaborating educators were able to have conversations and observations throughout the process to gather assessment data, keeping almost all students engaged in producing a majority of the time. The student work was eventually showcased to intermediate students in the school, who came to play in the 'Arcade' but also asked the primary students accountable questions about their literacy and science work.



(Photographs by Kristofor Schuermann, EDP work, 2018)

Design Thinking

Two strong examples of design thinking in the LLC that I would like to share occurred in 2017 and 2023. The first was with myself as teacher-librarian, in collaboration with students at a K to 8 elementary school in Peel District School Board. The second example in the LLC occurred with myself in collaboration with teacher-librarian, classroom teachers and students at an intermediate school and a nearby elementary school in Peel District School Board.

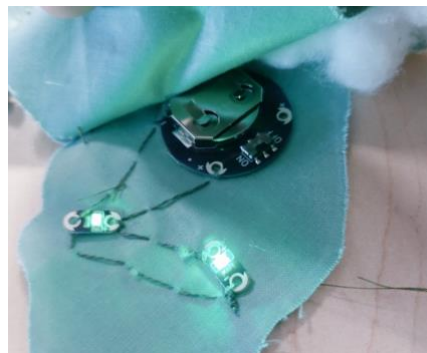
The first design thinking examples originated in 2017 with an extracurricular group of grade 6 to grade 8 students called the *Megabrights*. This equity of access and empowerment group gave a pathway to young women to lead many of our school's *MakerSpace*-related initiatives. Members of the group had unlimited access to innovative tools & operated under an open-inquiry / design thinking models using the *UN Global Goals* as a guide. I would consistently advocate to members to document their excellent work, especially when they took part in regional or global competitions they decided to pursue. As a design thinking example, one team of *MegaBrights* developed a *LittleBits* robot specifically for their brother's with ASD so they would stay calm and be able to stay in class [[click here for reference media](#)].

Another example was with another team of intermediate *MegaBrights* went through an extensive Design Thinking process to create a personal safety *Android* APP prototype that promoted safe and equitable community access at any time [[click here for reference media](#)]. Both instances had students critically consulting with the community as they iterated and evolved their designs to build human-centred solutions.



(Photographs by Kristofor Schuermann, design thinking work, 2023)

The second design thinking example stems from work in 2023 in a broad collaboration between schools & divisions. The initiative was dubbed *Fun Friends* and the goal was to build post-pandemic community and creative thinking connections between schools. Students in grade 7 connected with learners newer to school, most often kindergarten, to get to know them & what they would like or need in a companion toy [the *Fun Friend*]. The intermediate student builds empathy with the early-year student and learns the interests of their 'client' through an 'interview plan' and research [[click here for the graphic organizer](#)]. They then create a physical toy based on the data [by sewing, using wood, 3D design and printing], bring the *Fun Friend* to life through media [produce a stop-motion video, create a video game, make a comic book] in their LLC & present the finished products to their early-years 'client' for them to keep. This was another successful example of students critically consulting with the community as they iterated and evolved their designs to build human-centred solutions.



(Photographs by Kristofor Schuermann, design thinking work, 2023)

Analysis of Recent Data

The most recent qualitative data I collected was from students, educators and administrators during the 2023 *Fun Friends* design thinking and community building initiative.

Educators and administrators used observations and conversations from a variety of modern learning experiences, including the deliberate rollout of the engineering design process and design thinking models, at the school to present the work favourably to parent council and board-level school improvement plan.

The main block of data came from several grade 7 students who were asked for feedback after several months of collaborating with myself as part of the central-support modern learning team, the school's teacher-librarian, and their classroom educator. Twenty-two students were selected to provide feedback. These students had had a chance to participate in the most opportunities I offered in collaboration with the teacher-librarian at the school. This included not only the *Fun Friends* initiative, but also hard-skills use / application training with MakerSpace technology [LEGO robotics, TinkerCAD software, Scratch visual programming language, AI media tools, e-Textiles], global competency design workshops, and an iPad identity media project in collaboration with the education team from *Apple Canada*.

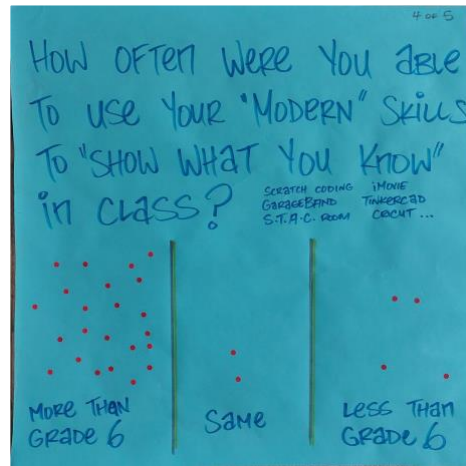
Data was collected in the form of a 'Dotmocracy' to give students more choice in how to weigh their feedback. Students were given nine sticker dots to use over several questions, with each question having multiple response options (Queens University, n.d.). Feedback questions were explained prior to beginning, and students were encouraged to re-read all questions prior to answering. We asked students to contemplate individually prior to adding feedback. Students could add an additional sticker to a response if they felt that category reflected strongly how they were impacted as a learner.

Notable student data was as follows:

Students preferred the design-thinking initiative over more isolated events, with 64% of respondents indicating the *Fun Friends* design project was their favorite experience of the year.

When students gave feedback about segments of the design-thinking model they preferred, 30% noted they most appreciated the human-centred approach to designing with and for the kindergarten students. 53% noted that creating plans and physically making the empathy toys was their preferred portion, giving weight to the idea of amplifying making and doing in the LLC. While only 17% noted that building media to bring the toys to life and share their work was the most impactful.

Some of the best feedback came in regards to voice, choice, and agency when it came to using soft-skills and hard-skills they had nurtured in everyday schooling. 79% noted they felt they could use or empowered to advocate for the use of their physical or digital maker skills, or strengthened global competencies in day-to-day life at school. 71% also felt they had more say in how to solve curriculum problems they were presented with in various subject areas after understanding how to use the design-thinking model of learning.



(Photographs by Kristofor Schuermann, data collection and presentation, 2023)

Final Thoughts

Over the past several years, as I have built my capacity to support progressive learning models and as my ability to collaborate with more teacher-librarians and students has increased, I have seen a positive effect. Learners are inspired to create innovative solutions that solve problems, share ideas, and disrupt traditional practices. I also see students as understanding more effectively how they can participate locally and globally as *changemakers* with the help of the LLC.

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