Inquiry-based collaborative learning:

A Literature Review

by

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Theoretical Framework

Constructivism

The chosen theoretical framework for our masters' project, which includes examining and reflecting upon both our teaching practices and students' opinion of their project building experience, will be through the constructivist approach to learning. Constructivism is "a learning theory which affirms that knowledge is best gained through a process of action, reflection and construction" (Brau, B. 2020, para. 28). Under this theoretical framework, the learning environment is student-centred, as opposed to a learning environment that follows a stand and deliver model, where learners are "passive recipients of information" (UNESCO, 2016, para. 4), and merely memorize and regurgitate facts. Furthermore, under the umbrella of educational constructivism it considers that one's background and life experiences will impact one's learning (Sjoberg, 2010).

John Dewey, an educator, and philosopher from the United States was the major proponent to develop this style of constructivism, in the 20th century. He encouraged the idea that "schools and classrooms should be representative of real-life situations" (Williams, 2017, p. 92). Within a classroom that supports a constructivist environment, learners must "ask questions, explore and assess" ("Constructivism as a paradigm for teaching and learning," 2004, para.1). As a humanities teacher, it is imperative to me to provide my learners with an environment that supports opportunities for processing, analyzing, critiquing, explaining, building, and creating. By providing these opportunities to my learners, it enables them to demonstrate their learning as they connect to new information. Moreover, my partners and colleagues involved in this project also support and facilitate the same method of learning. Ergo, the decision to employ constructivism as the theoretical framework for our master's project, was a sound decision, as it

"fosters critical thinking and creates active and motivated learners" (Gray, 1997, para. 6). Additionally, the Educational Constructivist theory supports our project's focus which is that the benefits of a collaborative and co-teaching environment that facilitates inquiry-based learning and project-based learning increases student motivation in learning. For example, Beck and Kosnik (2012), outline how a constructivist learning environment supports learner productivity when stating, that educators can "facilitate a culture in the classroom that supports critical and productive inquiry, a strong sense of community, and much collaborative learning" (p. 2) Throughout my teaching experience, I have found methods of active learning to be motivating to learners; it keeps them focused and engaged, rather than simply being spoken to. Lastly, as an educator, I find this style of working and learning together, with both my learners and colleagues, invigorating, and supportive in the development of new knowledge and professional growth.

Our choice of the theory of Educational Constructivism supports the idea that "the classroom is no longer a place where the teacher...pours knowledge into passive students, who wait like empty vessels to be filled" ("Constructivism as a paradigm for teaching and learning," 2004, para.1), and they become "viewed as sense-makers, not simply recording given information but interpreting it." (UNESCO, 2016, para. 4). I believe the process of active, hands-on, and reflective learning is conducive to Educational Constructivism, and which enables learners to be engaged, while at the same time supportive of developing lifelong learning and transferable skills.

Overview of Literature Review

Introduction

The focus of this master's project was to gain a sound understanding, through the study of scholarly literature, as to how educators can shift from traditional stand-and-deliver teaching practices to learner-centred approaches which facilitate a greater degree of learning and student motivation. Through scholarly examination and incorporation of co-teaching, collaboration, project-based learning, and inquiry we will work to enhance student motivation and the development of knowledge and skills that will be transferable throughout life.

Co-Teaching

Co-teaching is the coupling or grouping together of educators for the purposes of identifying learning goals, creating lesson plans, designing instructional materials, developing assessments, and working as a team sharing these obligations (Trites, 2017). Furthermore, co-teaching is developed for supporting students' growth of knowledge and skills. The following review highlights the benefits co-teaching can bring to both educators and learners, ways of implementing a co-teaching environment, and challenges of a co-teaching environment.

