The Challenges of Implementing Project Based Learning in the 21st Century Classroom

By

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Chapter 1: Introduction

"We cannot solve our problems with the same thinking we used when we created them."

-Albert Einstein

The world we live in today is vastly different from that of our ancestors. A wealth of technology surrounds us. We now live in a society that is "rapidly changing" and has an "advancing knowledge base" and we are constantly called upon to "solve complex issues on a daily basis" (Brears et al., 2001, p. 36). As a result, employers are looking for individuals that can adapt to new situations and develop innovative solutions to problems that we have never seen before. Thus, our youth need to be trained to think differently and cultivate skills that have traditionally been ignored in the school setting. These new skills are being called "21st century competencies" (Alberta Education, 2013, p. 3), and are highly sought after in the working world.

In order to teach our students 21st century competencies, we must move away from traditional modes of teaching. One such method is through the use of project based learning (PBL) within the classroom. PBL "is currently advocated as a powerful means for facilitating students' attainment of the high-level competencies and transferable skills increasingly being demanded by government, commerce, and industry" (Murray & Savin-Baden, 2000 as cited in Ertmer & Simons, 2006, p. 40). This mode of teaching enables teachers to prepare students for the high demands of our constantly evolving society. This study will attempt to contribute to the already existing body of literature a description of how PBL can be successfully implemented in classrooms. Along with an examination of the need for change in our education delivery model, it will also explore issues related to moving towards a PBL model in 21st century classrooms. Addressing these issues could help teachers increase student success when implementing PBL in their own classrooms.

Professional Motivations

As an educator, I feel obligated to prepare my students for challenges of tomorrow. In order to do so, I must help them to develop skills that would enable them to be "engaged thinkers and ethical citizens with an entrepreneurial spirit" (p. 3) as described by Alberta Education (2013). With a push towards developing 21st century competencies in education, I began to explore the ways in which these skills can be fostered in my students. The use of PBL within the classroom "challenges students to "learn to learn"" and encourages students to "take on active learning strategies and adopt a self-directed learning disposition" (ERIC, 2001, p. 2). These skills will promote success when they enter the working world. However, the process of implementing PBL has many challenges. It became my goal to develop a resource that would help teachers promote student success and address some of the challenges they would be faced when using PBL.

Overview

Project based learning is not a new concept in education. It has been a successful instructional approach for over 30 years and has built a foundation in medical education (Savory, 2006). More recently, PBL is gaining popularity in a variety of pre-professional disciplines and is now becoming a focus for K-12 education systems (Edmonton Catholic School Board, 2013; Ertmer & Simons, 2006). There are many benefits to using PBL in the classroom. Murray and Savin-Badem (2000) highlight that PBL is a "powerful means for facilitating students' attainment of high-level competencies and transferable skills" that are being increasingly "demanded by government, commerce, and industry" (p. 108). In 2013, the Alberta Government issued a ministerial order that stated students were to be taught in a way that would enable them to "know how to learn," "think critically," "identify and solve complex problems" along with

several other competency based skills (p. 1). PBL has the potential to meet each of these new

educational mandates. Two general goals of PBL are to "promote deep understanding of subject

matter content" and to "develop students' higher-order thinking" (Murray & Savin-Baden, 2000,

p. 109). Licht (2014) also highlights the fact that PBL is essential in teaching students "critical

thinking, communication, collaboration and creativity" (p. 51). In regards to the Ministerial

Order on Student Learning (Government of Alberta, 2013), PBL presents a methodology that can

be used to teach students the skills required for "21st century learning" (p. 1).

　　　　While the benefits of implementing PBL are evident in the research, there are still issues

to be addressed regarding its implementation. Current research reveals a vague differentiation

between project based and problem based learning, often combining them as the same thing.

The need for clarity within PBL is an issue that needs to be explored and addressed. A second

more pressing issue is the lack of student preparation for PBL. Baron et al. (1990) express the

concerns over the struggle students experience with PBL as a result of not having the skills

required to be successful. Although students currently lack the skills needed for PBL, they are

becoming the focus of educational shifts. Both the Alberta Government (2013) and the

Edmonton Catholic School Board (2013) have initiated changes that work towards teaching

"competencies" instead of "content" (p. 1). These issues, along with the shifting focus of our

current education system, will be further explored in the next chapter.

　　　　The main issue discussed in this paper is the lack of student preparation for PBL and how

to assist teachers in addressing this issue. Students are currently being taught in traditional,

teacher-directed classrooms that demands little inquiry on behalf of the students. As a result,

when students are put into self-directed learning situations they struggle with the responsibility

of performing inquiry activities on their own (Kirschner et al., 2006). Thus, it is necessary for

teachers to develop these skills before demanding them from their students. Scaffolding is an effective way of ensuring students are successful in PBL. It provides them with supports in a variety of forms to help increase skills level and promote success throughout the PBL process (Greening, 1998).

Purpose

This project will focus on reviewing the literature on PBL and the benefits it has for developing students' 21st century competencies. It will examine research supporting the positive outcomes of using PBL in the classroom. After looking at the benefits of PBL, it will then go on to explore some of the challenges that teachers face when trying to implement PBL within their classrooms. Once the issues have been unfolded, the paper will focus on one of the major issues identified with PBL.   The focal issue of this paper is the lack of student preparation for participation in PBL. As a result, the project will address the question of how teachers can initiate PBL in a way that encourages student success and enables them to develop the skills required during PBL.

Summary

The positive outcomes of PBL along with the challenges of implementation have been summarized in this chapter. It has offered an overview of what will be explored throughout the paper and presented the research problem that will be addressed in the closing chapters. The next chapter will focus on a review of the literature based on PBL. The skills developed through PBL will be reviewed along with the current issues associated with its' implementation. The following chapter will focus on presenting a rubric to help teachers initiate PBL in their classrooms and optimize student success. The final chapter will discuss my personal experience throughout graduate studies.

Chapter 2: Review of the Literature

As our society experiences rapid changes in the advancement of technology and information, it becomes necessary for our education systems to evolve to meet the new demands of this evolving society. The Alberta government has introduced a ministerial order to implement curricular redesign in Alberta that will transform the focus and delivery of education (Alberta Education, 2013, p. 3). In order to promote future success of students in the educational system, the Alberta government is moving towards a system focused on developing students to be "engaged thinkers and ethical citizens with an entrepreneurial spirit" (Alberta Education, 2013, p. 3).

The focus of this paper will be to outline the current need for shift in curriculum and delivery within the education systems, specifically looking at Edmonton Catholic School District. I will do this by examining the following areas:

1) Curricular shifts in education: moving from the traditional delivery methods to 21st century focused instruction

2) Edmonton Catholic School District response the Alberta Ministerial Order for Student learning.

3) PBL as a shift and the current research on PBL

4) Moving towards change: the pedagogical shifts of School Boards, teachers and students.

Curricular Shifts in Education

In this section I will focus on the shift from the traditional teaching model to one that is focused on 21st century competencies. I will examine why there is a call for changes to our

educational systems and the direction in which the Alberta government would like to proceed along with how the Edmonton Catholic School District is responding to this change.

Traditional Curriculum Model

When the term classroom is brought up, it is most often thought of as a "large-class, instructor-driven, lecture-based" (Strobel & van Barneveld, 2009, p. 46) environment. The traditional classroom model is one where the teacher is the "knowledge source" (Rosenfeld & Rosenfeld, 2006, p. 386) and the students are recipients of that knowledge (Edmonton Catholic, 2013). Teachers are most often seen as "experts" in their fields and are necessary for delivering the "fundamental concepts" of the educational curriculum (Dahlgren et al., 1998, p. 442). Within a traditional classroom it is very common to see the focus of the lesson on the teacher delivering information while the students are expected to retain what is being presented to them. It is rare that students are expected to engage in problem solving situations that are relevant to their current situations (Camp, 1996). Thus, there has been a demand for a redesign of education to meet the demands of our current society.

A Need for Change

Education is a continually evolving entity. As society advances through a constantly changing digital era, Canadian education must change to meet the new demands of our society. The C21 Committee is a non-profit organization that was created to advocate for 21st century learning in the Canadian education system (C21 Canada, 2011). Alberta Education is seeking to educate students for the world of tomorrow. As a result, classrooms will begin to see the effects of these changes to educational goals. Classrooms will need to adjust to support an environment that puts

a greater emphasis on education than on the school; on the learner than on the system; on

competencies than on content; on inquiry, discovery and the application of knowledge

than on the dissemination of information; and on technology to support the creation and

sharing of knowledge than on technology to support the teaching (Government of

Alberta, 2013, p. 2).

It becomes the responsibility of each school district to adopt this new direction in education and

find a way to implement it within their schools.

