Inquiry-based collaborative learning:

A Literature Review

by

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Theoretical Framework

Constructivism

As a teacher of the practical and applied skills, I have long admired the creativity and ingenuity of learners. As my trades program lends itself seamlessly to many aspects of project-based learning (PBL) and inquiry-based learning (IBL), I have been situated in a unique position to see students learn, and develop using these methods. Central to these learning methods is the constructivism theory of education. Splitter (2008) defines constructivism as, "primarily, an epistemological and psychological thesis about how we learn, viz. by actively and self-consciously bringing our past experiences and understandings to bear, in a collaborative exercise with other learners" (p. 5).

For students to engage in an effective process of IBL and henceforth PBL, the students' past experiences must be accounted for, in regards to what knowledge and practices they bring, to engage in their learning. The concept of students using their past experience in their learning, pertaining to education specifically, is not a new theory but dates back to the time of John Dewey, in the early 1900's. John Dewey is largely considered the philosophical founder of educational constructivism. According to Xyst (2016) Dewey argues that "knowing does not exist in the mind of a subject, possessed by an individual, nor does it come as a collection of facts or propositions. Knowing emerges from an intentional process of creating connections between actions and consequences" (p. 16).

The connections that Dewey is an advocate for, promote the idea that students should be applying their knowledge to construct and create. This educational constructivist approach, henceforth, denounces certain basic school tasks such as rote memorization and regurgitation. As this framework relates to our project, these 'real' skills are what we are hoping our students will

take away. As Splitter (2008) writes "Classrooms could, and should, be reconstructed as *communities of inquiry* in which seeing oneself as 'one among others' is a key priority" (p. 150). As students progress through their CCPBIL project, once assembled, they will indeed realise they are one among others, that form a learning community.

Finally, as teachers of educational constructivism theory, we must remember that "Constructivist teaching is based on the belief that learning occurs as learners are actively involved in a process of meaning and knowledge construction rather than passively receiving information. Learners are the makers of meaning and knowledge" (Gray, n.d., para 3). To ensure our students are constructing knowledge that is meaningful to them, we need to allow them not only a level of freedom in their learning, but to enable them to take ownership of that learning. Our CCPBIL project is our attempt to relinquish control and give our learners the reins over their own education.

Overview of the Literature Review

In order to take the necessary steps to immerse our school in a process of cross-curricular collaborative, project-based inquiry, resulting in a shared teaching environment (co-teaching), in this review of the literature, I will examine the four activities that supported this process: collaboration, co-teaching, project-based learning, and the inquiry process. As this project is a joint venture between three teachers at Fort St. James Secondary School (FSJSS), we each bring a wide array of curricular experience and expertise pertaining to our own subject areas to contribute to this project (a digital media / computer technology teacher, a social studies / careers teacher, and a vocational trades teacher). This diversity allows us to examine each body of literature from a unique perspective, and as we pursue a transformative change in our school,

assess how each aspect of that change helps to facilitate student learning pursuant to each area of expertise.

As such, this literature review has been broken into four main areas essential to the school wide change we are seeking to bring forth:

a) Collaborative learning, both as teacher collaborators to establish a positive foundation for student learning, and as learners collaborating together on their projects,

b) the concept of a co-teaching and the potential for a shared classroom in a given space,

c) project based learning, especially that which involves the movement of learners from learning environment to maker space, and

d) the inquiry process in which learners will engage in to help scaffold and structure their learning.

Collaborative Teaching and Learning

"Teacher collaboration is a situated and developmental enterprise, which calls for the mutual engagement and ongoing negotiation between different parties (e.g., teachers and school leaders) over time and across contexts" (Yuan & Zhang, 2016, p. 817). The literature assessing collaboration in education examines two separate, but inextricably linked areas of study: teacher collaboration, and student collaboration. Within the overarching framework of collaboration, the available literature seeks to address, how collaboration affects the inclusivity of education for all Learners, how collaboration can affect learner centered approaches to teaching, how the group selection process for collaboration can bolster or denigrate the group process, how conflict and

social skills are represented in the collaborative process, and how collaboration relates to ability, interest, and attitude.