Educators working in a co-teaching environment may work with one colleague or a small group of colleagues, and they may teach within the same discipline or cross-curricular. Regardless of the cohort make-up, co-teaching can bring many positive experiences to teachers. Co-teaching is beneficial to educators as it ends the practice of teaching in a solitary or isolated manner, and instead facilitates growing support amongst colleagues (Buckley, 2000). Furthermore, co-teaching environments enable teachers to share ideas, learn from one another's experiences and areas of expertise. Co-teaching can strengthen one's teaching practices as "teamwork improves quality of scholarship, strengths are combined… weaknesses remedied,

teachers complement one another's expertise" (p. 2). While co-teaching lends itself to a myriad of opportunities and benefits for teachers, the same can be argued with regard to the benefits co-teaching can bring to students.

Trites (2017), article, for example, suggests that there are advantages for students in classrooms that incorporate co-teaching. The article suggests that there are advantages for all learners when there is more than one teacher in the classroom. Vizenor and Matuska (2018) article focused on how co-teaching can benefit all learners and create successful schools additionally reported that their research described that, "among the benefits of co-teaching identified by students, accessibility was significant" (p. 23), thus supporting Trite's (2017) argument that more than one educator in the classroom is beneficial in supporting and facilitating learners in their educational growth and development, and additionally providing extra assistance to those who need it. Furthermore, Vizenor and Matuska (2018), suggested that co-teaching that provides a "blend of high expectations, teacher accessibility, and more personalized teaching methods [are] possible when two professionals collaborate to deliver instruction [that] affords students the opportunity to experience academic success" (p. 25). Buckley's (2000) article provides a myriad of advantages to learners in co-teaching environments including, but not limited to the idea that different teaching "styles and personalities are stimulating and exciting. This gets and keeps attention and prevents boredom. Students discover interdependence and correlations between subject areas and between the classroom" (p. 13). Although co-teaching clearly provides many benefits and learning opportunities for both learners and educators alike, it would be remiss to not identify the challenges.

Some challenges for educators, working within a co-teaching environment, as presented by Buckley involve spending increasingly more time and energy dedicated to re-developing

course material, re-establishing goals and outcomes, and formatting assessment practices to suit both or all educators involved in the co-teaching environment. It is also common to have added stress associated with co-teaching, as colleagues do not want to let their teaching partner or cohort down, or teachers may also be working outside of their comfort level or area of expertise. Furthermore, Buckley identifies problems with incompatibility issues that may develop between teachers if their educational goals or views are widely dissimilar. Lastly, power struggles can emerge if a teacher has issues with letting go of authority. Steps that educators can take to establish a successful co-teaching environment, include avoid bringing negativity into the classroom, as antagonism will have a biased effect on students' learning, and approach the situation with openness and energy. In addition to educators facing professional or personal issues associated with co-teaching, students, too, may endure challenges associated with this style of the learning environment.

Challenges or disadvantages students may experience in a co-teaching environment include, "too much variety...[as] some students flourish in a highly structured environment that favours repetition" (p. 5), and this structure may not exist in a co-teaching environment. Buckley discusses other issues that can bring challenge or disadvantage to students in a co-teaching environment, including the requirement of a more hands-on learning approach that learners may not be familiar or comfortable with, and co-teachers openly demonstrating conflict, differences in attitudes, or points of view amongst each other. Plank (2012) stresses a further complication for students, working in a co-teaching environment, can be associated with variety. This challenge can arise when students are unsure of which teacher they should turn to for assistance when met with challenges in their learning process or with course content. Despite challenges or disadvantages that can develop within a co-teaching environment, the benefits are significant.

Therefore, there are measures educators can take or follow to ensure the success of a co-teaching environment.

Steps that educators can take to design or establish a successful co-teaching environment, include identifying primary goals and outcomes, outlining and evaluating learning strategies, gathering the necessary information for the success of the co-teaching project, creating frameworks to assist with co-teaching responsibilities and assessment practices, and providing allowances for redesigning as needed. Furthermore, it is essential that educators implementing a co-teaching plan include time for feedback and discussion amongst themselves (Buckley, 2000). Discussion, provision of feedback, and reflection, amongst those working in a co-teaching environment are essential to keep positive communication flowing and provide support. Examined literature has identified that there is not one specific framework for designing a co-teaching environment. Instead, co-teaching is designed around the students' needs, content being taught, and teachers' strengths. Possible, co-teaching frameworks that cohorts could adopt, may include "one teaches - one observes, one teaches - one drifts, parallel teaching, station teaching, alternating teaching, and team teaching" (Cook, 2004, p. 14). Regardless of how educators develop their co-teaching environment, the students' learning process must remain at the forefront of their planning.