Edmonton Catholic Schools and the Ministerial Order

Edmonton Catholic School District has embraced the need to transform the goals of

education and has started the process of engaging their students in "21st Century learning

opportunities" (Edmonton Catholic, 2013, p. 2). Students will be prepared for the future by

"developing competencies of engaged thinkers" through the use of "student-centered teaching

approaches" as teachers shift their pedagogies towards "student-centered learning" (Edmonton

Catholic, 2013, p. 2). Using the Ministerial Order for Student Learning, Edmonton Catholic

Schools has outlined eleven pedagogical shifts that were to be the focus for transformation

motivations throughout the district. The shifts involve moving from a traditional "student as

recipient" (Edmonton Catholic, 2013, p. 2) model to a model that is focused on student

competencies, higher level thinking skills, and differentiation and personalization of learning

(Edmonton Catholic, 2013). Each of the shifts outlined by the Edmonton Catholic Schools can

be seen in Figure 1. The shift I will be focusing on is the aim to develop students as self-directed

learners (SDL) through the process of project based learning (PBL), which will be discussed in

the next section.
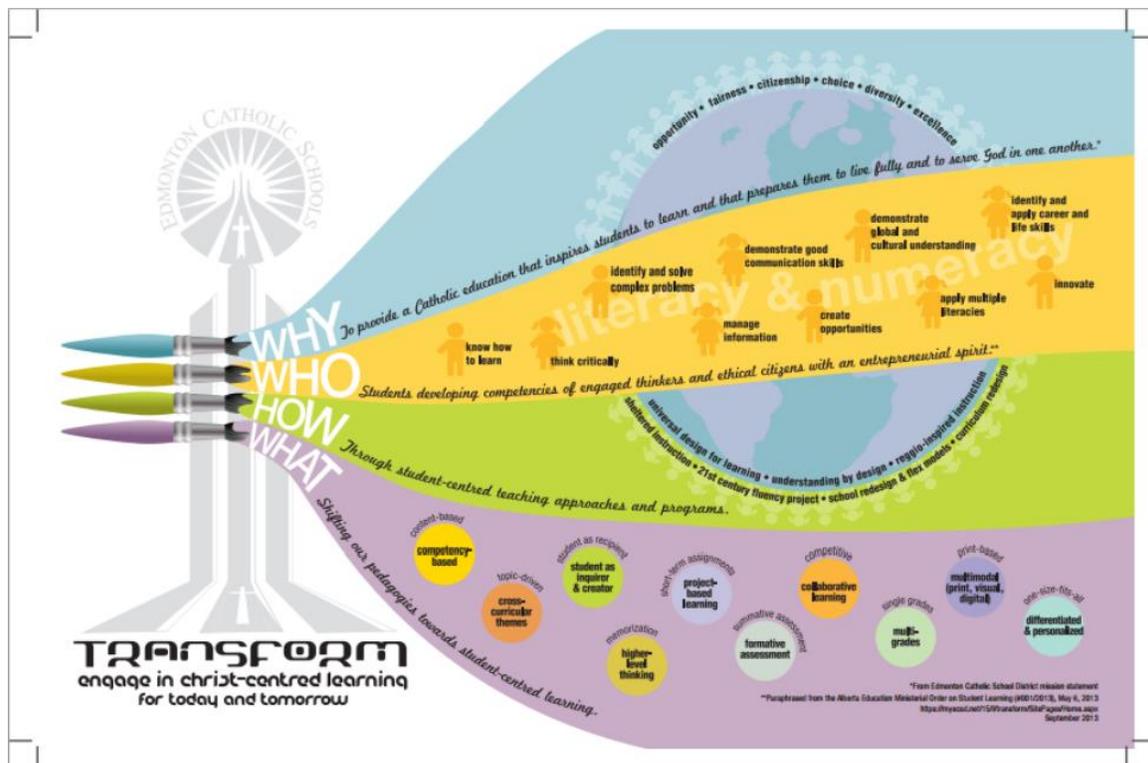
Figure 1. Edmonton Catholic Schools Transform!

       Edmonton Catholic School District has highlighted the use of PBL as a main shift to be

focused on throughout their Transform Initiative (2013). The idea behind this is to move away

from traditional, teacher-lead classroom structures and enable students to take control of their

own learning. Students will no longer be seen as "recipients of information" (2013, p. 3), rather

they will become the "producers" of knowledge and will be able to communicate what they have

learned using a variety of multi-modal techniques. The Buck Institute for Education emphasizes

that PBL is capable of developing within students "process skills" that will enable them to

"navigate their rapidly changing world" by putting equal emphasis on "academic learning goals

and on the competencies students need more than ever in the 21st century" (BIE, 2013, p. 5).

What is PBL?

       Both project based learning and problem based learning fall under the heading of PBL.

When searching for information on PBL both terms are discussed and explored as a method for

engaging students in student-directed learning. Differentiating between the two may difficult

based on the research that is being read. As Kolmos (1996) states, "it can be very difficult to

define and compare" project- and problem- based learning as "what one institution practices as

problem-based learning may look very much like what another institution practices as project-

based learning" (p. 141). Both project and problem based learning are "organized around a

driving question" (Blumenfeld et al., 1991 as cited in Barron et al., 1998 p. 273). However,

project-based learning tends to focus more on "the doing of an activity" and problem-based

learning focuses more on "the underlying conceptual knowledge" of performing such a task

(Barron et al., 1998, p. 274). Based on the policy shifts within Edmonton Catholic, the focus is

on project-based learning. The goal of this shift is to place students in situations where they

become "engaged learners" that are not only "communicating" their knowledge, but are also

"producers" of artifacts representing what they have learned (Edmonton Catholic, 2013). Rather

than having students complete multiple, short-term assignments that have little depth to them, the

Edmonton Catholic School District is moving towards long-term projects that require in-depth

knowledge to create (2013).

PBL is an ideology that has long been centered in constructivist pedagogy.

Constructivism "recognizes the importance of individual meaning making and makes it a central

aspect of pedagogic practice" (Hein, 1999, p. 16). The main focus of this school of thought is the

belief that "understanding is a construction that is unique to the individual" (Greening, 1998, p.

5) and is achieved through "experience and reflecting on that experience" (Richardson, 1997, p.

97). As a result, PBL was developed as a way to engage students in their own learning through

creating experiences that require the development and application of knowledge to understand

novel situations. The most common use of PBL is in the medical faculties in universities. PBL

was used to move away from "memorization" and focus on real-world situations that required

"problem-solving and critical thinking skills" (Savin-Baden & Major, 2004 as cited in Ge et al.,

2010, p. 30).

There are many definitions found in research used to describe PBL; either as project-

based learning or as problem-based learning. Blumenfeld et al. (1991) define PBL as "a

comprehensive perspective" that is focused on "engaging students in investigation" (p. 371).

They highlight the need for students to be involved in the learning process by seeking out the

solutions to problems presented, asking questions and formulating hypotheses, and drawing

conclusions (Blumenfeld et al., 1991). The Buck Institute for Education (2013) goes into even

more detail by defining project-based learning as "a systematic teaching method that engages

students in learning knowledge and developing 21st century competencies through an extended,

student-influenced inquiry process structured around complex, authentic questions and carefully

designed products and learning tasks" (p. 5). Both definitions emphasize the importance of

creating student engagement and creating the need for inquiry within the student.

The focus of PBL is to form an educational environment that is centered on the learner

(Grant, 2002). By creating this type of learning atmosphere, PBL is able to obtain the goal of

creating self-directed learners (SDL) (Dahlgren, 1989), implying that learners play an active role

in "planning, monitoring and evaluating the learning process" (Dolmans et al., 2005, p. 733).

The process of PBL "affords authentic learning tasks grounded in the personal interests of

learners" (Grant, 2011). Barron et al. (1998) summarized PBL (including both project and

problem-based learning) as helping students to acquire both "content and skills" while also

becoming "aware of learning activities" that would enable the students to "take more

responsibility and ownership of their learning" (p. 273).

By implementing this paradigm shift into classrooms, students will come to understand that "learning is an ongoing process and there will always be new issues to be explored" (Duch et al., 1991, p. 2). Students will develop the skills to become "life-long learners" that are able to adapt to new situations and devise solutions when presented with novel problems. As Hmelo-Silver (2004) describe it, PBL serves as a way to "guide learners to develop an extensive and flexible knowledge base" the will enable them to become "intrinsically motivated learners" that understand the value of continually developing their knowledge base (p. 32).

Despite the obvious and interesting positives around PBL, there is also a need to visit the research around its efficacy in the classroom. In the next section I will examine the issues that arise when attempting to implement PBL into everyday classrooms.

Theory on PBL

Blumenfeld et al. (1991) stress the importance of tasks and environment and the critical role they play in learning. Project-based learning ensures that students are immersed in their own learning through task-oriented problem solving that incorporates the environment around them. This idea of learn-by-doing has been around since John Dewey since the early 1920s (Licht, 2014). Since then, much research has been done to illuminate the positive impact that project-based learning has on education. Grant (2011) states "the potential benefits of project-based learning are substantial" (p. 39). These potential benefits only seem to increase as we apply PBL to the educational systems today. Project-based learning seems to be a perfect fit for meeting the challenges that our students are expected to face as technology and knowledge increase exponentially. Licht (2014) states the PBL is "essential" to teaching the 21st century skills of "critical thinking, communication, collaboration, and creativity" (p. 51). The Edmonton

Catholic School District (2013) also supports this theory that PBL serves to provide our students with the skills needed to help them succeed in the 21st century.