As posited by Pugach et al. (2011), collaborative learning, as a process, has been slow to become entrenched as a prevalent practice in modern education. This style of learning, however, is vital to enable teachers to teach to all learners. This allows teachers, in modern educational practice, to integrate special education and general education, and teach all learners equally. Due to this, a focus should be placed on collaborative learning to ensure the process is a priority in all schools. Pugach et al. further posit that by enabling teachers to teach all learners collectively in a meaningful fashion is also a guiding principle in inclusive education. If teacher collaboration is a paramount step in supporting inclusive education, then it is an area of study that should be pursued. Indeed, Yuan and Zhang (2016) agree with these sentiments as they are strong advocates for having school leaders provide time for teachers to collaborate, space to conduct this collaboration, incentive mechanisms to promote collaborative measures, and communication structures set up to facilitate better forms of collaboration. In addition to these studies, Hedegaard-Soerensen, Jensen, and Tofteng (2017) also agree that collaboration is an important condition for inclusive education. They argue that educators should co-plan, co-assess, and co-instruct, as working collaboratively in this manner benefits learners not only academically, but also socially and behaviorally as well.

Soerensen et al. (2017) lays out four categories of teacher collaboration as per Gottlieb and Rathmann (2014, as cited in Sorensen et al.), which are significantly linked to improvements in learning outcomes for learners. These include: giving advice, counselling, offering inspiration, and being a discussion partner. This information indicates that making collaboration a formal process has been shown to result in improvements for inclusive education. On a similar note,

Lepareur and Grangeat (2018) look at how teacher collaboration leads to improvements in student- or learner-centered approaches to education. Although their study is limited in terms of numbers of participants (n=3), they have found that teachers who engage in collaboration, ultimately focus more on learner needs by utilizing a more learner-centered approach to teaching. This is compared directly to teachers who worked in isolation, who have a tendency to use teacher-centered practices. As our project relies heavily on utilizing student-centered approaches to lesson planning, the research by Soerensen et al, Gottlieb and Rathmann, and Lepareur and Grangeat, is of paramount consideration for our planning.

Examining group processes, research suggests that collaborative learning includes definitive influences on group dynamics, from how groups are chosen and interact to how group norms are maintained throughout the process. The first of such steps, is the choice of said groups. Krammer et al. (2018) for example, examined how teachers choose teaching teams, and if providing teachers, the ability to choose their own teammates, for collaboration, resulted in an improved level of collaborative teaching. They found that having teachers select their own teams, indeed, resulted in more compatible teammates, however, they did not find that self selection resulted in any greater level of collaborative teaching. A notable limitation of this study is that it was conducted in Austria, which has an education system that differs from our own. The information presented here, however, should be kept in mind, as having a choice of teams on collaborative projects will likely yield similar outcomes moving forward. Once groups have been chosen, teachers and learners will engage in a number of collaborative skills to complete their given project. “Developing networking skills, maintaining collaborative relationships with people, and making decisions as a team are considered essential skills to be successful in the new era” (Lee, Huh, & Reigeluth, 2015, p. 562).

A boon for both teachers and learners alike, using collaborative learning, is their ability to utilize and gain specialized social skills while undertaking a collaborative project. Relating to this is a study put forth by Chu et al. (2011). This study, which examines student reading ability and interests, exemplifies the benefits of teacher and student collaborative learning on student achievement. Ultimately, Chu et al. used a combination of collaborative teaching and inquiry project-based learning within their general studies courses to determine how it affected student reading levels. They determined that this combination of collaborative teaching and inquiry resulted in substantial improvement in student reading levels. Although this study does not show that collaborative learning is the only way to improve attitudes towards learning and reading ability, it does draw a positive correlation between the two.

It needs to be noted, however, that within this framework, Lee et al. (2015) recognize that social collaboration, regardless of age, can result in conflict which must be taken into consideration. They have found that, although task-related conflict serves to improve production on a given topic, process and relationship-related conflict seek to denigrate the group process. As this study was assessing high school learners in North America, it has direct implications to our own context. As such, it lends to the fact that we need to ensure proper group management is in place to minimize relational and process conflicts to maximize learning.

Overall, as collaborative learning (both teacher and student focused) is an integral component of our project, examining its efficacy and managing its intricacies is vital to conducting a successful transition at FSJSS. As the literature has shown, collaboration has the power to result in an increased focus on the learning, and even has the ability to help provide the learners with additional skills, which are fundamental for their future. As our school, and its educational goals evolve, collaboration (between both teachers and learners) will be essential to

establishing a normalized project based inquiry learning model that is both learning centric and meaningful.