Collaborative Teaching and Learning

Collaboration, or working with others to complete a task, is common practice in many industries today, including, but not limited to medicine, technology, real-estate, health sciences, and hospitality services. In the realm of education, collaboration amongst teachers has grown rapidly throughout the 21st century (Pugach et al. 2011). Possible reasons for the rise in collaboration amongst educators could be represented by the argument suggesting "teachers need

to be proficient collaborators in order to successfully perform their job" (Vangrieken et al. 2015, p. 18). Furthermore, "education is seen as an important context for students to acquire collaborative skills" (p.18). Collaborative groups, amongst educators, can be created for a variety of purposes and designed with specific criteria, goals, and level of depth of focus. Regardless as to why collaboration in the workforce has increased among co-workers, and more specifically amongst educators, research indicates that this practice provides benefits to educators in the areas of support and idea-sharing (Hedgarrd-Soerensen et al. 2017) and it fosters the improvement of educator scholarship (Yuan & Zhang, 2016). Furthermore, teacher collaboration can assist in strengthening students' learning processes, and it can foster a positive, learning environment.

Collaboration can bring benefits to teachers. Research suggests, for collaboration to be of benefit, it must be completed in a manner that is conducive to respect among participants, and naturally contrived, rather than being forced into a collaborative team, which could negatively impact the creativity, discussion, and progress being made amongst educators (Yuan & Zhang, 2016). Hedegaard-Soerensen et al. (2017) identify that collaboration amongst teachers can positively provide one another with consultation and guidance, in addition, to support one another's viewpoints, thereby providing one another with encouragement and motivation. Vangrieken et al. (2015) also recognize the positive aspects of collaboration and discuss how this process can build an overall improved sense of morale amongst individuals and staff, as collaboration breaks down the isolation that many teachers experience while working within the confines of their classrooms. The positive outcomes that collaboration can build between educators, will be reflective in their attitudes and practices. Consequently, positive collaborative experiences for educators can further facilitate students' success in their educational growth and development.

Students can benefit from teacher collaboration when teachers' instruction or practice has been further developed and strengthened through collegial mentorship, a valuable characteristic of collaboration. Improvements to one's teaching practices will ultimately impact learners in a positive manner, as demonstrated through learners' growing success and achievements. (Vangrieken et al., 2015). Furthermore, teachers involved in the collaboration may adopt practices that are less teacher-driven, and instead, follow conventions that are increasingly more student-driven (Lepareur and Grangeat, 2018). These practices again can support an increase in learners' success and understanding of concepts being explored and taught.

Chu et al. (2011), provide an excellent example of teacher collaboration and positive student learning experiences. Their work focused on educational growth that elementary-aged students from Hong Kong made while working on completing their inquiry portion of a problem-based learning project. The study examined four teachers, including a technology teacher, two general studies teachers, and one teacher-librarian. Prior to the start of the project, the three teachers and one librarian collaborated around what criteria students would be working on to meet expectations. The uniqueness of this project was that it incorporated the strengths of each individual educator involved, which can be argued as being "integral components in the learning approach utilized in this study" (p. 242). The collaboration team brought a wide variety of expertise to assist students in completing their projects. For example, the general studies teachers assisted students with the formation of their inquiry questions, the discovery of facts and information, and assisted with reading comprehension and vocabulary issues; the librarian taught important elements of research to the students, and the technology teacher assisted students in completing their presentations with the use of technology. The results of the study identified the positive growth and outcomes that students gained in their learning, specifically in the areas of

reading ability, reading interest and attitudes towards reading, with having the assistance of a collaborative teaching team providing ongoing support (Chu et al. 2011).