Research on PBL

The theoretical and actual benefits of PBL have been documented through various research studies in a variety of fields. PBL is being used in the university faculties of "Science, Medicine, Engineering," and throughout "K-12 school systems" (Camp, 1996, p. 2). For example, Camp (1996) highlights if this was a study tell me because it reads as an opinion that focusing on goals "broader than the acquisition and application of content" (p. 1) fostered more positive learning attributes of learning in students" (p. 2). Students showed a deeper "understanding of the application of their knowledge in practice" and were able to address the "complexities of other issues" related to practical application once PBL had occurred (Mills & Treagust, 2003, p. 12). Camp (1996) found corroborating evidence showing that PBL helps students to better "transfer concepts to new problems" (p. 3). Evidence also shows that students that participate in project-based learning are able to "retain knowledge much longer than students taught conventionally" (Camp, 1996, p. 3). When it comes to creating students that are skilled in self-direct learning, studies have shown that PBL has a large impact on developing and increasing these skills, along with motivation (Camp, 1996). Evidence shows that students become more "highly motivated to learn" during PBL than in "lecture-based programs" (Sadlo, 1994 as cited in Murray & Savin-Baden, 2010, p. 111). As students increase their motivation, they are able to substantially increase their knowledge base through "increasingly self-directed study" (William & Shelagh, 1993, p.26).

Based on both opinions and research, PBL appears to be the ultimate solution to satisfying the need to create competent 21st century learners. However, there are still many

questions left unanswered when it comes to successful implementation of PBL in the classroom

setting, especially at the K-12 levels. The following section will discuss the issues of PBL and

what more is needed both in the research and in the classroom.

Why is PBL a problem?

The majority of the research on PBL focuses on success stories or the possible benefits of

using PBL in educational systems. Even though the potential benefits are substantial, moving

towards PBL is challenging. Research on PBL can be unclear and "limited" when it comes to

implementation (Murray & Savin-Baden, 2000). There are two major issues that can be

identified when examining the research on PBL. The first issue is the lack of clarity between

problem- and project- based learning. Hmelo-Silver (2004) brings to attention the second major

issue associated with learning through project-based learning. She identifies the fact that PBL

"emphasizes that learners are actively constructing knowledge" and that they have the skills to

do so (p. 239). As a result, there is a transformation of student and teacher roles (Hmelo-Silver,

2004). This section will focus on these issues that arise when trying to implement PBL into the

learning environment.

Confusion with wording. One of the major defining problems of moving towards PBL

in the classroom is the unclear definition of what PBL is and what it entails. Throughout the

research in this area, problem-based and project-based learning are used interchangeably. Barron

et al. (1998) have gone so far as summarizing both problem and project-based learning research

into one category2014, failing to differentiate between the two forms of student learning. They

have proposed the idea that the terms project and problem can both be used to describe PBL with

little to no distinction between them. As teachers strive to incorporate this new educational

paradigm into their classrooms, they are forced to navigate a variety of information that is

unclear and fails to provide details significant to the implementation of PBL in the classroom.

      The Need for Clarity. Clarity in PBL is significantly lacking when it comes to defining

problem and project based learning. In order for this shift in thinking to be successful, clarity is

crucial.   Perrenet et al. (2000) identify the similarities between problem and project- based

learning noting that both are "based on self-direction and collaboration" and both have a

"multidisciplinary orientation" (p. 345). These two similarities are very broad and leave many

questions unanswered. While Mills and Treagust (2003) attempt to differentiate the two

definitions by stating that project-based learning focuses on the project as the "dominant

activity" with students accessing content "when required" and the teacher remaining in control

for the majority of the process (p. 11). They go on to say that problem-based learning allows

students to "control content, delivery and interaction" (p. 11) with the teacher only determining

the project or problem (Mills & Treagust, 2003). Grant (2011) states that the "production of a

learning artifact" is the only thing that "distinguishes project-based learning from problem-based

learning" (Helle, Tynjala, & Olkinuora, 2006, p. 291 as cited by Grant, 2011). While Grant states

that the only difference is the production of an artifact, the previous two research papers focus on

the influence the instructor has throughout the process.

      Looking at these attempts to differentiate between the two terms and processes causes

even more confusion when referring back to the competency shifts outlined by Edmonton

Catholic. The goal of using project-based learning in the classroom is to move away from

teacher-centered content delivery and allow students to take control. Looking at the definition

outlined by Mills and Treagust (2003), project-based learning does not meet this objective the

same way that problem-based learning would. As a result, this lack of specificity in terminology

causes confusion on whether teachers are actually meeting the goals of transform.

Lack of student preparation

Most of the research on PBL focuses on the desired outcomes of implementing a PBL

program. Many discuss the skills that can be developed when PBL is successful, but few

mention the skills that students must already have in order to succeed. Barron et al. (1998)

describe the "difficulty of implementing such instruction in the classroom" as students struggle

to employ the skills needed to solve the driving question (p. 276).   Trying to implement PBL at

an early age can create issues. "Evidence has shown that PBL presents a challenge to novice

learners" as the introduction of vague problems may "generate a heavy load on students'

working memory due to their lack of proper schemas to integrate new information with their

prior knowledge" " (Ge et al., 2010, p. 31). PBL often leaves students "on their own to explore

and figure out problems with minimal guidance from instructors" (Ge et al., 2010, p. 30). The

majority of students have been raised in a traditional classroom and have been recipients of

knowledge, not generators. They have not been sufficiently prepared to become the directors of

their own learning. Blumenfeld et al. (1991) stress that "students need to have sufficient

knowledge of the content and specific skills to explore information" in order to be successful in a

PBL environment (p. 378). Most students experience difficulty trying to understand why they are

not "simply being told the information which teachers want them to know" (Greening, 1998, p.

5) and struggle to connect what they need to know to what they already know.

A shift in focus

William and Shelagh (1993) summarize a major issue of PBL perfectly by stating that it

"turns instruction topsy-turvey" (p. 26). As discussed previously in this paper, one of the goals

of PBL is to guide students towards self-directed learning (Dahlgren et al., 1989). This involves a major "paradigm shift" (Camp, 1996, p. 1) for many professional educators. Teachers are forced to assume "new roles" (William & Shelagh, 1993, p. 26) in the educational process. Similarly, students are no longer passive recipients but are expected to play and active role in the learning process and become responsible for "actively constructing" and "reconstructing their knowledge networks" (Dolmans, 2005, p. 732). The traditional lecture-based education model is forfeited in place of a new model that places both teacher and student in unfamiliar territory.

Despite the negatives that I have highlighted in this section, the Edmonton Catholic School District continues to push towards implementing PBL in the classroom as one of their shifts towards "student centered learning" (Edmonton Catholic, 2013, para. 3). As a result of this push, there will be a major shift in how education is delivered and in those who go about delivering it. In the next section I will discuss the effects of implementing PBL on the pedagogical views of school boards, teachers, and students.

Moving Towards Change

Implementation of 21st century learning into the classrooms will result in changes at all levels of the educational system. Previously held beliefs regarding teacher instruction and student learning will need to be transformed as new methodologies are introduced into the classroom. Not only will students and teachers experience pedagogical shifts, but school boards will also be forced to alter their previously held ideologies on learning. In this section I will look at the three levels within the education system that will need to adjust their pedagogical views in order to facilitate the PBL process.

School Board Pedagogical Shift

As Alberta Education calls for instructional methodologies aimed at developing 21st

century competencies, schools boards are forced to implement new policies to meet these

demands. It can no longer be the case that we find "one instructor implementing PBL" in the

classroom (De Simone, 2008, p. 181). Rather, it must become wide spread throughout the

district. This forces school districts to rearrange their pedagogical stance when it comes to

curriculum delivery and assessment. In an informal response to the changes in school delivery

models, Anne Fierheller (2015) states "professional learning communities (PLCs) have been

asked to transform which has eliminated the "top-down" implementation model and enables

teachers to make decisions regarding school policies". This change to education is giving

teachers the freedom to govern their own classrooms and deliver content using the

methodologies of their choosing. It is also a drastic change from the traditional model of

administration dictated policies that educators are forced to follow.

Teacher Pedagogical Shift

As Camp (1996) stresses, moving towards a true PBL model forces teachers to undergo a

"paradigm shift" (p. 1). Greening (1998) discusses how PBL results in "wide-ranging changes to

the values of traditional education, and cannot be realistically applied "on top of" existing

infrastructure" (p. 10). A major issue with implementing PBL in the classroom is the need to

simultaneously change methods of instruction and assessment while also changing curriculum

(Barron et al., 1998). With PBL, teacher roles move from one of delivering information to one of

"facilitating learning" (Dahlgren et al., 1998, p. 439). Teachers are forced to re-examine their

pedagogical views as the ideology behind PBL "conflicts with deep seated teacher beliefs"

(Rosenfeld & Rosenfeld, 2005, p. 386).

This confliction of "innovative pedagogy" and personal beliefs can give rise to conflicts that are difficult to resolve. Dahlgren et al. (1998) describe the struggles some teachers experience when they feel their expertise was not being fully utilized as a result of not using traditional lecture styles. PBL requires teachers to adopt a "learning perspective" and focus on the "students' learning process" (Dahlgren et al., 1998, p. 441). They need to truly believe that students are capable of adapting a "deep approach to learning" while also acquiring "an attitude that is conducive to deep learning" (Dahlgren et al, 1998, p. 441).

