PROJECT BASED LEARNING IN PRIMARY GRADES
by
TIMOTHY G. FOX

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APPROVED BY:  N. Suzanne Standerford, Ph.D.
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# Table of Contents

Abstract ..................................................................................................................................4

Chapter I: Introduction

  Statement of Problem........................................................................................................5
  Research Question(s) ......................................................................................................6
  Definition of Terms .......................................................................................................6

Chapter II: Review of Literature ............................................................................................7

  PBL Defined and Contrasted ........................................................................................6

    History of PBL ........................................................................................................9

    Elements Defined .....................................................................................................11

  Potential Drawbacks to PBL Implementation ................................................................12

    Teacher Attitudes .....................................................................................................14

    Viability in Primary Classrooms .............................................................................15

    Self-Directed Learning .........................................................................................18

    PBL Impacts on Underachieving Schools ..............................................................22

    PBL and Learning Disabilities ...............................................................................24

  Support for Implementation .......................................................................................26

    PBL and Technology .............................................................................................29

  Summary .....................................................................................................................38

Chapter III: Results and Analysis Relative to the Problem ...................................................38

  PBL Defined and Contrasted .....................................................................................38

  Potential Drawbacks to implementation ......................................................................40
Viability in Primary Classrooms................................................................................42

Support for Implementation.......................................................................................43

Chapter IV: Recommendations and Conclusion..........................................................45

Recommendation .......................................................................................................45

Areas for Further Research .......................................................................................46

Summary and Conclusion ..........................................................................................47

References ................................................................................................................49
Abstract

Efforts to implement educational reform in today’s culture are widespread. Constructivist approaches hold promise for increasing both student achievement and motivation. One of the most popular approaches under the canopy of constructivist learning methods is project-based learning. In this review of literature, a closer look is taken at the successes and challenges of this method, its viability in primary grades is explored, and instructional recommendations are made to teachers who may be considering implementation.
Chapter I: Introduction

We will each have a decided impact on the lives of those in our care, thereby ultimately influencing society. Many feel that we are limited when it comes to the value of education in our culture. Ken Robinson, in his lecture on Changing Educational Paradigms, points out that, “Many brilliant people think they are not, [brilliant] because they are judged by an educational culture that believes they have no academic ability” (Robinson, 2010). As a culture we are beginning to rethink what we deem valuable. Project Based learning suggests an alternative model.

Statement of Problem:

Many question whether traditional methods for teaching are effectively preparing students for success. In our current culture of standardized testing, the focus is primarily on achieving high test scores on a narrow set of standards. Unfortunately, this leaves little room for critical thinking, problem solving and collaboration. Is there a method that gives students an opportunity to let learners shine in a range of diverse areas while applying curricular content knowledge to real world problem solving? Some believe that if managed carefully, project-based learning has this potential.

In addition to interweaving foundational knowledge in the curriculum, we should seek to teach and facilitate areas of study that students are passionate about. Our aim should be to cater to a learner’s natural abilities while giving them opportunities to practice with real life applications. Establishing a hands-on collaborative approach to learning that integrates the curriculum should be the goal. We should encourage learning from each other in an active manner that benefits our larger community. This type of model has great potential, but limiting factors often impact those who seek to create such an environment. For instance, acquiring
permission from administrators for alternative schedules and resources can be tough. Teamwork, communication, and uniformity can also be issues. In addition, simply thinking out of the box is painful for some who are very invested in traditional methods. Can these hurdles be overcome? Can project-based learning help students to gain a deeper, more relevant understanding of content knowledge? Will it help develop self-confidence and more positive attitudes toward learning? The purpose of this literature review is to answer these questions and determine whether project based learning is viable in primary grades.

**Research Question:**

Is the implementation of project-based learning in primary grades a viable option?

*Sub-questions:*

Are there specific methods and strategies a primary teacher can employ to organize and support this type of model?

Does project-based learning increase content knowledge and motivation among learners?

**Definition of Terms**

The terms used in this literature review serve two primary purposes: to adequately define the framework for project based learning, and to provide vocabulary relating to this framework for learning.

**Project-Based Learning**

In project-based learning, students work in groups to solve challenging problems that are authentic, curriculum-based, and often interdisciplinary. Learners decide how to approach a problem and what activities to pursue. They gather information from a variety of sources and synthesize, analyze, and derive knowledge from it. Their learning is
inherently valuable because it's connected to something real and involves adult skills such as collaboration and reflection. At the end, students demonstrate their newly acquired knowledge and are judged by how much they’ve learned and how well they communicate it. Throughout this process, the teacher's role is to guide and advise, rather than to direct and manage, student work. (Solomon, 2003)

**Problem-Based Learning**

Problem based learning is similar to project based learning, but may be considered a subset of project-based learning. It does have it’s own genesis, however, primarily in medical school case study scenarios from the 1960s. A typical model may adhere to the following steps:

1. presentation of an “ill-structured” (open-ended, “messy”) problem
2. problem definition or formulation (writing a “problem statement”)
3. generation of a “knowledge inventory” (creating a list of “what we know about the problem” and “what we need to know”)
4. generation of possible solutions
5. formulation of learning issues for self-directed and coached learning
   sharing of findings and solutions

(Buck Institute for Education, 2013; Thomas, 2000)

**Chapter II: Review of Literature**

Attempts at school reform have taken many forms over the years. Some of the most promising initiatives fall under the umbrella of constructivist learning models. In this pool of teaching and learning strategies is a framework for learning termed “project-based learning” or
PBL. This collaborative model encourages learners to use higher order thinking skills to solve authentic problems that have relevance to their lives in and out of the classroom. In this review the research analyzed defines project-based learning and evaluates its effectiveness in K-8 education. Topics include: history of the movement; PBL as it differs from other constructivist approaches; potential problems with implementation, support systems for implementation in primary classrooms; and the effectiveness of technology paired with project based learning.