Teachers and students are not the only beneficiaries of collaboration. Indeed, the school environment can also be positively affected by collaboration amongst educators. Through a meta-analysis of 82 studies on various aspects of collaboration, Vangrieken et al. (2015), identify how collaboration amongst colleagues can change the tone or environment of the school community. School communities and an administration that support teacher collaboration reap the benefits of growing modernization, fair-mindedness, and exploration. Clearly, teacher collaboration can result in experiences and benefits to teachers in their professional practices, to students in their educational gains, and to the overall positive learning climate within a school community.

The ideas of Vangrieken et al. were further echoed by Yuan & Zhang (2016), when they write that collaboration can be regarded as a meaningful and important component of the teaching profession and has been identified to improve teacher practices and student learning processes. However, it does not exist without its challenges. Vangrieken et al. (2015), argue "teacher collaboration should not be a magic solution that solves all problems as it can entail negative consequences" (p. 36). Collaborative group dynamics can be so diverse, they lead to conflict within the group. Additionally, one's attitudes, values, past collaborative experiences, willingness to learn, level of contribution, and beliefs regarding the significance of teacher collaboration can impact how effective or ineffective collaboration works. Some educators also view collaboration as a threat to their teacher autonomy, as discussed by Vangrieken et al. If efforts are not taken to provide a positive, and supportive collaborative environment, negative issues and behaviours can arise. Vangrieken et al. provide examples of possible issues, including

competitiveness, tension, conflict, non-compliance, and cliques. Ergo, for a collaborative teaching and learning environment to be successful, it is essential that those involved are both supportive and respectful of one another.

Lee, et al. (2015), further address the possible conflicts that can develop amongst collaborators, including interpersonal conflict, task-oriented conflict, and procedural conflict. Negative collaboration amongst educators will not develop the same outcomes as those established in an environment that supports collaboration in a positive, safe, respectful, empathetic, and professional manner; and whereby a clear framework or goal is adhered to and identified. Whether collaboration takes place between educators or learners, negative behaviour and attitudes are detrimental to the growth and development that positive collaboration can facilitate.

Project-Based Learning

Project-Based Learning (PBL) follows a constructivist teaching methodology, whereby students are active participants in their learning. Within a PBL environment, students get a choice as to what they want their study to focus on. They must develop a question or problem to be solved, related to their area of focus, and it must be designed in such a manner that demands deep thinking or inquiry. Learners must be able to justify or present how or why they arrived at their conclusion, which is usually demonstrated through a project highlighting their authentic learning. (Jonassen et al. 1999). In addition to the deep thinking and rigour PBL demands of learners, this review will highlight how this learning process can assist in the development of essential skills that can be used throughout life, and how PBL enables creativity in students learning.

Gary (2015) discusses the use of PBL within the area of various computer studies at the post-secondary level and establishes the argument that a PBL environment is the most dynamic way for students to genuinely and confidently develop the technical skills needed for their future professions as it engages them in active learning. Gary maintains the argument that educators have the responsibility to prepare students with both the technical skills needed for their post-secondary course work, but also skills, which are transferable into their future careers, and life itself, such as problem-solving and teamwork. Ultimately, Gary supports the notion that the time allotment, thoroughness, and rigour that PBL affords, will enable students to gain a myriad of skills. Clearly, PBL facilitates deep learning, and thoroughness in learners' investigation processes, and it promotes the development of skills. However, PBL also enables one to be innovative or creative in how they demonstrate their understanding, demanded by the inquiry process.

Viana et al. (2019) completed a quantitative study focusing on whether PBL had any influence on learners' thinking processes, in terms of enabling creativity. Their study involved physics students who were given the assignment of creating a problem or inquiry-style question regarding the Laws of Momentum. The PBL environment that the physics students worked in provided time, a positive element of PBL as previously mentioned by Gary (2015), that was necessary to complete a thorough study. Viana et al. (2019) described how physics students developed their in-depth problem or question formulation, performed rigorous inquiry and collaboration, and developed a solution. Students used innovative measures, with equipment available, to demonstrate their learning, gaining knowledge and understanding. This quantitative study demonstrated that using PBL supported an increase in students' creativity as their level of flexibility increased while completing the problem-based learning assignment. Furthermore, the

researchers acknowledged that the knowledge and skills learners gained from their PBL experience could also be applied in further studies, within physics or other areas of study. Ultimately, the examination of the articles by Gary (2015) and Viana et al. (2019) identify that time, thoroughness, and creativity are positive elements of PBL as they enable and provide a learning opportunity to learners in their question or problem formulation, inquiry, skill development, and conclusion to their study. Although PBL provides a wealth of learning experiences for students, it does not come without its challenges. For example, Gary (2015), states specific challenges that are associated with PBL environments include:

> PBL can be difficult to assess, both formatively and summatively, due to the ingenuity some students show in hiding behind others' work. Moreover, teaching in a PBL approach requires the right amount of guidance toward learning outcomes. No two projects or project teams are the same, so nobody has the same experience - yet everyone needs to achieve the same outcomes. (p.100)

Jonassen et al. (1999) further identify PBL challenges by arguing that the extended length of PBL projects brings in the question of "quality versus quantity and depth versus breadth" (p. 196). Lee et al. (2015) pinpoint that conflict can exist within groups of individuals working on PBL assignments that can derail the process. They categorized various types of conflict that may arise in groups working within PBL environments, including internal group conflict, conflicts related to tasks and processes needing to be completed, and relationship conflicts among individual group members. Despite the aforementioned challenges associated with PBL, the learning processes of deep thinking, questioning, exploring, collaborating, and demonstrating one's understanding supported by a PBL environment provide an overarching and thorough

learning experience for students. This learning experience will build knowledge and skills that learners can build upon, adapt, and use throughout life.

Inquiry-Based Learning

An inquiry-based learning (IBL) environment is one that supports the "process where learners are involved in their learning, formulate questions, investigate widely and then build new understandings, meanings and knowledge" (Alberta Focus On Inquiry, 2004, p. 1). The following literature will highlight what inquiry provides for learners, what is necessary for teachers to provide learners for inquiry to be successful, an examination of IBL models or frameworks, and potential challenges associated with IBL.

IBL follows a learner-focused approach, as opposed to traditional teaching practices, that are teacher-focused and follow a stand-and-deliver format, where students merely receive information (Khalaf and Zin, 2018). Ergo, within an IBL environment, students are actively engaged in their learning, through the processes of questioning, collaborating, problem-solving, and reflecting. Khalaf and Zin provide an excellent comparison between traditional methods of teaching and IBL. They discussed how within traditional teaching environments, where the teacher is the central focus and whereby, delivers a set program focusing on specific outcomes within a given period of time, is not as effective as IBL environments, because they "do not favour active engagement of learners in the learning process, but rather focus on the behavioural impacts of immediate context and the teacher's role on learners" (p. 546). Additionally, Khalaf and Zin identify how traditional teaching methods do not take learners' growth of knowledge and understanding of content into account. Lastly, they suggest that the traditional or teacher-

centered learning environment, "highlights the nature of memorization...which is considered a drawback to the long-term practice of learning" (p. 543).

Khalaf's and Zin's research on IBL, is further supported by Smallhorn et al. (2015), in that they, too, view IBL environments as fostering a more in-depth learning than traditional methods. Smallhorn et al. examine the outcomes of shifting from traditional lecture-style environments, specifically, in first-year biology university science courses, to one that is supportive of IBL. They identify that learners, in the traditional setting, receive their information through instructional addresses and laboratory assignments that "have exposed students to experiments which test the concepts taught...[yet] result in a predicted outcome" (p. 65). Smallhorn et al. examined the learning transformation from traditional methods of teaching biology courses and labs to settings adopting inquiry-based learning processes; and their findings indicated that IBL positively impacted students' learning experiences. Furthermore, they stated that this "opportunity for students to be involved in inquiry-based activities, engage with content and assist in the development of analysis and critical thinking skills" (p. 65).