One major obstacle most educators need to overcome is their need to teach as much information as possible in a given amount of time. According to Dahlgren et al. (1998), many teachers believe that PBL lacks in breadth of information and that they were unable to cover as much material as a traditional lecture-based style. Murray and Saven-Baden (2000) highlight the shift in pedagogical thinking of moving from quantity in education to quality. Teachers need to move from the mind set of being "suppliers of legitimate knowledge" (Murray & Saven-Baden, 2000, p. 117) to seeing themselves as being a "facilitator" in knowledge acquisition (Rosenfeld & Rosenfeld, 2005, p. 386). Traditional pedagogy is challenged when PBL is implemented in the classroom and teachers are forced to question their educational beliefs. This creates a struggle within as teachers try to adapt to a new way of looking at education while also trying to meet the educational needs of their students.

Student Pedagogical Shift

Teachers are not the only ones experiencing a complete shift in roles. Students are forced to take on new responsibilities for their learning that they have never had before. Self-directed learning can prove "particularly difficult" for learners when it comes to "applying metacognitive strategies" (Linn & His, 2000, as cited by Hmelo-Silver, 2004, p. 260). Rather than participating

in traditional "didactic teaching and learning experiences" (Grant, 2011, p. 50), students are now expected to be "responsible for their own learning" and employ "reflective, critical thinking skills" (Bereiter & Scardanakua, 1989). Furthermore, this means that students need to "be aware of what knowledge gaps" they have in order to understand what information they need learn (Dalgren et al., 1998, p. 438). They can no longer rely on "merely memorizing facts and right answers" to succeed in the classroom (Murray & Saven-Baden, 2000, p. 110). While Licht (2014) describes PBL as allowing students to take control of their learning and enabling them to grow as learners, Camp (2011) stresses that students are "not experiences with the open-ended nature" of PBL. This creates major challenges for students as they "lack familiarity with inquiry learning" and have difficulty identifying "critical issues" (ERIC Development Team, 2001, p. 2).

Conclusion

Through this literature review, I have focused on highlighting the current shift towards PBL within our educational systems. As we proceed through this age of rapidly advancing technology, it becomes necessary for our educational systems to meet the needs of an ever-changing society. As a result, Alberta Education has given directions to move towards teaching 21st century competencies within our classrooms. Although the Edmonton Catholic School District has embraced this shift in curriculum, there are still obstacles to be overcome. There is a lack of clarity when it comes to defining exactly what is meant by PBL. There also exists a struggle to take into account the skills necessary for students to succeed when place in a PBL environment. As well, there is a major pedagogical shift that must be overcome by the school boards, teachers and students. PBL has been shown to be a valuable resource for deep and meaningful learning in the classroom but there is still much to learn about it.

The next chapter will discuss the need for teacher resources to help increase student success in PBL. It will focus on a rubric that will provide teachers with an understanding of student skill and thus enable them to develop proper scaffolds to support student learning throughout the PBL process.

Chapter 3: Implementing PBL in the Classroom

Research has shown PBL helps students develop a variety of valuable 21st century competencies. Hmelo-Silver (2006) discusses how PBL helps students develop strong problem solving skills, work productively in groups, and adapt to novel situations. However, there are many obstacles to overcome before it can be successfully implemented in the classroom such as ensuring students are set to up to be successful in PBL. Many teachers have taken on the daunting task of incorporating PBL into their classrooms but fail to "be realistic as they plan for and implement their first few PBL units" (Ertmer & Simons, 2006, p. 50). If success is not immediate, it is common for teachers to give up on PBL and return to a teaching style they are familiar and comfortable with. However, as discussed by Ertmer and Simons (2006) with proper teacher support and resources, I believe that teachers can prepare their students to be successful in a PBL environment and enable them to reap the many benefits PBL has to offer.

PBL demands a range of skills from the learner that are not normally required within a traditional classroom (Wells et al., 2009). For example, students are expected to "become responsible for their own learning" and discover information on their own rather than have it provided or taught to them (Hmelo-Silver & Barrows, 2006, p. 24). By enabling students to cultivate these skills, we are preparing them for the demands of the workforce that they will soon be a part of. However, before success in the workforce students need to find success in the classroom. Thus, it is important that teachers are able to set students up for success by helping them build a solid foundation for these skills through the use of scaffolds. With proper scaffolding, student success will increase and the benefits PBL will be attainable. I feel that teachers need help in the initial stages of PBL implementation in order to know what skills their students are lacking and the extent of scaffolding required.

Project Rationale

A major setback to successful implementation of PBL in the classroom is a lack of student skills needed to successfully complete a PBL unit. This project focuses on how teachers can assess existing student skills and identify skill deficiencies in order to incorporate an appropriate set of scaffolds within their PBL unit. Although PBL encourages students to take control of their learning, it does not mean that teachers need to completely remove themselves from the learning process. One issue is that "new PBL instructors are not always provided with clear and specific guidelines on how scaffolding can be used to achieve successful learning" (Choo, 2012, p. 170). By identifying these lacking skills, teachers will better be able to incorporate the necessary scaffolds needed to develop strong 21st century learners. The ERIC development team points out that "success with PBL largely depends on whether students have been sufficiently prepared to take on certain new roles" in the learning process, "such as those of inquiry seekers and collaborative team players" (2001, p. 3). Thus, teachers need to know how they can support students in taking on these new roles.

The focus of this project is to provide teachers with a resource that will help them in the initial stages of a PBL unit by providing them with a rubric that will assess their students' skills. PBL requires a specific skill set and if students do not have these skills, success will not be possible. Thus, it falls on the teacher to help students develop these skills and they can do that through the process of scaffolding. The ERIC development team defines scaffolding as "a means of coaching students to the extent that they can perform intellectual tasks on their own" (2001, p. 3). Initial PBL units may require extensive scaffolding until students become comfortable with this new style of learning and are able to take more control of their personal learning experience. As the ERIC development team states, scaffolding support can be decreased as skills develop

and students are able to employ "self-directed learning strategies" (2001, p. 5). The process of

scaffolding will enable students to experience success early on in the PBL process and prevent

students from becoming frustrated or disengaged due to lack of understanding or ability.

Discovering the Need for a Rubric

The need to develop a rubric for assessing student skills stemmed from my personal

experience of implementing a PBL unit in my Science classroom. I had received training from

Buck Institute for Education (BIE) on how to develop a thorough PBL unit that could be used in

my classroom. However, I found that even though I had a well-developed plan, implementation

was difficult. As the unit progressed, I found that many students struggled with meeting the

criteria I had set out for them. Basic research proved to be a challenge for many students. They

were unsure of where to find information and how to determine if the information was valid. I

realized that it was necessary for me to provide guidance to help them progress through the

research stage at the level that was needed. After taking time to reflect on the process I had just

experienced, I realized that there were several key components that I had not been prepared to

address. The training I took had helped me establish expectations and learning outcomes for my

students but failed to provide me with a way to help my students meet them. I was not prepared

to address the challenges of shifting learning responsibility from myself to my students.

Greening (1998) states that "in changing from a subject based discipline to an integrated PBL

mode, it is often difficult to anticipate the need for scaffolding" (p. 11). During my training from

BIE, an institution that prides itself on training educators in PBL, there was no mention of

scaffolds or assessing student skills. Greening (1998) goes on to say that PBL "does not

preclude the use of scaffolding to assist in the development" of required skills like "student

independence" and "learner ownership of problems" (p. 6).

As a result of my experience, I began consulting with my colleagues and exploring

current research on successful implementation of PBL. Through this consultation, it became

clear that many of them felt that students were not prepared to be self-directed learners. Many

students did not have the basic skills required to take control of the learning process and engage

in the inquiry process that is required in PBL. As Ertmer and Simons (2006) explain, the shift

from teacher-directed learning to student-directed learning "does not occur naturally or easily"

and often leads to students becoming "disoriented or frustrated if they do not receive the support

or guidance needed to be successful" (p. 44). I realised that I had not been giving my students

the support they needed to be successful as I did not realize it was part of the PBL process. It

became clear to me that just as I needed to support my students, teachers attempting PBL for the

first time also needed support in the form of resources. In order for PBL to be successful in the

classroom "a variety of resources is needed to support both teachers' and students' efforts"

(Ertmer & Simons, 2006, p. 41). As a result, I focused my research on how to provide teachers

with the resources necessary to create a successful PBL experience for their students.

Through the literature I came to the realization that there is a basic skill set required by

students in order for them to be successful in PBL. When consulting with my colleagues, it

became clear that students were weak in the required skill areas or lacked them completely.

Thus, it became necessary for the teacher to be able to develop and strengthen the necessary skill

set through the use of scaffolding. But this prompted the question of "How do I know what skills

my students are lacking and what scaffolds do I need to employ?" My answer to this question

was to develop a rubric teachers can use to assess student skill prior to implementing a PBL unit.