**PBL Defined and Contrasted with Other Constructivist Learning Models**

In her article on the power of projects, Curtis (2002) defined project-based learning in terms that are easy to understand. She also took a look at PBL in action and provided concrete examples of how students used it. In her research, for example, she found students who were designing a school for the year 2050 (judged by architects), as well as students who were working on building a sidewalk to connect campus buildings. Thus illustrating, quite literally, that project-based learning can range from the concrete, to the very abstract. The students she studied ranged from early elementary to high school. Curtis pointed out positive aspects of PBL, including: motivating students who may traditionally be considered hard to reach; the opportunity to differentiate to meet diverse needs; increased retention as students are applying learning to authentic situations of interest; increased attendance; and decreased behavior problems as students are more engaged. Conversely, challenges with implementing project-based learning were considered as well. These included: Time management constraints; difficulty in identifying authentic projects that will meet curricular needs; increased workload in planning; and meeting each student’s diverse needs as they explore projects from differing perspectives. Throughout the article, attitudes and opinions regarding PBL were overwhelmingly positive.
In his thorough review, Thomas (2000) explored multiple facets of project-based learning. Beginning with a comprehensive definition of project-based learning, key elements were discussed, as well as similar type learning models, such as expeditionary learning. Thomas goes on to compare and contrast these models. Four programs were highlighted that have drawn attention to the history of this movement. They included 1) Outward Bound, expeditionary inquiry based projects 2) medical school models for learning that begin with a diagnosis 3) research projects on cognition in the classroom, and 4) application of technology as it impacts cognition in the classroom. Thomas went on to discuss much of the research that exists for project-based learning. He broke this down into four categories, including: summative and formative type evaluations of PBL in action; a section on what types of student characteristics lend themselves to success with problem-based learning models; and what can be done to make it more effective in implementation. An additional portion of research focuses on potential problems with implementation. The following ideas collected by Thomas (2011, pp. 26-27) is a list of possible factors:

**Time.** Projects often take longer than anticipated. In addition, difficulties that teachers experience in incorporating Project-Based Science into district guidelines are exacerbated by the time necessary to implement in-depth approaches such as Project-Based Learning.

**Classroom management.** In order for students to work productively, teachers must balance the need to allow students to work on their own with the need to maintain order.

**Control.** Teachers often feel the need to control the flow of information while at the same time believing that students' understanding requires that they build their own understanding.
Support of Student Learning. Teachers have difficulty scaffolding students' activities, sometimes giving them too much independence or too little modeling and feedback.

Technology use. Teachers have difficulty incorporating technology into the classroom, especially as a cognitive tool.

Assessment. Teachers have difficulty designing assessments that require students to demonstrate their understanding.

Thomas concluded that PBL is popular among students and teachers, has the potential to increase positive attitudes about learning, and lends itself to deeper learning, higher level thinking and increased capacity to apply the knowledge gained. Drawbacks include difficulties in implementation. He stated, “Most teachers will find aspects of PBL planning, management, or assessment fairly challenging and will benefit from a supportive context for PBL administration” (p. 37). He also discussed evidence of challenges with students managing time, effectively using resources, and working independently.

In this look at project-based learning in the primary grades, Katz & Chard (1999) aimed to define “The nature of a project” (p. 1). Elements of the project approach were defined; distinctions were made between differing approaches and concrete examples were used. In this study the term *project* was defined in this study as “an in depth study of a particular topic, usually undertaken by a small group of children and occasionally by an individual child” (p. 2). A problem or topic is identified and an investigation commences. This approach depends on students taking an active role in their learning. This could include everything from planning to assessment. As this study focuses on the very youngest learners, advice is given to help make this approach meaningful to them. The researchers in this case relay the importance of choosing topics young learners can relate to. They referred to this learning as having *vertical or horizontal*
relevance. These terms are defined as follows. “Vertical relevance refers to the learning that is intended to prepare children for the next class or the next school; horizontal relevance refers to learning experiences that are meaningful at the time they are experienced” (p. 4). It is recommended that before students look to learn about people, places and events that are far away or more abstract, they develop more confidence as they learn about things that impact them personally. They point out that as learners grow and become increasingly confident, more abstract, vertical type learning experiences will become more successful.

Terms and vocabulary having to do with project-based learning are vast and potentially confusing. Katz & Chard (1999) define a few terms that are often used interchangeably. These include projects, themes and units. In this study a theme is defined as “a set of activities around a broad topic or large concept.” A unit is defined as “a set of preplanned lessons on a particular topic. A project in contrast is “a piece of research about a particular topic…in which ideas, questions, theories, predictions and interests are major determinants of the experiences provided and the work accomplished”(p.5). When students are engaged in project work, describing verbs such as deciding, arguing, checking, predicting, explaining, reporting, and collaborating would be commonplace.

The researchers went on to draw distinctions between varying schools of thought regarding an appropriate curriculum for the youngest learners. They explained that many schools focus on an academic curriculum- A more traditional approach where a narrow set of skills are taught in a whole group setting and students are given opportunities to practice them by using worksheets and drill and practice type methods. According to the researchers, “The content of these exercises is often unrelated to the world in which they live and learn” (p. 7). As the pendulum swings the other direction they define the traditional nursery or kindergarten
approach – A curriculum that focuses on the arts and spontaneous play. These researchers suggested that neither approach is ideal, but that a more balanced approach is the key. They advocated for an approach that places high value on intellectual goals. According to the researchers, this is an approach where “Children’s minds are engaged in ways that deepen their understanding of their own experiences and environment and thereby strengthen their confidence in their own intellectual powers…dispositions to observe and investigate, for example” (p. 9). They go on to point out that the goal of the project approach should be to “experience school as real life rather than as an anticipation, postponement or withdrawal from life, to be resumed outside the school” (p.10). Finally, Katz & Chard (1999) discussed the positive impact that learning in a community and as a community can have. They pointed out that traditional curriculum often inspires a competitive nature that actually has students working against each other to achieve personal goals rather than spending time on common goals that can benefit the community as a whole. The ideal they proposed is a situation whereby, “Children work together, resolve differences accept individual responsibilities and contribute in differentiated ways…A major aim we believe is served by the inclusion of project work in the curriculum is to help children to become able to participate competently in and contribute to a democratic society” (p. 9).