Co-Teaching

The second layer, fundamental to our project, is not only to utilize collaboration to focus on a student-centered approach to learning, but to use instructor expertise where it is the most beneficial, by co-teaching and sharing our learning spaces. I have found in my teaching practice that sharing our learning spaces enables learners to act in a fluid manner. That is, allowing them the ability to move dynamically throughout the spaces in our school, which allows teachers to share their space with learners that are not necessarily 'their' own. This enables us, as teachers, to teach our expertise to the learners seeking guidance in each specific area, and allows teachers to work together to provide a greater range of content linkages ultimately fostering a greater sense of community. No one exemplifies this sense of community better than Kathryn Plank (2012), who writes about co-teaching as more than just a teaching method, but rather a way to create scholarly communities within a school. These communities involve both teachers and learners, who work together to collaboratively learn, and understand concepts. Within the framework of co-teaching, and as such classroom sharing, there are several steps to establish this practice effectively, and there are pitfalls to avoid.

In the planning stages of co-teaching, it should be recognized, in accordance with Plank, (2012) that the process does not specifically follow or need to follow a pre-established model. Instead, Plank asserts that lessons must be planned, delivered, and assessed much like they would have using a single teacher. The difference, however, is now there are potentially many different stakeholders in each lesson. Plank continues to argue that it has to be remembered that co-teaching is not simply about dividing labour between co-teachers, but instead it is a process

that should be used to enhance the learning for not only all learners, but the staff as well. Furthermore, this planning process ultimately results in a process of collaborative learning for the teachers, which includes its benefits and challenges. With Planks writing in mind, it should be noted that this process of collaboration, with respect to co-teaching, does not occur by itself. The act of working together, to plan and create all aspects of teaching and learning, must be done throughout the entire process, including the act of planning, and implementing assessment practices. This is a must to establish a student-centered learning environment as discussed in the collaboration section. The concept of working together is further expanded upon by Buckley (2000) who argues that co-teaching should involve a group or groups of teachers that work together on a regular occurrence with purpose. This act of co-teaching results in a teaching practice that ultimately helps learners learn. This sentiment is reinforced by Gucciardi et al. (2016), who conducted a study with student-faculty team-teaching. This study resulted in students which "feel better supported in gaining a deeper understanding of the course material given the readily accessible assistance and tutoring that is provided" (p. 453). This research shows that by enabling multiple teaching and tutoring perspectives for learners to access while engaging with course material, learners have the ability to gain additional insight that would not be possible with a single teacher.

Inevitably, the act of engaging in co-teaching is subject to a number of potential challenges such as communication, logistics, and the additional amount of time it takes, that must be actively addressed in order to maximise cooperation and student learning. Take this passage by Plank (2012) written during a case study:

> We are in daily contact with each other; you may direct questions to either one of us, and we may well consult with the other about your questions, in the deliberate

> way we organized each class session, and in trying to meet with individual learners together, when possible. Another critical strategy for us was to develop an approach to grading— which had implications for the design of assignments— that would enable both of us to be equally familiar with the learners' work. We gave a good deal of thought to the logistics of grading as we prepared to teach the course. (p. 67)

Logistically, planning for all the variables noted by Plank above, that each teacher needs to be aware of when co-teaching is exceedingly complex. As such, Plank suggests that a great deal of time and energy in terms of planning needs to be expended in order to effectively manage all of the tasks. On a similar note, Buckley (2000) points out that teaching teams need to be balanced or work loads may end up being distributed unequally. This need to balance often equates to the fact that each team may differ on a number of fundamental grounds such as: course, type of student, student to teacher load, meeting and teaching style, or technology use. As such, it should be noted that no team teaching situation will be the same, and there can be no one-size-fits-all model.

On a more positive note, despite the challenges of pursuing team teaching, there are many benefits of it. According to Androutsos and Brinia, (2019) there are many skills not directly taught at the high school level today. In order to tackle this, co-teaching can be a solution. They discuss the changes that have been evolving as society advances. These changes include those that are economical, technological, and societal in nature. As these areas have evolved, it has created fields that require new skills and abilities in areas such as creativity, innovation, and co-creation. These new skills must be taught in a new way, such as through co-teaching, to effectively meet modern demands. In their study, they found that learners gained an increased

number of these skills compared to the traditional modality of teaching. Along these same lines, Buckly (2000) also argues that team teaching helped transition learners out of a single teacher, single subject class ideology, into a more progressive model that meets the modern demands of today's world.

Overall, co-teaching mirrors the principles of collaboration and helps to provide essential skills to learners, ensuring they are the center of learning. Although there may be an increased impetus to collaborate effectively, this collaboration helps to result in directing additional resources to those who need it most; the learners.