The purpose to designing a rubric was to provide teachers with an outline of skills that

were essential for students to be successful in PBL. The skills that I had identified through the

research were: communication (Greening, 1998), inquiry (Smith et al., 1995), collaboration (Savory, 2006), research (Blumenfeld et al., 2001; Hmelo-Silver & Barrows, 2006), and activation of prior knowledge (Green, 1998; Choo, 2012). The rubric design rates each skill on a 1 to 4 level. Each skill is defined with a general description of what the skill would look like at each level. Later in this section, the rubric will be broken down and each skill explained along with suggestions of how to assess the skill. The actual rubric can be found in the appendices. The rubric is designed to help set teachers up to provide the proper level scaffolding for their students.

Need for Scaffolds

There is often the misconception that since PBL focuses on having students take responsibility for their learning (Savory, 2006) that teachers are to remove themselves from the learning process. Greening (1998) addresses this misconception by stating that although PBL emphasizes "student independence and learner ownership of problems" it "does not preclude the use of scaffolding to assist in the development these attributes" (p. 6). As seen in the previous section, students will not necessarily have the skills required to be successful in a PBL environment. But that does not mean that they are unable to develop those skills as they proceed through a PBL unit. Hmelo-Silver (2004) discusses the importance of the teacher acting as a 'facilitator' in the learning process, meaning the teacher is still involved but guides the process rather than controls it. Facilitating student skill development in PBL can take on the form of scaffolding.

Definition of Scaffolding

Instructional scaffolds "refer to the tools, strategies, or guides that enable learners to reach higher-levels of understanding and performance than would be possible without them" (Wood, Bruner, & Ross, 1975 as cited in Ertmer & Simons, 2006, p. 44). Teachers can use a variety of resources to help initiate or strengthen skills that are required for any given problem. Scaffolds

can take on the form of soft or hard scaffolds. Soft scaffolds refer to how the teacher "responds

to the learner's efforts or learning needs" and how the teacher acts within the classroom (Choo,

2012, p. 172). This type of scaffolding is "dynamic" (Ertmer & Simons, 2006) and depends on

human interactions (Choo, 2012). Soft scaffolds mostly come in the form of support from the

teacher and collaboration with peers. Hard scaffolds are "static supports" that can be developed

in advance by "anticipating learner difficulties" (Choo, 2012; Ertmer & Simons, 2006). These

scaffolds include handouts and worksheets or the use of technology to help explore certain

concepts (Choo, 2012). The use of both hard and soft scaffolds are "critical components in

successful completion of student-centered learning activities" (Ertmer & Simons, 2006, p. 45).

Why Scaffold?

Scaffolding is critical to the PBL process. It is needed to help students develop skills that are

required to complete tasks and to gain independence in their learning. Teachers need to "help

students become aware of and examine their own conceptions" and help them "develop and use

learning strategies" (Blumenfeld et al., 1991, p. 383) before they can expect students to do it on their

own. Choo (2012) stresses that sufficient supports to scaffold student learning must be provided in

order to ensure that students have "acquired the essential knowledge" (p. 169) and understand the

concepts being covered. It has been shown that when the learning process is supported by scaffolding

"students perform better, achieve more, and transfer problem-solving strategies more effectively"

(Ertmer & Simons, 2006, p. 50). The level of scaffolding can be adjusted according to student skill.

The weaker students are, more structured and guiding the scaffolds need to be. Blumenfeld et al.

(1991) state that it is "especially critical" to scaffold for "students who are not proficient in using

thinking strategies" (p. 385). When scaffolding is used effectively, students are able to develop the

skills to become more independent in their learning and take on the responsibility of acquiring

knowledge on their own. As students progress in their abilities, teachers can slowly diminish the amount of scaffolding they provide (ERIC, 2001; Hmelo-Silver & Barrows, 2006).

Unpacking the Rubric

After a systematic examination of the literature, I have developed a rubric identifying five essential skills required for students to be successful in PBL. With the rubric teachers can identify which skills their students have and rate their ability in that skill using a numerical scale. The higher a student scores on the scale, the more capable the student is in using that skill. After assessing each skill, the teacher will then be able to determine which skills need to be scaffolded and the extent to which scaffolding is required. The five essential skills needed for student success in PBL are:

1. Communication: the ability to share what one has learned in a clear and coherent way (Savory, 2006).

2. Inquiry: the ability to analyse, evaluate and apply knowledge to the problem at hand (Smith et al., 1995)

3. Collaboration: the ability for students to work together to generate and share information and develop solutions to a problem (Savory, 2006; Hmelo-Silver & Barrows, 2006)

4. Research: the ability for students to explore and access critical information that is relevant to the problem (Blumenfeld et al., 1991).

5. Activation of Prior Knowledge: the ability to connect prior learning to new information and applying it to solve the current problem (Greening, 1995; Choo, 2012)

This section will focus on defining each skill and explaining why it is a necessary skill in PBL.

Essential Skills

Moving from a traditional teacher-directed learning environment to a PBL environment has many benefits for students but also creates a large hurdle for both teachers and students to

overcome. Students are now required to "take on active learning strategies and adopt a self-directed learning disposition" (ERIC, 2001, p. 2) which is a drastic change from their previous experiences. This new style of learning is challenging for students as they "find it difficult to cope when asked to transform into active critical thinkers" (ERIC, 2001, p. 2) rather than retainers of knowledge. Taking an active learning stance and engaging in critical thinking requires a skill set that is not normally exercised in the traditional teacher-directed classroom. Each of the following skills is essential in order for students to experience success in a PBL environment.

Communication

Communication is defined as "a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior" (Merriam-Webster, 2015). Communication takes on both written and verbal forms during PBL. Students must be able to communicate with their peers and with their teacher in order to share their learning and understanding of the concepts being discovered. Savory (2006) stresses that "it is essential that each individual share coherently what he or she has learned" during the process and be able to express "how that information might impact developing a solution to the problem" (p. 13). Hmelo-Silver & Barrows (2006) also emphasize the importance of communication skills in helping group members "negotiate shared meaning" of information related to the problem at hand (p. 31). If students are unable to communicate what they have learned, they will be unable to progress through the stages of the PBL process. Duch et al. (2001) also express the need for students to be able to "demonstrate versatile and effective communication skills, both verbal and written" (p. 6) in order to share information with their peers.

Since communication is an "essential principle of PBL" (Greening, 1998, p. 2), teachers need to ensure that students have adequate written and verbal communication skills before initiation a PBL unit. Teachers can use the rubric I have developed, with minor adaptions from an existing rubric on inquiry, to assess the levels of each PBL skill required. Specifically, teachers can refer to Figure 2 for a sample of the rubric used to assess student communication skills. The rubric is separated into four levels to assess student skills and uses general descriptors to help teachers perform their assessment.

Skill	1	2	3	4
Verbal Communication: Focuses on the ability of the student to transfer information in a clear, concise way through speech.	Student works alone and does not participate in verbal discussions. Students has a difficult time expressing thoughts or finding the right words to answer questions.	Student is able to form simple verbal answers to questions and express thoughts. Student will rarely ask for help or discuss topic with peers.	Student can express ideas using full sentences and uses clear language. Thoughts and ideas are directly related to the topic being studied. Student is able to formulate questions and share new ideas with peers.	Student is able to engage in rigorous verbal interaction with others specific to subject being studied. Can express complex thoughts using clear and concise language. Is able to describe complexities of subject through generalizations, questions, and making distinctions. Student can verbally demonstrate a deep understanding of topic.

Figure 2. Communication Rubric

Teachers can draw on previous student work in the classroom and in group activities to determine which descriptor best fits each student. One way a teacher can assess student verbal communication skills is to ask the student to summarize a concept being taught in the class (Hmelo-Silver & Barrows, 2006). The extent to which the student can clearly and coherently describe their learning process and understanding of the concept will help identify the skill level of the student. For written communication the teacher can refer to student responses on assignments, looking for clear writing and the ability to effectively use writing conventions to express their understanding.

Inquiry

The ability to engage in the inquiry process during PBL is important. PBL requires "the evaluation, integration and critical analysis of information relevant to the problem" (Smith et al., 1995, p. 151). Inquiry skills can be summarized as the ability to formulate questions that will lead to meaningful discovery of important information. It involves "the ability to think about problems and be prepared to attempt to solve them in a rational manner" (Smith et al., 1995, p. 151). Inquiry skills also include the ability to identify critical concepts and determine what information is missing and what more needs to be learned. Many students are challenged when it comes to initiating the inquiry process on their own and "often find it difficult to identify critical issues" (ERIC, 2001, p. 2). Since PBL is shifting the responsibility of learning to the student, students need to be able to "propose the areas in which they may need to find out more in order to solve the problem" (Choo, 2012, p. 169). The inquiry process in PBL requires students to assign themselves tasks to acquire knowledge "on the basis of what needs to be known to solve the problem" (Smith et al, 1995, p. 149). Thus, students must be able to understand how to ask questions and highlight information they need to learn. Figure 3 provides general descriptors to help teachers rate their students' inquiry abilities (adapted from Harlen et al., 2003).