Potential Drawbacks to PBL Implementation

A qualitative research form Yuen-ling Li (2012) focuses on the implementation of project based learning in early elementary education in Hong Kong. Research makes it apparent that a shift in teacher education has taken place as well as the overall philosophy in how young children are educated in Hong Kong. Throughout this study words like “authentic,” “relevant”
and “collaborative” come up time and again. In addition there are multiple references to the
delivery of knowledge in realistic everyday type situations. Yuen goes on to mention that in
some certification programs, teachers are required to take a course in project-based learning.
Given the push for this type of model, a privately funded research project was implemented
between 2008-2010. This project was titled “Research on the Advantages of Project Learning
and the Implementation of Project Learning in Early Child Education with particular research
interest on the Utilization of Resources in the Internet” (p. 476). At the onset of this study, 600
Hong Kong kindergarten programs were invited to take part in this qualitative study. A total of
51 schools agreed to take part. Participants included 129 teachers and administrators, each of
whom took part in a questionnaire/survey of the implementation of project-based learning. Of the
51 participating schools, ten participated in classroom observation. The students represented
urban, rural and suburban populations in the Hong Kong area. Data was collected through the
use of questionnaires, surveys, and video recordings. Data was then summarized according to
theme. According to the Yuen, two specific questions framed the following discussion:

(1) What are the views of Hong Kong kindergartens teachers on project learning?

(2) Is there a general pattern of practice among kindergarten teachers adopting

Project-learning? (pp. 478-79).

Yuen refers to “project learning,” in this study, rather than “project-based learning.” For
the sake of clarity, each refers to the term project-based learning defined earlier in this review.

Like many other research studies, initial views of project based learning among teachers were
very positive. The idea of students working collaboratively on engaging projects that are
authentic in nature made sense to them. While this was the case, data indicated that
implementation was a challenge. Teachers frequently had difficulty giving up familiar teaching
styles and habits. Many of the projects were teacher driven and derived from elaborate lesson plans (which, by the way, was discouraging for the teachers involved). The general consensus was that teachers were excited about the prospect of change, and worked very hard to plan, gather materials, etc. However, they were unprepared from a pedagogical standpoint. In other words, they were ill prepared, as far as training goes and did not have a firm understanding about intended goals and outcomes. This thought from the author sums up a primary obstacle, not only in this study, but also in many instances where the success of project-based learning is considered.

The potential problem lies in the fact that teachers are not only being asked to change their roles and take on increased responsibility, but they are also being asked to change previously held attitudes and beliefs (p. 485).

An additional study from Hertzog (1994) focused on project based learning in a primary setting. In addition, it focused primarily on the obstacles encountered with implementation. This study took place in a secular private school with two teachers and a total of 14 students in grades 1-3. According to Hertzog (1994), the school advertised a “constructivist approach and a project-based curriculum with emphasis on creativity, problem solving, critical thinking, and interdisciplinary units” (p. 17). At the time of the research, the school was in its first year of operation. Data was gathered through observation and interview. Subjects included teachers, students, parents and board members. Research took place roughly over a four-month period. The most significant impediment to enacting a true project-based learning model was lack of knowledge and a break down in communication. Parents, teachers, and board members all seemed to have differing perceptions about what project-based learning consisted of. While they all clearly wanted students to have authentic experiences and learn in a constructive manner. It
was evident that few, if any of them had a clear picture of what this should look like in practice. Many parents demanded increased “science or math time” indicating a wish for traditional time slots allocated to traditional subjects. Teachers also clearly had distinct time for spelling, computers, etc. There were also areas of the room devoted to specific activities- “art corner,” “science corner,” etc. There were some references to possible projects and certainly an attempt was made to differentiate instruction. In the end, however, learning from a project based model was obviously a peripheral rather than a central part of the curriculum. This study clearly illustrates the broad spectrum of ideas that many have about what project-based learning actually looks like in practice. It also demonstrates how deeply our culture is entrenched in traditional models of teaching and learning. As hard as they tried to create a new model for learning, given a blank slate, teachers (often under parental pressure) reverted to more traditional methods of teaching.

Viability of PBL in Primary Classrooms

The focus of the following case study from Ciftci (2013) was to determine if project based learning (PBL) is an effective method to motivate learners in multi grade or multi age classrooms, specifically in rural areas. Using qualitative research methods, attitudes and perceptions of 18 fourth and fifth grade students were analyzed. In addition, eight parents participated in the study.

Students were introduced to the concept of problem-based learning and split into three groups. With guidance, they identified projects that were relevant to the community they lived in. As they commenced with research, attitudes and opinions were monitored. Ultimately learners developed presentations to share with peers and families.
Attitudes and opinions were determined through interview questions, such as “Did students of multi grade classes encounter any difficulties during the project based learning? If yes, what were they?” (Ciftci 2013 p.87) Answers to the questions varied, but the overwhelming consensus from the participants was that this was a positive experience. More specifically, parents were pleased with the excitement, self-confidence, and motivation their children experienced during this process. Notably, there was also an increase in group work efficacy and decision-making. Students worked with peers, families, and members of the community (the mayor of the village in one case) to complete research and develop presentations.