Project-Based Learning

Thus far we have predominantly examined the role of the teacher in our transition at FSJSS. This change, however, is for the benefit, and betterment of student learning. To modernize our learner's approach to education we are seeking to engage them in a process of project-based learning, or PBL. PBL is an overarching framework which means to engage "learners in sustained, collaborative focus on a specific project, often organized around a 'driving question.' These aspects are critical: sustained collaboration over a deep interaction requires learners to establish a rhythm and working process to solve a complex problem" (Gary, 2015, p. 99). The framework for PBL will be briefly examined here, in terms of the processes in which teachers will be engaging in. In our study, Inextricably linked to PBL is the student centered teaching and learning approach known as inquiry learning. This concept will be examined in further detail in the upcoming subsection.

Project-based learning, at its core, is about connections. According to Lam et al. (2010), it is about connecting learners to educators, each other, the outside world, and skills and

experiences they would not otherwise be able to participate in. They assert it allows the learners to gain practical experience while engaging in a process of collaboration with their peers to gain new insights and skills. This way of teaching and learning is a change from the traditional norms of stand and deliver style teaching in education. As such, one of the greatest difficulties is getting teachers to adopt PBL into their classrooms. It is reasonable that teachers may feel this way as PBL is an entirely new and challenging way of teaching. Many teachers that have been trained and experience traditional stand-and-deliver style of teaching methods may also have very limited experience with PBL. Since PBL does not necessarily reflect their current practice, a great deal of anxiety and learning may need to take place in order to make the change. Lam et al. further argue that to help this transition along, support structures within the school are needed to be in place to help teachers adopt PBL as a teaching philosophy. Without these, teachers will be less motivated to try to adopt PBL methods. These support structures can include additional time for planning, mentorship, co-teaching, or other professional development opportunities.

According to Gary (2015), Other challenges with project-based learning also include but are not limited to: establishing physical learning environments conducive to PBL, difficulty assessing PBL in both summative and formative manners as projects may vary a great deal, teaching in a manner that provides the correct amount of guidance and scaffolding, scaling PBL projects for different number of learners and budgets, and keeping teachers and learners from burnout on sustained projects. Although there are a number of components that need to be addressed, Gary also indicates that it is the educators' responsibility to ensure that all of our learners have, not only the basic technical skills to be successful in their career, but to also ensure the learners are able to employ higher order functioning to expand upon those skills. It should be noted that, although this article by Gary explicitly examines learners' technical learning via

computers, it remains relevant as a major component of our learners' PBL will involve using computers and associated technology.

The Inquiry-Based Learning Process

Finally, in our transition to a school that incorporates a collaborative, project-based learning environment, the inquiry process is the heart of what learners will be following to achieve mastery in their learning. One of the most paramount documents which inspired us to pursue this style of project-based learning was put forth by the Government of Alberta entitled the Alberta Focus on Inquiry (2004). In this document it is stated that,

> Inquiry-based learning is a process where learners are involved in their learning, formulate questions, investigate widely and then build new understandings, meanings and knowledge. That knowledge is new to the learners and may be used to answer a question, to develop a solution or to support a position or point of view. The knowledge is usually presented to others and may result in some sort of action. (p. 1)

Within this definition, it is clear there are many facets to inquiry learning. To effectively ensure learners are gaining as many skills and as much insight as possible throughout this process, it is important to look at a number of different aspects of inquiry. The sub-areas of inquiry that are emphasized by the literature include: the varying models of inquiry, the need for student scaffolding, the levels of student autonomy during the inquiry process, the learning areas and skills gained or during the inquiry process, and,

lastly, the positives and potential limitations of using the inquiry process as a form of learning.

The first model of inquiry we looked at was also presented in the *Alberta Focus on Inquiry*. It shows that inquiry is a process that includes planning, retrieving, processing, creating, sharing, and evaluating information. During this process, the student and teachers are to be reflecting on each stage of their project to enhance their learning. It is noted in the focus that the planning process is the most important, as it not only is the phase which entices excitement about the project ahead, but also ensures learners are determining how best to locate materials for their projects. Ultimately, the goal within this framework is to learn new skills or gain insights that may or may not have been directly related to their project. Similar to the model put forth by the Government of Alberta, Pedaste et al. (2015) proposed a slightly different multi-step inquiry process. In their paper, they discussed a model that included the following stages: orientation, conceptualization, investigation, conclusion, and discussion. This model contains very similar components to the model put forth by the Government of Alberta. Likewise, it also was designed to help teachers and administrators create lessons using an inquiry-based framework. Both of these models help their users to ensure they are implementing inquiry learning efficiently and effectively.