Inquiry: Focuses on the ability of a student to ask questions and gather information that is relevant to the topic being studied. It also includes the ability of the student to identify missing information.	Student is unable to summarize the issue or formulate a question about chosen topic. Student cannot identify missing information. Is unable to develop a theory or hypothesis related to issue.	Student is able to summarize issues in a simple way but struggles to formulate questions about the topic. Student can identify basic missing information but is unable to identify key details. Student can form a simple theory related but fails to incorporate important information.	Student can clearly and precisely formulate vital aspects of the issue and identify relevant information that is missing. Student can formulate questions specific to solving the issue presented. Student can develop theories and hypotheses based on information relevant to the issue.	Student identifies integral relationships when formulating vital aspects of the issue. Student is able to analyze information essential to the issue while formulating questions to discover pertinent information. Student exemplifies strong questioning skills by demonstrating coherent working theories and examining a variety of viewpoints and assumptions.

Figure 3. Inquiry Rubric

Student understanding of the inquiry process needs to be assessed as students are

generally "unfamiliar with different stages of the inquiry process" (ERIC, 2001, p. 2). To prevent

students from becoming frustrated and giving up early, assessing skill levels will help in

determining the level of scaffold needed to promote success with inquiry. Ertmer and Simons

(2006) noted that scaffolds can be used to help "initiate students' inquiry skills" (p. 45) and assist

them in developing the necessary questions. One way to assess student inquiry skills is to have

the student generate a hypothesis regarding the specific concept that is being learned. This

forces students to "focus their inquiry" and helps the teacher to observe the student's

understanding of what needs to be discovered (Hmelo-Silver & Barrows, 2066, p. 32). Students

can be further assessed by having them generate questions about the problem. The teacher will

be able to identify whether students are asking questions relevant to what they need to know and

the depth of their questioning abilities.

Collaboration

The importance of collaboration skills is stated repeatedly in the research. Savory (2006)

stresses the importance of collaboration in PBL by stating "collaboration is essential" for a

successful PBL experience (p. 13). Ertmer and Simons (2006) also emphasize that

"collaboration is a key component of PBL learning environments" (2006, p. 42). Thus, it is

crucial that students are able to work effectively as part of a group. Collaboration involves the

ability of students to "share information and work productively with others" (Savory, 2006, p.

13) in an effective manner. They must be able to work with their peers to complete tasks

relevant to the project and to share information. Collaboration is important as "student learning

occurs as students collaboratively engage in constructive processing" (Hmelo-Silver & Barrows,

2006, p. 24). Working as part of a group is the foundation of acquiring knowledge about the

problem at hand. Student collaboration skills need to be evaluated prior to initiating a PBL unit

in the classroom. Figure 4 provides a sample rubric that can help assess the ability of students to

work in groups.

Collaboration: Focuses on the ability of the student to work with his/her peers in a productive and cooperative way that enables them to complete tasks relevant to the project.	Student fails to interact with peers or connect with others in a team environment. Does not engage in discussions. Will not complete assigned tasks within group.	Student shows minimal participation in group. Barely contributes to discussions or shares ideas. Struggles to get along with group members, puts little effort into tasks assigned by group.	Student shows a good connection with group members. Regularly contributes to discussions and shares ideas. Completes tasks within the group.	Student demonstrates a strong connection with the group and is willing to take on a leadership role. Willingly completes all tasks to the best of their ability and is willing to help others within the group. Encourages group members to contribute and ensures all members are involved in the task.

Figure 4. Collaboration Rubric

PBL depends heavily on students working together in groups to generate knowledge to

solve a problem. In order for students to be successful in completing necessary tasks, they must

"make optimal use of their time and resources when working in groups" (ERIC, 2001, p. 2).

Fortunately for teachers, assessing collaboration skills is relatively easy compared to assessing

the other four skills required in PBL. Students demonstrate their ability to cooperate with their

peers both in and out of the classroom. Teachers can rely on observations of peer interactions

and classroom behaviour to determine how well students are able to focus when working with

others and whether or not they will be successful in a group setting.

Research

Being able to effectively carry out research is the fourth essential skill required in PBL.

Blumenfeld et al. (1991) state that students are responsible for accessing information on their

own and find "examples and representations that will help them understand and use central

ideas" (p. 373). Throughout PBL the teacher is supposed to act as a facilitator (Hmelo-Silver &

Barrows, 2006) rather than a provider of information. Thus, it is important for students to have a

basic understanding of the necessary concepts and "specific skills to explore information

pertinent to the problem" (Blumenfeld et al., 1991, p. 379). Those specific skills include the

ability to look up information that is directly connected to the problem. Students need to be able

to "identify important information" related to the problem to help further guide their research

(Choo, 2012, 169). The information collected must also come from a variety of reliable sources.

To be effective in researching, students need to be able to confirm what they have learned by

looking to multiple sources. General descriptors for assessing student research skills are shown

in Figure 5.

Research: Focuses on the ability of a student to gather relevant information from a variety of reliable sources and reference them appropriately.	Student lacks focus during research and is unable to find information connected to topic. Student does not use sources or fails to cite sources. Student does not provide any facts or information on topic.	Student gathers information but it fails to connect with the topic and is not from valid or accurate sources. Student is unsure of where to get information or how to put information together. Facts are simply restated.	Student has a combination of relevant and irrelevant information. Student only uses a few select sources but is able to cite them. Information is put together in a coherent manner and facts are explained.	Student has collected information relevant to the topic. A variety of sources is accessed and information is compiled in a coherent and focused manner. Facts are supported and are directly related to research topic. Student understands where to get reliable information.

Figure 5. Research Rubric

Student research skills may be the most difficult skills to assess. Until a student has

actually carried out a research project, a teacher has very little evidence available to evaluate.

Teachers can use some basic questions to get a general idea of how well a student can look up

information and whether they understand what a reliable source is. The following questions can

be used to help determine what level a student is at:

1. What is the main idea associated with the problem?

2. How will you answer questions associated with the problem?

3. Where will you get the information you need?

4. How do you know if a resource is reliable?

These are questions that I have used in my previous experiences of implementing PBL in my

classroom. By having students answer these questions I to form a general idea of how well they

could perform research and how I would need to assist them with the research process.

Activation of Prior Knowledge

The ability to activate prior knowledge is listed by Greening (1998) as one of "three

essential principles" in PBL (p. 2). Activation of prior knowledge refers to a student's ability to

recall what they already know and relate it to what they are learning. Being able to make these

connections helps students to better construct new knowledge (Hmelo-Silver, 2004). Choo

(2012) highlights the importance of students being able to identify "concepts learnt in previous

lessons which may be relevant" (p. 169) to the problem they are trying to solve. The process of

relating what they know and what they read helps students to develop strong critical thinking

skills (ERIC, 2001) which is one of the goals of PBL. Being able to access prior knowledge is

also important in driving some of the other skills needed for PBL. Recalling information can

help direct the research process and help students identify what is missing from their knowledge

base (Smith et al., 1995). Figure 6 shows a sample rubric of how teachers can assess a student's

ability to recall information relevant to the problem.

Activation of Prior Knowledge: Focuses on the ability of the student to recall facts and information from previous lessons that are essential to the project at hand. This also includes being able to make connections between new and old information.	Student is unable to identify previous information relevant to topic. Student fails to activate prior knowledge that is required for project.	Student can recall information with prompting and is able to remember basic concepts taught in previous lessons. Student is unable to connect prior knowledge to the project.	Student readily recalls information learned in previous lessons. Student connects prior knowledge to the project with minimal guidance.	Student is able to recall and expand on information covered in previous lessons. Student can make in-depth connections between prior information and the project at hand. Student can readily draw on previous concepts and apply them to novel situations.

Figure 6. Activation of Prior Knowledge Rubric

Assessing students' ability to activate prior knowledge can be done by providing students

with a short quiz or set of questions that focuses directly on what information the students are

required to recall. Evaluating student recall can be done throughout the PBL process as new

information is acquired and can be used to address any misconceptions that are developed

(Ertmer & Simons, 2006).

Although these five skills are critical to implementing a successful PBL unit, they are not

the only skills needed. There are many other skills that are required throughout the PBL process

but they can also be addressed through scaffolding. I have identified these skills as essential

because they play key roles throughout PBL and are especially important as the process is

initiated. If students are not properly supported with each of these skills, it is easy for them to

become discouraged and disengage from PBL. Along with identifying each of these skills, I

have developed a rubric that can be used to assess the levels at which students are achieving

these skills. The rubric was designed based on personal experiences within the classroom and

determining where I believe students should be if they are to be successful on their own. The

inquiry section of the rubric was adapted from an existing rubric on inquiry developed by Harlen

et al. (2003). The rubric can be found in whole in the appendix and used for assessing the ability

of students about to engage in PBL. Regardless of ability, scaffolds can be designed and

implemented for each stage of PBL and help students move towards being successful self-

directed learners.

Conclusion

PBL can be successfully implemented into any classroom given the right supports. By

assessing student skills teachers will better be able to provide the appropriate scaffolds to

promote student independence and ensure knowledge acquisition. Scaffolding can take on many

forms and can vary from highly structured to minimal guidance. When used effectively,

scaffolds can help ensure a successful PBL experience for both teachers and students.

The purpose behind this project is to provide teachers with a starting point to begin planning for scaffolding. The rubric can be used to ascertain the skill levels of students about to partake in a PBL unit. Once skill levels are established, teachers will have a better understanding of how much support is needed for their students to be successful. Through the use of the general descriptors, teachers can assess where their students are at rather than assuming students can perform at needed levels. The rubric is to be used to determine what level of scaffolding is needed for students. Hard or soft scaffolds can be used to help build lacking skills and promote student success in PBL.