In their study on the effectiveness of PBL, Wirkala & Kuhn (2011) sought to eliminate many of the factors that traditionally make PBL difficult to analyze by keeping the length of the study relatively short. According to the researchers, the goal was to “Study the effectiveness of PBL in a natural instructional setting yet under tight experimental control” (p.1158). Another interesting component of this research is that the intent was also to simultaneously measure the effectiveness of group oriented, team style PBL and PBL where students work in a strictly independent fashion. A quote from the researchers:

We compare not only PBL and lecture/discussion instructional conditions but also two forms of PBL instruction—team and individual—in order to examine whether the effectiveness of PBL is reduced when its social component is subtracted, and hence whether social collaboration is an essential component of the PBL method (p.1159).

This study took place in an urban public alternative middle school and was comprised of 6th Grade students. Three groups were formed comprised of approximately 30 students each. Each group was diverse, both ethnically and socioeconomically. Although no students qualifying for special education participated, students varied a great deal in academic performance, ranging
from high achieving to low average. Standardized test scores were also used to determine that all students involved met or exceeded standards at grade level. These groups were tasked with two problems: One being a study of how “groupthink” dynamics could be dangerous, and the other, how to improve memory retention as it applies to workplace safety and production. Students were given instruction in three different formats: Lecture/ Discussion Based; PBL in a team format; and PBL in an individual work format. Each of the three learning sessions was 40 minutes long and students had access to 2-3 instructors during each of these sessions. This took place over one and a half weeks. The table below (pp.1174-75) illustrates the format in which each group learned.

<table>
<thead>
<tr>
<th>Class 1</th>
<th>Topic 1</th>
<th>Class 2</th>
<th>Topic 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBL-individual</td>
<td>PBL-team</td>
<td>PBL-team</td>
<td>LD</td>
</tr>
<tr>
<td>LD</td>
<td>PBL-individual</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: PBL = problem-based learning, LD = lecture/discussion.*

Assessments took place nine weeks after these sessions. The goal was to determine which, if any of these methods, resulted in deep learning, and how effectively students would be able to recall and apply information after a significant amount of time had passed. The assessment took place in two forms, comprehension and application. Rubrics were created as well as a coding system to record data. The charts below illustrate performance percentages of students in each group for both application and comprehension assessments (pp. 1174-75).
The researchers concluded that the students in both PBL groups had comprehension and application skills that were superior to the groups who engaged in the lecture/discussion format. Interestingly, the differences between the team and individual PBL groups was not very significant, indicating in this case, the social aspect of problem solving was less of a factor in successful retention and application.

In a study by Zhou & Lee (2009), self-directed learning is defined and explored as it relates to project based learning. In this qualitative study participants’ capacity for self-directed learning is analyzed once project based learning methods and strategies are introduced in the classroom. In this study self-directed learning is defined as,

A term including both external factors that facilitate the learner taking primary responsibility for planning, implementing, and evaluating learning, and internal factors or personality characteristics that predispose one toward accepting responsibility for one's thoughts and actions as a learner (p.38).

The participants included 100 sophomore college students majoring in computer science from Guangzhou University with a mean age of 18.7 (p. 39). Students were split into two groups. A control group of 50 received instruction through traditional lecture methods and an experimental group of 50 received instruction using PBL strategies. Pre and posttests were
administered. Questionnaires and interviews were also used to collect data. Students answered 58 questions used to determine “self directed learning readiness” (p.39). A five-point scale was used to determine responses. After data collection, the mean improved self-direction score of the experimental group was 5.33 and the mean of controlled group was 4.00. Interview results indicated positive experiences with PBL style learning as well, including increased confidence and the ability to take charge of their own learning. Another significant area had to do with social learning and increased communication skills. Students appreciated and saw value in the collaborative aspects of learning.

A study by Drake & Long (2009) focused on problem-based learning in a 4th grade science classroom. The researchers point out there is little research on the effectiveness of PBL in primary classrooms. According to Drake & Long, “A review of the literature, while informative at the middle and high school levels, revealed considerably less research on the use of PBL at the elementary school level” (p. 4).

This experimental approach focused on two classrooms. The 33 students participating were ethnically diverse, academic achievement varied and 80% of students qualified for free or reduced lunch. Efforts were made to ensure the make up of the classes were as equitable as possible regarding academic achievement. The same university teacher did the teaching in both groups. Students were taught for 45 minutes a day for a period of two weeks. The researchers point out, “Tasks for both groups were similar and included the use of print, video, and computer resources as well as hands-on experiments, small group work, teacher-led discussions, and demonstrations” (p. 4).

The experimental groups’ instruction differed from the comparison group in one aspect: the addition of the elements of PBL. In this case the students receiving additional PBL instruction
used the following model

This model includes the following four steps:

1. **Engagement:** The problem is presented to the students and any roles are explained.

2. **Inquiry/Investigation:** It is determined what information students already know, what information they need to know, and how best to acquire this information.

3. **Problem Resolution:** Students analyze their options and decide on an action or a decision.

4. **Debriefing:** Students discuss not only the content they have learned and how it may be useful in new situations but also the processes involved in solving the problem (p. 5).

Both researchers handled administration of assessments and data collection for each group. Data collection was in the form of pre and posttests, observations and interviews. In addition, the same posttest was administered to 10 students (chosen randomly) 4 months later. The interviews involved asking 5 random students from each group the following two questions:

1. If you had a problem, what would you do first? Then what?

2. When you have questions or don’t understand something, what can you do to find answers? (p. 6)

The results for the pre and posttests were encouraging for advocates of PBL. The following table indicates relevant data (p. 6).

<table>
<thead>
<tr>
<th>Table 2. Growth in Content Knowledge Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td><strong>Content Test</strong></td>
</tr>
<tr>
<td>(16 items)</td>
</tr>
<tr>
<td>Pretest</td>
</tr>
<tr>
<td>Posttest</td>
</tr>
<tr>
<td>Growth</td>
</tr>
<tr>
<td>Posttest</td>
</tr>
</tbody>
</table>

*p < 0.05

The effect size, *(d) = 0.72*, was in the medium range.
This table indicates slightly more growth with the PBL group (12.5 out of 16 as opposed to 11.93.) In addition to content “time on task” was measured to determine if student engagement and motivation for learning is improved with PBL methods. The following table shows the PBL group was engaged approximately 10% more of the time than the control group (p.8).