While IBL assists in the development of learners' problem-solving skills, determination, and communication skills, it also facilitates establishing positive behaviours, or attitudes, around problem-solving processes through engaging activities (Khalaf and Zin, 2018). Lewis et al. (2018), discuss the aforementioned characteristics of IBL when identifying that this style of environment provides learners with personal input into their learning "as inquiry is driven by the students' own interests" (p.25). They further discuss how their school district transformed from its original methods that had adopted a teacher-focused environment within technology to one that eventually became learner-focused. Educators involved in this switch soon realized, however, that this switch within the technology learning environment was not enough.

Therefore, educators made the decision to incorporate IBL environments to increase student choice in their learning. According to Lewis et al. the incorporation of IBL was successful across the district, and the changes made enabled learners to:

> thrive and flourish in an atmosphere where student voice and choice become the norm, where school librarians and teachers work together to transform teaching and learning for all learners, and where innovation, scholarship, integrity, and perseverance are part of every student's educational experience. (p. 27)

Furthermore, through discussion with educators involved in this inquiry transformation, Lewis et al. reported that student equity was also increased. For example, a district educator indicated that:

> Guided inquiry leads to natural differentiation. It provides gifted students the opportunity to not be constrained by content they already know, and it levels the playing field for students who struggle – everyone has a question, not just them. They learn something different than everyone else, and they get to be the expert—something that might not happen for them in traditional units. (p. 26)

Other researchers who have also found IBL to enhance student learning, and equity, include McNair (2017) and McGrath and Hughes (2017).

McNair (2017), through their own teaching endeavours, as an education specialist, realized that teen learners needed to be acknowledged and heard, with regards to their learning processes. Specifically, teens needed "to communicate to transfer their learning into real-world, authentic experiences" (p. 32) Therefore, the educator supported and implemented an IBL

environment allowing learners to collaborate with one another, and to discuss their views, connections, understandings, and share their learning outcomes. The article suggests that the time and space an IBL environment provides for learners, to have their voices or opinions heard, is invaluable, as it establishes and sustains a level of individualism within one's learning. Like Lewis et al. (2018), McNair further acknowledged that IBL environments provide students with a choice in what they are learning, thus sustaining opportunities for one's creativity and interests. Lastly, the author recognized that the characteristics associated with IBL environments can encourage "a love of learning for all students" (p. 30).

In terms of equity, McGrath and Hughes (2017) conducted qualitative research, concentrating on how IBL can facilitate equity and inclusivity amongst diverse groups of learners in the classroom. Their article focused on researching middle-school aged students, both with and without learning disabilities, within the regular science classroom setting. Their study's purpose was to gain an understanding of how much knowledge is gained by learners, identified with learning disabilities, within an IBL environment. The researchers noted, when a structured inquiry process was adopted with clear instructions and a solid framework, students with learning disabilities were more successful, although it was not without challenges. Additionally, they reported that "students with learning disabilities recognized the support of their peers as an aid in their learning" (p. 140). Furthermore, it was recognised that students, with learning disabilities were more accepting of receiving teacher assistance when they were struggling.

> Students with LD indicated they welcomed teacher support when working in groups, but during independent work, most students used "Google" for support rather than raising a hand and asking for assistance. Some students even resisted help when educators approached them. (p. 140)

This observation reinforces that IBL can foster equity and inclusivity in a regular classroom setting with diverse learning needs. McGrath and Hughes further identified that it is essential that educators are prepared for the demands associated with IBL, and that learners are being instructed on the language, steps and processes associated with this learning design. The authors further highlighted, that for those students with learning disabilities, it is imperative to make the necessary modifications and adaptations, as required. McGrath and Hughes identified that adhering to a systematic format of inquiry would be beneficial as it "utilizes supports while engaging students in inquiry-based instruction, [and] explicit instruction within the context of inquiry may provide an effective form of...inquiry beneficial for students with LD" (p. 140). The aforementioned information clearly identifies that IBL environments contribute to learners' acquisition of knowledge and skills, while at the same time providing opportunities for voice, equity, and personalization. However, establishing IBL environments involve a change in teaching practices and learners' processes.