Chapter 4: The Graduate Study Experience

Being accepted into graduate studies came as a slight surprise to me. At the time, I was still very new to teaching and was not expecting to be accepted into a program that required an understanding of teaching in the classroom. I chose to apply early in my career, with only two years of teaching experience. Having just recently spent six years in post-secondary school I was not sure if I was ready to jump back into student mode. I was still trying to adjust to teaching in a classroom and was not sure if I was ready to add more work to what I already had to do. However, I believe that it was the best choice I could have made for my professional aspirations. I have built a solid foundation of knowledge based on curriculum and instruction as a result of my MEd experience. Having examined and explored a variety of experts in the field of educational curriculum I was able to expand my understanding of different theories and methodologies. As a result, I feel more comfortable in my role as an educator and feel that I have established direction for my professional aspirations. Throughout this experience, three things have converged to make it meaningful to me:

I.   My personal growth over the duration of the program

II.   My professional growth as an educator in the classroom

III. The government mandated changes that are occurring as a result to changes in society

I will be discussing the importance of these three things throughout this section and providing rational for their importance.

Personal Growth

Before applying for my masters, I had a set goal in mind in regards to my career. My goal was to move into a consultant position with my current school district or to move into a government position that deals with curriculum development and change. When I was presented

with the opportunity to pursue my MEd I saw it as a chance to develop my knowledge in the

areas of curriculum and instruction. I felt that it would provide me with a level of expertise I did

not see as possible to obtain through teaching alone. By furthering my knowledge in the area I

wanted to see change in, I saw it as a way to ensure that I was qualified to be in a position to

make decisions about curriculum and how students are taught. I am still driven to achieve my

initial goals once I have obtained my MEd but my reasons for obtaining those goals has changed

and strengthened as a result of my experiences throughout this journey. Originally, my desire to

move into a government position that would allow me to have an influence on curriculum within

the province or to take on a consulting position that would also influence curricular decisions did

not have a strong basis. Both these career aspirations came from a desire to make a change to

how students learn and access information within the classroom. It was during my transition

from learning about teaching to actually teaching in a classroom that I began to see a need for

change in education. In lectures we were told that we needed to prepare our students for to enter

the working world and that it was our responsibility to provide them with the skills to do so.

However, when I entered the classroom as a teacher I saw that we were doing little to help

develop those skills within our students. Lessons centered on the teacher and gave students few

opportunities to discover on their own. As a new teacher, I saw a large disconnect between what

we were being told and how we were expected to run our classrooms. As I observed this

disconnect, I was unable to pinpoint the types of changes that needed to be made or how they

could be made, I only knew that change was necessary. After spending the last two years

researching and discovering theories on education I now have a clear picture of the changes I

want to see.   I have spent a full year researching project based learning (PBL) and can envision

the changes this will bring to our classrooms. PBL emphasizes building students' critical

thinking skills, collaboration skills and problem solving skills. It turns the traditional lesson on

its head and puts students in charge of their own learning. Students are expected to take

responsibility for their learning and seek out the information they need to solve a problem. The

teacher is no longer the provider of information but instead becomes a facilitator in finding that

information (Hmelo-Silver, 2004). This style of learning changes how students access and

discover new knowledge and requires them to use skills that are not used in a traditional

classroom. Using PBL, we will not only help students gain valuable skills that will enable them

succeed in the classroom but will also help them succeed in the working world.

Looking back to the very beginning of my studies, I can see that I was already drawn

towards the idea of developing students' 21st century skills in the classroom. By this I mean

students need to be able to access relevant information through reliable sources. They must have

the ability to analyze that information and apply it to new situations. It was through my research

and experiences in each class that led me to understand how to effectively work towards teaching

these skills to students. One of the first papers I wrote for my degree focused on the

"Progressivist Development of 21 Century Competencies." It discussed the importance of

engaging students in their learning and making content relevant to their lives (Ellis & Lawrence,

2009). At the time, I was unable to explain or define what that would look like in a real life

classroom. However, as I also moved forward in my professional career I was introduced to the

concept of PBL. The concept of PBL aligned with what I was already working towards in my

professional practice. I was working to connect how I taught my students with the shifts the

outlined by the Alberta Government (2013). The concept of PBL provided me with a model that

would help me change my lessons to not only meet my personal goals for my classroom but to

teach to the shifts that had been outlined by the province. At the same time, I was able to find

direction for my research and use that research to further develop a physical model that reflected

the mental vision I had. I now had evidence to support what I was working towards in my

classroom. The research served as a foundation for me to begin changing how I approached

teaching. I was able to change how I carried out my lessons and switch the focus of my

classroom from myself to my students. This process allowed me to see that it is possible to

change how students are taught and it reinforced my belief that students can take responsibility

for their own learning.

Professional Growth

The experience of completing graduate studies while also teaching full time has done

little to change my thoughts and beliefs about education. When I entered the field of education I

saw it as a way to prepare our youth for the world they would be entering as adults. To me this

meant providing them with much more than just facts, it meant providing them with skills that

are necessary outside of the confines of a classroom. My graduate research has helped reinforce

and clarify these beliefs I already had. I had a desire for change but no focus for that desire. I

believed that students needed a new way of learning to help prepare them for world that has

changed drastically in a small period of time. Students need to be provided with skills that will

enable them to adapt to novel situations and meet challenges with confidence. They need to be

able to interpret the wealth of information they are bombarded with each day and have the skills

needed to evaluate the importance of that information. With my thesis, I was able to identify a

change that would help students learn these skills using methods different than those used in a

traditional classroom. PBL focused on teaching students skills that I already believed to be

important to their success. I was able to explore the various ways that PBL could be

implemented and then use those studies to shape a PBL model that wold work for my own

students. The benefits of being able to apply what I was learning to actual practice made a huge

impact on my desire to continue researching and discovering as much as I could about PBL. As

a result, I was also discovered how I could use what I had learned to help others in my profession

explore PBL and experience success when implementing it in their classrooms.

Although this experience has not changed my beliefs about education it will help me to

change how I perform my role as an educator. As I was still teaching while completing my

studies, I was able to take what I learned in theory and then apply it to my classroom. I have

started creating lessons that focus on engaging students in the learning process. My lessons

require students to be involved with what they are learning by discovering information on their

own and extracting information from what they research. I no longer feel that I need to lead

every lesson by providing students with information to memorize. Rather, I want to focus on

helping students increase their ability to find information, to identify important and relevant

facts, and then to incorporate the information with what they already know. In order to do this, I

need to continue changing how I deliver my lessons and to do so by using what I have learned

during my graduate studies.

I have already started incorporating the information I have researched within my own

classroom and have helped initiate school-wide projects based on the same theories of PBL.

Both student and teacher responses to these changes varied from resistant to excitement to try

something new. As I worked collaboratively and independently on PBL projects I noticed that

the students were more accepting to changing the format of their lessons than most teachers

were. The majority of students were excited to work on their own and use technology to access

information. They liked having the freedom to work on things in the order they wanted rather

than having a teacher direct the entire process. While the students enjoyed the change in

learning style, I found that many teachers were resistant to making the changes required for PBL.

Some concerns expressed by teachers were the amount of extra planning it would take to design

a PBL unit and the pressure to ensure all subject content was taught. Although I understand the

reason for teachers resisting PBL, I strived to help the teachers make small changes that were not

overwhelming. I understand that the process of changing is difficult and can be stressful for

teachers. However, I believe that the benefits these changes will have for students is worth it. So

far I have found the process of changing my teaching practice to be a lot of work for myself but

it has also been very rewarding. The process of gaining teacher support has been challenging

and sometimes frustrating as I have attempted to support other teachers in making changes in

their classrooms as well. It was difficult to move teachers out of their comfort zone and

convince them of the possibilities PBL offers. But I found that if teachers approached PBL

slowly with small steps they were more likely to continue working towards larger PBL projects.

Government Mandated Changes

        I feel that I have begun teaching at an amazing time. The Alberta Government is calling

for a "curriculum redesign" that will "shift" how our students are learning (Alberta Government,

2014, p. 1). This call for change has opened a wealth of possibilities for educational

professionals like myself. I feel that I am able to explore new modes of instruction and

incorporate a variety of resources into my lessons. The ability to experiment with and focus on

competencies allows me to take what I have researched and apply it to my practice. As a result, I

see my role as an educational professional as being one of change. The current trend in education

is moving towards student-centered learning that focuses less on content and more on

competencies (Alberta Government, 2014, p. 1). I don't see myself as being restricted to a

traditional teacher-directed method of teaching. The district that I teach in has embraced the

Alberta Government's call for change which has enabled me to have more freedom in applying what I have learned.

Through my graduate experience, I was able to perform research on PBL which has become the foundation on which I have been building my own professional practice. The last two years have seen me implement PBL in my classroom from a small project to an entire PBL unit. Using the research from my thesis, I will be able to highlight key features of PBL and find the best strategies for implementing them into my lessons. I will be able to shift from only delivering content to enabling students to develop competencies while also learning important information. I plan on focusing my professional career on engaging students in learning that is relevant to them and that will provide them with skills required in the workforce. Completing my graduate studies has prepared me not only to improve my personal professional abilities, but to also help with the professional development of my colleagues.