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Comparison (n = 17)</td>
<td>Experimental (n = 19)</td>
</tr>
<tr>
<td>Appropriate time-on-task</td>
<td>58.75</td>
<td>68.24</td>
</tr>
<tr>
<td>Appropriate transition</td>
<td>16.25</td>
<td>12.94</td>
</tr>
<tr>
<td>Inappropriate nonproductive</td>
<td>24.38</td>
<td>18.82</td>
</tr>
<tr>
<td>Aggressive</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

This finding is significant in the sense that students are essentially spending more time learning. In fact, the researchers quantify this with the following statement.

Students in the PBL experimental classroom had 4.27 more minutes per 45-minute class session of time-on-task behavior than their comparison group. This would result in an additional 21.35 minutes of engaged science instruction per week, and an overall gain of 12.80 hours of science over the course of the school year (p. 12).

Conclusions of this study also indicate that students in the PBL group were more effective problem solvers “15 versus 6” and sought a broader range of sources to answer questions “17 versus 7”(p. 12). Conclusions of this study indicate potential for the effectiveness of PBL methods in teaching elementary science.

In another recent study, Halvorsen et al. (2012) sought to determine if project-based learning in 2nd grade social studies curriculum had potential to improve standards based
assessment scores among students in lower achieving SES schools. SES is defined as *Supplemental Education Services*, a tutoring initiative started in conjunction with the No Child Left Behind Act. The instruction integrated social studies and literacy. More specifically, the 2nd grade classrooms involved worked on civics and economics units. Participants included six teachers and 10-12 randomly selected students from each classroom. Two of the teachers were from very high achieving schools according to reading, writing, and social studies standardized test scores. Four of the teachers and classrooms were from underperforming schools. The two schools with higher achieving students had a free and reduced lunch population of 2%. The underperforming schools free and reduced lunch population was between 85 and 95%. (p. 10) According to Halvorsen et al. (2012), “The economics and civics projects were comprised of 21 and 20 lessons respectively, with each lesson lasting approximately 45 minutes” (p. 10). Teachers were provided with detailed lesson plans based on PBL methods and given the opportunity to consult with designers of the project. Data collection methods included interviews as well as pre and posttests. The civics assessment, containing 16 questions, measured nine Michigan GLCEs having to do with civics and government. Each question was scored on a scale of 1-4, for a possible total score of 36. Examples of questions included: “Why do you think we have a government?” and “What are some things the government pays for or takes care of for us?” The economic assessment measured student achievement of five economics standards and three literacy standards. The civics unit was set up in a similar fashion. Questions on this unit included: “There are lots of businesses in this community. Can you name some?” and “What does a restaurant need in order to make pizzas? What does the restaurant need to sell pizzas?” and “Can you tell me any public issues in our community that affect you?” In addition reading and writing assessments were administered. In each case three GLCEs were
measured using a 4-point rubric for a total of 12 possible points. The table below illustrates the results of the assessments (p. 43).

Table 2

*Literacy and Social Studies Assessments in Low-SES and High-SES Classrooms*

In each case, students scored higher on the posttests than the pretests. According to the researchers,

> Our analyses of the post-assessments showed that second-grade students from the low-SES schools attained statistically equivalent levels of achievement as students from the high-SES schools in social studies and reading (p. 18).

The units administered were tied closely with a large number of GLCEs in literacy and administered within reasonable time constraints. The researchers recommend three implications for this study:

1) Our findings might improve perceptions of the capabilities of students in low-SES school districts when provided with rigorous and relevant curriculum and pedagogy.”

2) “Our study may foster greater attention to social studies and
content literacy education in the primary grades, particularly in low-SES settings.” And 3) “Our study may encourage educators to experiment with project-based approaches in other domains within their classrooms and schools” (p.28).

One notable limitation of this study was that there were not experimental and control groups. (Halverson, et al. 2012) concluded there is ample evidence to support the idea that project-based learning units with integrated curriculums can be effective methods for promoting student success. An additional benefit discovered through this study was that students from low SES schools had an increased level of civil awareness. They refer to it as narrowing the “civic empowerment gap” (p.30). This has the potential of taking learning beyond the classroom and into the community as they have more tools to affect change in their environment.

In a qualitative study by Filippatou & Kaldi (2010) the impact of project based learning on students in primary grades with learning disabilities is explored. Participants included six fourth grade classrooms near Athens Greece. From these mainstream classrooms, 24 students with learning disabilities were selected from three different schools (nineteen boys and five girls). The classrooms selected were based on the following three things:

(a) teachers who volunteered to implement a project-based learning educational program,
(b) classes, which had pupils with learning difficulties and (c) teachers with similar amount of experience on project-based learning implementation in the classroom (p. 19).

The topic of “sea animals” was determined by interest level among students after informal group interviews as well as discussions with teachers. Students studied sea animals during for two to three hours per week for eight weeks. The learning style was cross-curricular and followed a typical PBL type model. Several methods were employed to collect data on this study, including:
1) Knowledge based tests: (the subject was sea animals). This assessment included 15 questions and answers were assessed on a three-point scale. Students were read the questions and given the opportunity to respond orally. 2) Attitude scale: This assessment sought to measure several factors including collaborative work, traditional vs. PBL teaching and self-efficacy regarding learning the content. 3) Individual 30 minute interviews: These consisted of questions about collaboration, engagement and content about the project. The results are indicated on table 3 below (p. 22).