For learners to take responsibility for their learning performance, teachers must support a transformation in their delivery of content. Chu et al. (2017) discuss the changing role of educators as becoming more supportive "facilitators rather than instructors" (p. 132). Moreover, within IBL environments, educators must be well organized, and aware of students' strengths, weaknesses, and other challenges in order to "contextualize instruction in appropriate zone of proximal development" (p. 132). For example, some learners may need more guidance and structure, based on reading ability, comprehension, writing, and computing numbers. Whereas other learners may have a wealth of background knowledge and possess well-established skills, thus enabling them to work with less assistance or guidance, and consequently formulate their own questions, conduct their own research, and develop conclusions more independently. Lastly,

Chu et al. identify that it is essential for teachers to "refrain from materials too far beyond students' level, which may result in confusion and frustration" (p. 143). Educators' awareness of learners' struggles, and their growth of knowledge and skills within IBL environments is also necessary, otherwise "students will not feel confident, supported or empowered through their learning journey" (Mackenzie, 2016, p. 28). Undoubtedly, it is prudent that educators choose an inquiry framework that will be both supportive of all learners' needs, and the style of inquiry that they will be implementing. Many forms of inquiry have been developed and implemented by researchers, educators, and educational organizations to support IBL environments, including but not limited, to Pedaste et al. (2015), Banchi and Bell (2008), Dana et al. (2011), Alberta Focus on Learning (2004), Bybee et al. (2006), and Rodriguez et al. (2019).

Pedaste et al. (2015) created a scaffold with the purpose of being able to "provide instructional designers and teachers with a synthesized inquiry-based learning framework from learners' perspective that can be used to ensure an effective inquiry-based learning process" (p. 57). Their study suggested that IBL is often "organized into phases that form an inquiry cycle" (p. 47). Moreover, their research identified analogous features among the frameworks they analyzed, thus enabling them to create a single IBL model that incorporated the "strengths of existing inquiry-based learning frameworks" (p. 47). The main components, or phases, that Pedaste et al. amalgamated into their approach to inquiry, included "Orientation, Conceptualization, Investigating, Conclusion, and Discussion" (p. 47). In addition to the five main inquiry phases, the new model embodies parallel subsections or sub-cycles, including: "questioning, hypothesis-generation, exploration, experimentation, and data interpretation" (p. 57). These subsections provide learners with continuous growth and development between the five main components or phases. Furthermore, reflection and discussion co-exist throughout the

entire IBL learning process, subsequently, allowing educators to continuously connect, assist, and monitor learner growth.

Banchi and Bell (2008) created an IBL model known as "The Inquiry Continuum" (p. 26). This particular IBL framework outlines a "four-level continuum confirmation, structured, guided, and open" (p. 26). Unlike the model developed by Pedaste et al., this model advances in both difficulty and growing student autonomy. For example, learners receive the most teacher support upon commencing the confirmation inquiry stage. As learners move up each level, and develop more skills and knowledge, they gradually become more self-sufficient in their learning, consequently leading to the last level of open inquiry. It is at this last stage where learners, according to Banchi and Bell (2008), have "the purest opportunities to act like scientists, deriving questions, designing and carrying out investigations and communicating their results" (p. 27).

Dana et al. (2011) also discuss a four-leveled inquiry model inspired by Callison (1999). Much like Banchi and Bell (2008), this model also adopts the concept of moving towards growing student autonomy in their inquiry processes as they move through leveled phases, including "controlled, guided, modeled, and free" (Dana et al. 2011, p.3). Again, students initially start with strong teacher support, as demonstrated in the initial controlled phase, where "the teacher chooses the topic and identifies the resources that students will use to answer their questions" (p. 3). Upon working through the second and third stage, learners will reach the final stage, or free inquiry. It is at this stage that "students choose their topic without reference to any prescribed content" (p. 5).

Alberta Focus on Learning (2004), demonstrates a third IBL scaffold, involving a cycle of six stages, including planning, retrieving, processing, creating, sharing, and evaluation. At the completion of each stage, within this model, is the incorporation of reflection. This IBL framework was created with the intent of providing educators and learners with a platform that would outline instructions, gauge feelings, incorporate common language, provide guidance, and monitor learner progress.