The final, and most recent model we examined was posited by Mackenzie (2016). In this model, he discusses the inquiry model as a supported journey. That journey may be structured, controlled, guided, or free. In each of these four areas, teachers guide the learners through their inquiry project a set amount. The structured method as the most guided, and the free method as the least guided. Within these layers of support,

Mackenzie talks about seven additional steps that apply to each. These include: The four pillars of inquiry, creating an essential question, creating a free inquiry proposal, beginning exploration and research, collecting learning evidence, creating an authentic piece, and publicly displaying understanding. It should be noted that Mackenzie's inquiry work was based off of the inquiry work by Fitchman (2011), which maintains the same four levels of inquiry support.

Overall, the three models of inquiry all contain a very similar premise and are structured in a similar manner. Each model essentially opens with a question, idea or burning thought, and a topic that a student needs to pursue and research. This is followed by some additional planning, research, project assembly, and finally a method to demonstrate learning. The difference between the methods, however, is the discussion surrounding the scaffolding present in each. In the *Alberta Focus on Inquiry* (2004), scaffolding is only talked about as the inquiry model is the scaffold for instruction, and that many skills and strategies will need to be taught explicitly in each of the stages. The article by Pedaste et al. (2015) also only briefly mentions outside resources for scaffolded inquiry. Mackenzie (2016), however, discusses throughout his book the need for a more scaffolded approach in inquiry-based learning. He further argues that, in order for inquiry to be successful, there has to be a specific level of control and oversight, until such time as learners are able to be set free to choose their own project. This concept of scaffolding can be viewed as vital within the literature on inquiry learning. To begin, Chu et al. (2017) discuss this concept of scaffolding and support in their article. They argue that, as teachers transition to learning mediators, they need to facilitate and manage the development of student knowledge as the inquiry projects progress. They also briefly

discuss how not all scaffolding has to be present in the form of a teacher, but can instead be a guiding technology.

In a similar article by Michos et al. (2018), the researchers looked at how the inquiry process played a role in technology-enhanced learning environments. Specifically, the authors wrote about the importance of having supports and scaffolding, and looked at using a digital tool to help this process. They found that more time and further tools for scaffolding were needed. This, again, highlights the importance of scaffolding for inquiry projects. A complementary article to this was written by Xenofontos et al. (2019) in which the researchers talk about the difficulties of creating digital scaffolding tools for learners. There are essentially two distinct difficulties in scaffolding tools, much like in helping scaffold an inquiry project for learners. These are: helping learners to structure their work in a meaningful way and properly problematizing work, which enables learners to use logic and deduction to solve or create their project.

Looking at a different consideration for inquiry-based scaffolding, McGrath and Hughes (2017) examined how learners with learning disabilities needs were met when taught with an inquiry-based learning model. They found that learners who had learning disabilities had a more challenging time acquiring process knowledge than learners that did not have learning disabilities. However, they found that the learners with learning disabilities could be successful with additional planning, support, and further scaffolding. This scaffolding could also take place in the form of peer support.

Also central to the concept of scaffolding is the concept of student autonomy. Without providing learners enough freedom to engage with their topic and the research

materials, we reduce the potential for alternative cognitive and meta cognitive skills to be obtained. The research below outlines one of the main arguments for inquiry-based learning are the skills and abilities learners gain throughout the process, which they are not able to acquire through traditional teacher-centric education. Chu et al. (2017) posit that inquiry-based learning interventions are essential in the modern world to have learners learn 21st century skills. Likewise, McNair (2017) argues that learners need to gain high levels of both problem-solving, and communication skills for the future. He postulates that these skills are essential for the future workplace, and can be learned through inquiry learning in school.

Ultimately, the literature shows that inquiry-based learning is a reasonable and achievable method of learning that can yield realistic and achievable results for our students. It, however, is also subject to a number of challenges that must be addressed to make it viable. Lewis (2018) argues that these forms of guided inquiry, as discussed above, yield natural differentiation between learners. It gives those learners that are gifted the chance to work to their means and gain as many skills and insights as possible. It also allows learners, who need extra support, to cover the basics without the pressure of falling behind. This structure works for all learners but fails to acknowledge the amount of guidance and scaffolding needed for each specific group of learners. McNair (2017) for example, frequently describes the inquiry process as one that is guided but does not outline the amount of guidance required based on learner ability. MacKenzie (2016) also frequently talks about the success of learners being contingent based greatly on the level of scaffolds provided. These details remind us that one of the most challenging factors in implementing an inquiry process is ensuring the appropriate amount of support and

scaffolding is provided for the learners. This means giving them enough freedom to pursue their passions, while ensuring they have enough guidance to be successful.

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