The research I have done throughout my studies has made a positive impact on my professional career and has provided me with the knowledge to make a positive impact on others in the educational profession. Going into my studies I had the desire to make a change but was not sure how to go about doing so. But, with my experiences and my research I was able to identify the changes I could make within my classroom and within my school. I have spent the last two years working on the Transform committees at each of the schools I have worked at. These committees are responsible for initiating change within the school and working towards implementing the shifts that have been outlined by the Catholic school district, such as student-centered learning and teaching competencies more than content (Edmonton Catholic School Board, 2013). My role on these committees focused on engaging other teachers in learning about PBL and demonstrating the benefits of it. My role on the Transform committee focused on

helping teachers understand what PBL is and to help them develop lessons that incorporate PBL into their classrooms. As I have progressed in my studies, I have increased my knowledge of PBL and have developed a solid foundation of research to support what I know about PBL. I plan on further using this research to help support other teachers in their understanding of PBL. It will also enable me to provide evidence to support my belief that PBL enhances student learning and helps to develop the 21st century skills the Alberta Government and the Edmonton Catholic School Board are moving towards.

My Contribution to the Profession

Through my personal experiences and by performing research on PBL, I was also able to identify an area of struggle within PBL. The lack of student preparation for independent learning was a major obstacle when it came to implementing PBL within my classroom. As I read through the studies, lack of student skills was cited numerous times as a challenge that needed to be overcome. Reflecting on how students have been taught in recent years I began to realize that it would not be plausible to expect students to be able to perform well in PBL tasks without first developing certain skills. For example, students today have mostly experienced sitting in desks taking notes while a teacher lectures. PBL requires those same students to research on their own and decide what information is relevant to their assigned problem. However, we cannot expect students to be able to carry out these tasks without first teaching them the skills required to perform effective research. We must also teach those students how to identify important information before we force them to do it on their own. Thinking about the need to prepare students for PBL brought up the question of what skills were required for PBL and what does mastery of those skills look like? Thus, I focused my project on developing a rubric that would enable teachers to identify and evaluate the skills essential to PBL. Once the teacher has

assessed student skill levels, they will better be able to design projects or lessons using scaffolds that develop and strengthen student skills until those scaffolds are no longer needed.

The rubric that I have designed is an important tool for any teacher planning on using PBL in their practice. Not only will it impact my colleagues in my school but it could also help teachers throughout my district. Edmonton Catholic School District is pushing towards teaching students to be "self-directed, adaptable, discerning and curious, as they engage individually and collaboratively in 21st century learning" (Edmonton Catholic Schools, 2013, p. 1). One of the ways they plan on doing this is through PBL. However, personal experience and connecting with colleagues has proven this to be a difficult undertaking. Colleagues that I have spoken to expressed frustration in regards to student performance during PBL activities. I believe that with my research and actual experience with PBL, I can help direct teachers in identifying where student skills are breaking down. The rubric can act as that initial stepping stone that will guide the rest of the PBL project and help teachers to set student up for success. Not only do I feel my rubric will be beneficial to other teachers but I also believe that the knowledge base I have developed will also benefit my school and my district.

Advice on PBL

This experience has developed a strong passion in me for PBL. I believe that is has substantial benefits when it is implemented appropriately. This past year of research has only strengthened my desire to bring PBL to my classroom and the classrooms of my colleagues. The more I learned about PBL, the more avid I became about incorporating it into my practice. It also showed me that PBL is not an easy concept to jump into. It requires a large amount of front-end planning. The planning is time consuming and does not always yield the desired

results. However, as with any other thing, it improves with practice. Three key

recommendations I have for anyone planning on engaging in project based learning are:

1. Understand that before success there will be failure. Just because something does not get

   the desired results on the first try does not mean it will not work.

2. You must prepare your students for success before success can occur. You must help

   students develop the skills they need before you can require those skills from them. This

   may mean that you need to provide basic worksheets or activities to help scaffold student

   learning until they are able to perform the desired skill on their own.

3. Be brave. Experiment with different ways of bringing PBL into the classroom and using

   different PBL models to help students learn new concepts. You will not know what it

   can do until you try it and are willing to fully implement the process and accept what may

   and may not occur. It is okay to start small and progress to more encompassing PBL

   projects but you will not get there without trying something new.

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Appendix

A Sample Rubric for Assessing Student Skills

<u>**Implementing PBL in the Classroom: Teacher Resource**</u>

In order for students to be successful in a project-based learning (PBL) environment, they must exhibit certain skills. Based on the proficiency of each skill, a variety of scaffolds can be implemented throughout the PBL process. As skills are acquired, the use of scaffolds can be decreased. Use the following assessment scale to rate the skill level of your students. From that point you can determine what forms of scaffolding are required to promote success throughout your PBL unit.

Skill	1	2	3	4
Verbal Communication: Focuses on the ability of the student to transfer information in a clear, concise way through speech.	Student works alone and does not participate in verbal discussions. Students has a difficult time expressing thoughts or finding the right words to answer questions.	Student is able to form simple verbal answers to questions and express thoughts. Student will rarely ask for help or discuss topic with peers.	Student can express ideas using full sentences and uses clear language. Thoughts and ideas are directly related to the topic being studied. Student is able to formulate questions and share new ideas with peers.	Student is able to engage in rigorous verbal interaction with others specific to subject being studied. Can express complex thoughts using clear and concise language. Is able to describe complexities of subject through generalizations, questions, and making distinctions. Student can verbally demonstrate a deep understanding of topic.
Written Communication: Focuses on the ability of the student to present important information through writing in a clear and concise way.	Student struggles to write down ideas. Fails to use proper sentence structure or writing conventions.	Student can form simple sentences. Ideas are not connected and writing is hard to understand.	Students can write strong, coherent sentences. Ideas are clear and easy to understand. Effectively uses writing conventions and has a strong vocabulary.	Writing is well thought out and coherent. Ideas are presented in an interesting and understandable way. Writing shows strong understanding of the vocabulary related to subject. Writing conventions are used accurately.
Inquiry: Focuses on the ability of a student to ask questions and gather information that is relevant to the topic being studied. It also includes the ability of the student to identify missing information.	Student is unable to summarize the issue or formulate a question about chosen topic. Student cannot identify missing information. Is unable to develop a theory or hypothesis related to issue.	Student is able to summarize issues in a simple way but struggles to formulate questions about the topic. Student can identify basic missing information but is unable to identify key details. Student can form a simple theory related but fails to incorporate important information.	Student can clearly and precisely formulate vital aspects of the issue and identify relevant information that is missing. Student can formulate questions specific to solving the issue presented. Student can develop theories and hypotheses based on information relevant to the issue.	Student identifies integral relationships when formulating vital aspects of the issue. Student is able to analyze information essential to the issue while formulating questions to discover pertinent information. Student exemplifies strong questioning skills by demonstrating coherent working theories and examining a variety of

				viewpoints and assumptions.
Collaboration: Focuses on the ability of the student to work with his/her peers in a productive and cooperative way that enables them to complete tasks relevant to the project.	Student fails to interact with peers or connect with others in a team environment. Does not engage in discussions. Will not complete assigned tasks within group.	Student shows minimal participation in group. Barely contributes to discussions or shares ideas. Struggles to get along with group members, puts little effort into tasks assigned by group.	Student shows a good connection with group members. Regularly contributes to discussions and shares ideas. Completes tasks within the group.	Student demonstrates a strong connection with the group and is willing to take on a leadership role. Willingly completes all tasks to the best of their ability and is willing to help others within the group. Encourages group members to contribute and ensures all members are involved in the task.
Research: Focuses on the ability of a student to gather relevant information from a variety of reliable sources and reference them appropriately.	Student lacks focus during research and is unable to find information connected to topic. Student does not use sources or fails to cite sources. Student does not provide any facts or information on topic.	Student gathers information but it fails to connect with the topic and is not from valid or accurate sources. Student is unsure of where to get information or how to put information together. Facts are simply restated.	Student has a combination of relevant and irrelevant information. Student only uses a few select sources but is able to cite them. Information is put together in a coherent manner and facts are explained.	Student has collected information relevant to the topic. A variety of sources is accessed and information is compiled in a coherent and focused manner. Facts are supported and are directly related to research topic. Student understands where to get reliable information.
Activation of Prior Knowledge: Focuses on the ability of the student to recall facts and information from previous lessons that are essential to the project at hand. This also includes being able to make connections between new and old information.	Student is unable to identify previous information relevant to topic. Student fails to activate prior knowledge that is required for project.	Student can recall information with prompting and is able to remember basic concepts taught in previous lessons. Student is unable to connect prior knowledge to the project.	Student readily recalls information learned in previous lessons. Student connects prior knowledge to the project with minimal guidance.	Student is able to recall and expand on information covered in previous lessons. Student can make in-depth connections between prior information and the project at hand. Student can readily draw on previous concepts and apply them to novel situations.

The lower students score on the skill assessment, the more structured the scaffolds will need to be.