A fifth inquiry model is the 5E-Instructional Model. This model was developed in the late 20th century by the Biological Sciences Curriculum Study (Bybee et al. 2006), and it is commonly used as an inquiry scaffold in sciences today. Bybee et al. indicate that the main components that make up this model include "engagement, exploration, explanation, elaboration, and evaluation" (p. 1). It is noted that each of the five phases "has a specific function and contributes to the teacher's coherent instruction and to the learners' formulation of a better understanding of scientific and technological knowledge, attitudes, and skills" (p. 1). This 5E instructional model follows a linear pattern of learning, whereby the teacher initially starts out by engaging students in discussions around concepts that are interesting and "pique their curiosity and encourage deep thinking" (Rodriguez et al. 2019, p. 50). The second step, exploration, involves discussions through questioning and answering. Next, students have the opportunity to explain their understanding regarding what is being examined. Rodriguez et al. state that students "putting concepts into their own words…[provides] the chance to deepen their own understanding" (p. 52). Elaboration, the fourth step, encourages students to dig-deep into their learning, make connections, and to extend upon what they have learned thus far. Lastly, evaluation is where students demonstrate their learning. Rodriguez et al. assert that the 5E-Instructional model enables learners "to build and create...with agency in their own learning,

...confidence in their abilities, and hones 21st-century skills that will help them become the innovators of tomorrow" (p. 7). Clearly, there are various methods of inquiry that educators can implement, to enhance learners' educational experiences. Although IBL provides a deep level of learning, growth in understanding concepts and building of skills, and has the potential to contribute to "real joy from learning" (Dana et al. 2011, p. 3), it would be remiss to not identify some of the challenges associated with it.

Despite its facilitation of knowledge and skills, IBL does have some critics. McGrath and Hughes (2017) highlighted that there may be difficulties with the language level or choice of vocabulary used in inquiry. Therefore, it may be necessary for educators to conduct a pre-teaching of concepts being studied, especially for those students who may struggle with vocabulary and reading comprehension. Meanwhile, Lewis et al. (2018) identified that some students have difficulty formulating their inquiry questions, thus suggesting that educators need to teach students how to formulate higher order questions that could not simply be answered by researching the internet; students would have to be taught how to develop deep-thinking questions that would require inquiry. Furthermore, they suggest that implementing IBL requires more teacher pre-planning prior to starting the inquiry process to ensure students understand what is expected of them throughout their inquiry process or study. Dana et al. (2011) outlines that some educators may struggle with losing control of the classroom setting that is consistent with traditional teaching methods as IBL environments foster more independent creativity in their learning design. Kirschner et al. (2006) take a completely different stance, as they argue that IBL environments are "less effective and less efficient than instructional approaches that place a strong emphasis on guidance of the student learning process" (p. 75). Educators will have

to complete frequent assessments of students throughout the inquiry process to monitor learner progress, and of understanding and knowledge gained.

Conclusion:

Upon completion of this literature review, research has identified that educator collaboration and co-teaching methods, can successfully support learner inquiry and project-based learning, thus leading to the development of increased student engagement in their learning. Although collaboration and co-teaching take time and persistent efforts, they provide educators with positive opportunities to:

- end teaching in isolation,

- discuss and plan,

- work through challenges together,

- ignite or renew creativity and energy,

- share thoughts and opinions,

- design engaging and meaningful curriculum,

- foster trust and build collegial support,

- share individual strengths, and

- build new skills from one another's distinct teaching styles.

Additionally, learners also reap the benefits of teacher collaboration and co-teaching. For example, learners will gain from increased educators' support in the classroom, exposure to different teaching areas and strengths, and renewed energy and creativity. When components of collaboration and co-teaching are well established, continuously discussed and assessed, amongst

educators they can use, or intertwine their developed knowledge and skills to further support

learners during activities such as inquiry and project-based learning. Ergo, well structured

collaboration and co-teaching methods can serve as a foundation to uphold the evolution of an

environment that delivers clear frameworks to assist learners' needs, strengths, motivation, and

engagement in learning.

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