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Knowledge Score 1</td>
<td>7.86</td>
<td>22</td>
<td>5.48</td>
</tr>
<tr>
<td>Total Knowledge Score 2</td>
<td>16.82</td>
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<td>4.94</td>
</tr>
<tr>
<td>Task value 1</td>
<td>2.97</td>
<td>24</td>
<td>0.69</td>
</tr>
<tr>
<td>Task value 2</td>
<td>3.36</td>
<td>24</td>
<td>0.31</td>
</tr>
<tr>
<td>Self-efficacy 1</td>
<td>2.72</td>
<td>24</td>
<td>0.60</td>
</tr>
<tr>
<td>Self-efficacy 2</td>
<td>3.14</td>
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<td>Group Work 1</td>
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<td>Group Work 2</td>
<td>3.28</td>
<td>24</td>
<td>0.31</td>
</tr>
<tr>
<td>Traditional Teaching 1</td>
<td>3.41</td>
<td>24</td>
<td>0.70</td>
</tr>
<tr>
<td>Traditional Teaching 2</td>
<td>2.62</td>
<td>24</td>
<td>1.01</td>
</tr>
<tr>
<td>Experiential Learning 1</td>
<td>2.43</td>
<td>24</td>
<td>1.11</td>
</tr>
<tr>
<td>Experiential Learning 2</td>
<td>3.58</td>
<td>24</td>
<td>0.56</td>
</tr>
</tbody>
</table>

*Note: 1 = Before the implementation of the P-BL  2 = After the implementation of the P-BL*

According to Filippatou & Kaldi (2010)

Pupils with learning difficulties scored significantly higher on the knowledge test administered after the completion of the project, indicating that they enriched their knowledge on all seven thematic unit (p.22).
Qualitative results from the interviews indicated that students felt this method of teaching helped them learn better. The following student’s interview response is an example.

*I liked this procedure very much, because we saw real sea animals in the class, we examined them, we saw a DVD, we made an aquarium. The book doesn’t say so much and our teacher does not often show us DVDs and pictures. It is boring when the teacher only is talking* (Vicky)(p. 23).

The researchers concluded that students with learning difficulties could benefit from PBL type learning models in several ways including “academic performance, motivation, cooperative learning, social acceptance, and engagement in the learning process” (p.25). Interviews and observations implied that collaborative learning in this case was especially effective. One factor that they caution considering, however, is that students with reading disabilities may have trouble accessing and disseminating secondary resources. They may need additional adaptations to optimize learning.

**Support for Implementation**

This summary of research from Newman & Wehlage (1995) focuses on school reform and highlights efforts schools have made to enhance student performance. Many of their findings are consistent with the goals of project-based learning. In this report data was analyzed ”from more than 1,500 elementary, middle and high schools throughout the United States, and conducted field research in 44 schools in 16 states” (p.1). Through synthesis of the research, they concluded that there are four “key factors” that influence positive gains in performance for students. They include, “Student learning, authentic pedagogy, school organizational capacity, and external support” (p.1). In discussing student learning, they stress that research indicates that high quality learning takes place when students “organize, interpret and analyze information, instead of
merely reproducing specific bits of knowledge from a textbook or classroom lecture” (p. 1). They also conclude that knowledge should be expressed in a deep manner (essays or discussions as opposed to multiple choice). Finally, they should be able to apply what they learn in an authentic way. The value of what they learn should have implications beyond the classroom.

Authentic pedagogy refers to teaching that incorporates real world problem solving and focuses on content that has relevance to the learner both in and out of the classroom. An additional point is that authentic pedagogy promotes a higher level of equity among learners and has more potential to promote social justice. Organizational capacity deals with schools having shared goals and solid plans for achieving them. Of particular importance is that faculty and staff in these successful schools takes “collective” rather than “individual” responsibility for the success of learners. In successful cases, strong leadership that stays true to a well developed mission statement through hiring, staff development, and high expectations.

The final area is external support. The researchers note this is tricky because as much as schools need “technical, financial and political support,” there is great potential for the sources of this support to lead the school in a variety of directions and undermine the overarching goals of the school. Three specific strategies are mentioned as schools look to maximize the effectiveness of external support. They include: “Setting standards for learning of high intellectual quality; providing sustained, school-wide staff development; and using deregulation to increase school autonomy” (p. 1).

In the following study, Thomas & Mergendoller (2000) sought to shed light on effective methods of PBL implementation from “experts” in using these strategies in the classroom. More specifically, they focus on effective classroom management techniques. Participants include 12 teachers who have been labeled as “experts” in the field of project based learning. In this study
they “subjected their descriptions of classroom practice to a qualitative analysis” (p.1).

According to the researchers, Fifty-three classroom management principles were identified. These were grouped under “seven themes and 18 sub-themes.”

Themes included: Time Management, Getting Started, Establishing a Culture that Stresses Student Self-Management, Managing Student Groups, Working with Others Outside the Classroom, Getting The Most Out of Technological Resources, Assessing Students and Evaluating Projects (p.1).

The 12 teachers studied were selected based on the following criteria.

“These teachers (a) were recognized as experts by other teachers within the national PBL community, (b) had experience in training other teachers in the implementation of Project-Based Learning, and (c) had made presentations about their experience with and implementation of Project-Based Learning at practitioner conferences or workshops” (p. 9).

Forty-three questions were developed based on effective implementation, management and assessment. Teachers were interviewed and responses were broken down into the categories previously mentioned. In general, many of the concerns present in a traditional classroom were not as critical in these classrooms. The burden of managing learning time is shifted from the teacher to the students in a learner-centered classroom. In a PBL classroom management tasks are complex and varied as evidenced by this quote,

*Project Based Learning teachers’ management concerns go beyond setting the stage so that students can listen to the teacher or engage silently with prescribed content. PBL teachers are responsible for putting together varieties of resources, information sources, learning contexts and participants, then orchestrating time, tasks, and arrangements throughout the course of instruction* (p. 34).
The use of technology in conjunction with PBL strategies is common. A WebQuest is one possible tool that can be used to enhance project-based learning. In the following study, Halat (2013) defined a WebQuest, explained several applications associated with it, and sought to determine if student motivation and attitudes about learning improves as a result of this technology based instructional tool. A WebQuest in this context is defined by the researcher as: “A computer-based learning and teaching model in which learners are actively involved in an activity or situation, and use the Internet as a resource” (p. 69). As a method of instruction, he goes on to point out that WebQuests are a student-centered and project-based approach to teaching and learning, which is supported by a variety of theories, including the theories of constructivist philosophy, critical and creative thinking, situated learning environments, cooperative learning, and engaged learning (p. 69).

Participants in this eight-week study included nine pre-service education students and 56 fourth and fifth grade students. To begin this qualitative study, the nine education students were given a presentation about the use of WebQuests as well as background information and associated research. They were then given the opportunity to create their own WebQuests to share with a group of four to ten 4th and 5th grade students. Students were given instructions and guidelines for use. After completion, students were given a questionnaire to complete with questions such as “What do you think about the use of WebQuest in learning?” “What parts of the WebQuest do you like?” and “what are the things on WebQuest you dislike?” (p. 71). Answers were then coded and classified. 71% of students surveyed indicated positive experiences with this format. 66% of participants indicated they were very engaged, suggesting increased motivation for learning.
According to Halat, strengths of WebQuest include:

- It can be an alternative teaching technique that enhances students’ motivation toward the class.
- It could serve as an alternative assessment tool in the assessment of student’s learning.
- It helps teachers to get an idea about the students’ degree of acquisition of knowledge and students’ implementation of the gained knowledge.
- It provides teachers an opportunity to see and assess students’ ability in using technology in learning.
- It can enhance teachers’ creativity in thinking and writing, such as trying to find interesting and funny fictions/scenarios and to adapt and combine these scenarios with math or other topics.
- It can enhance teachers’ higher-order-thinking skills, such as finding topic-related websites, examining and selecting professional, well-prepared and reliable websites among the others.
- It requires students to be active learners (p.70).

Halat suggests potential weaknesses as well. These include off task behavior as students link to websites and possible technological difficulties (lost connections, etc.). There is also potential for disinterest, as the WebQuests can be too teacher driven if not considered and designed carefully.

This study by Hernandez-Ramos & De La Paz (2009) took a look at middle school social studies instruction and whether PBL can be effective in this setting. An additional goal of the researchers was to explore the benefits or drawbacks of technology use in conjunction with these methods. More specifically, the researchers attempt to discover whether or not “technology-assisted problem based instruction” (p.154) produces more knowledge of content than a more
traditional comparison method. Additional questions have to do with motivation to learn and attitudes regarding social studies learning. The participants are two 8th grade classrooms from Northern California. A summary of the methods use to gather data are as follows:

Teachers in both conditions planned instructional units after collaboratively determining the content that was to be assessed on the pre- and posttest. A veteran teacher taught students in both conditions. Students in both conditions experienced an approach to instruction that allowed them to learn from each other, and they used a variety of resources that went beyond traditional textbook, lecture, and recitation. They also used primary and secondary sources and were asked to write at least one journal entry. The essential differences between the two conditions centered on (a) whether there was a single culminating group project, (b) if group learning served as the primary means for constructing knowledge of the entire unit, and (c) whether students used technology to create multimedia projects (p. 156).

The results showed that the group who used PBL methods integrated with technology did, in fact, show more growth in content retention.

Regarding the subtest covering comparable content from the six-week unit, the finding was significant in favor of students at the intervention school, $F(1, 168) = 5.84, p = .017$ (effect size = 0.52), who also outperformed students in the contrasting group on the overall test, $F(1, 168) = 9.60, p = .002$ (effect size = 0.47) (p. 162).

Opinion surveys were also administered to determine if participants in the PBL school had more positive attitudes about studying and appreciating the study of history. According to the researchers, “Taken as a whole, these data suggest that most students at the intervention school had positive views about their experience working collaboratively to create a multimedia project
in history” (p. 166). Ramos & De La Paz (2009) go on to discuss a few limitations or concerns to consider as technology assisted PBL is used as a teaching method. One concern had to do with the generation of an appropriate question or problem to answer. Some felt that the question having to do with westward expansion was determined or driven by state standards and was not authentically created by students. There was also concern that to maximize the potential of this process, students should have more input into the methods of presentation such as the type of software used. Final conclusions about this study were positive regarding the effectiveness of technology based PBL teaching as it impacts content knowledge and attitudes about learning social studies in general.

In this study of constructivist teaching strategies, Robbins (2005) recounted a collaborative inquiry project that took place in 2004. The participants were comprised of seven adults who had a variety of teaching experience including primary, secondary, teacher/librarian and post-secondary educators. This study took place over one college semester. Participants were charged with developing lesson plans that helped move students “Beyond the Bird Unit.” The Bird Unit being an example of a traditional teaching and learning scenario where the teacher does the research and makes choices about the types of questions students focus on rather than questions being student generated. She also pointed out that this type of teaching does not promote information literacy. In this quest, participants studied the effectiveness of teaching information literacy using three types of constructivist approaches: project based, problem based and inquiry based learning. In an additional lesson, combinations of constructivist approaches were considered. Participants were also asked to analyze the collected work of lesson plans. The information gathered through discussion and written analysis served as research data and was coded according to learning theory. Results were evaluated in terms of effective instruction. A
consensus was reached that the three constructivist approaches increased student motivation and aided in encouraging students to take responsibility for their learning. In addition these approaches encouraged social learning. According to Robbins, (2005)

Students not only learn about subject content from each other, but they also see how other students work together to share and build knowledge. They learn how credibility is established among peers by verbally evaluating activities and products (p.8).

She went on to point out that social learning has the added benefits of encouraging high level thinking skills as students feel a sense of accountability for being credible and valuing opinions from a diverse range of learners. Caution is urged when considering implementation of these strategies. Teachers should have a clear understanding of the strategy being used. They should also consider whether or not resources are available to keep students motivated and within the zone of proximal development.

The following body of research by Blumenfeld, et al. (1991) analyzes the effectiveness of PBL type approaches and takes a look at factors that contribute to implementation as well as factors that limit success. In addition the researchers focus on the effectiveness of technology and its potential to enhance this learning style. This research deals, to a great extent, with the learning environment- what students need to be successful and motivated and what teachers need for successful implementation. In this study, the researchers define project-based learning as

A comprehensive perspective focused on teaching by engaging students in investigation. Within this framework, students pursue solutions to non-trivial problems by asking and refining questions, debating ideas, making predictions, designing plans and/or experiments, collecting and analyzing data, drawing conclusions, communicating their ideas and findings to others, asking new questions and creating artifacts (p. 371).
A key word in this quote is “engaging.” The researchers point out that project-based learning is motivational for students when done correctly because of its engaging nature. Aspects of this framework that help to make it engaging include relevance and choice. They go on to point out that when students make a connection between learning in the classroom and real life experiences outside of the classroom, they are more actively engaged. While there is much research that supports this claim, implementation is not widespread. Blumenfeld, et al. (1991) provided three possible reasons as to why this is. 1) Projects are designed without enough attention paid to what motivates students and where students were developmentally. 2) Many questions are designed by teachers rather than students and are therefore, less important and engaging to students. 3) Teachers are under prepared for the shift in pedagogy and lack the necessary commitment and training to teach effectively in this manner (p. 373).

The researchers believe that students must find the projects being considered to be “interesting and valuable.” They also suggest that students must “perceive that they have the competence to engage in and complete the project” (p. 375). Finally, they believe students are more successful when they are focused on learning rather than grades. As these three elements of motivation are explored, suggestions are made to help achieve these goals. When interest and value are considered, the following elements are deemed important.

“a) tasks are varied and include novel elements; b) problems are authentic and have value; c) the problem is challenging; d) there is closure, so an artifact is created; e) there is choice about what and/or how the work is done; and f) there are opportunities to work with others” (p.378).

They also provide a couple of cautions for implementation. These include tempering the novel or dramatic elements so that they don’t overshadow learning and finding authentic questions that
are rich enough to ensure deep learning. As the issue of perceived competence is considered, the researchers remind that students should have some background knowledge about the topic explored and they should have knowledge about “tools” used to do the investigative work (computers for example). As focus on learning rather than grades is considered, the researchers acknowledge this is very difficult. Creating an environment where language is carefully considered as to avoid anxiety about performance seems to be the key.

Blumenfeld, et al. (1991) also took a look at the teacher’s role in successful PBL implementation. They proposed the following elements to be critical for success.

“a) Create opportunities for learning by providing access to information; b) support learning by scaffolding instruction and modeling and guiding students to make tasks more manageable; c) encourage students to use metacognitive processes; and d) assess progress, diagnose problems, provide feedback, and evaluate overall results” (p. 381).

In addition, they emphasize the importance of creating a risk taking environment, but one that is also “orderly and efficient” management system to accomplish tasks. To accomplish this teachers must be prepared. PBL type instruction often falls by the wayside as well intentioned teachers become overwhelmed. Underlying all teaching methods and management strategies is the teacher’s belief system and philosophy of education. The researchers point out that success in implementation will depend in a large part on whether the teacher’s belief system is “compatible with a constructivist approach to teaching and learning” (p. 382). They go on to point out that in many cases, “Teachers view learning as the process of obtaining information rather than an active process of knowledge construction” (p. 382). When it comes to instruction, scaffolding thinking and problem solving strategies becomes critical.
The researchers argue that technology has the potential to aid in solving some of the problems inherent with PBL. Using technology has the power to engage students, provide variety, aid in helping students work collaboratively, and is a great tool for creating artifacts. The point is also made that it can aid teachers in acquisition of knowledge and resources. It also has the potential to enhance pedagogical knowledge through research of effective PBL programs and networking with others who have had success.

Many educators agree that integrating constructivist-teaching strategies, such as PBL, into the classroom has great potential to benefit learners. It would seem, however, that making this happen in reality has its share of challenges. Ertmer and Simons (2005) point out that “Given the general lack of experience most teachers have with open-ended teaching strategies, novice PBL instructors are likely to encounter difficulties in all aspects of instruction: planning, implementing, and assessing” (p.1).

This study takes a closer look at some of the obstacles teachers typically face when implementing these strategies and offers guidance as to how teachers may overcome them. The following factors are considered as solutions are explored:

Teacher (beliefs, previous experiences, pedagogical and content knowledge, commitment to the innovation), 2) Classroom (resources, support, class size, class schedule), and 3) School/Community (curricular and testing policies, community support and involvement) (p.3).

Further research indicates that intrinsic qualities such as confidence, flexibility and tolerance for change will impact the success of implementation as well. Ertmer and Simons (2005) recommend that teachers need scaffolds as they move forward. They define scaffolds as “tools for enculturating novice PBL teachers into the thinking patterns of more experienced, and thus,
The first hurdle teachers often need to overcome is the identification of an appropriate “problem.” The following questions are recommended considerations when coming up with a well-designed problem.

1) Would my students run across significant content working on this situation?
2) Would the content fit my curricular responsibilities?
3) Would the content be appropriate for my students?
4) Can a PBL unit be built around this situation? (p. 6).

Among other strategies, they advocate considering problems relevant to your community. Local media, for instance, may be a useful source. Next, they advise identifying resources you may already have on hand. Finally, they recommend use of some type of checklist, perhaps focusing on the aforementioned criteria for a good problem.

Once a problem is identified, possible resources need to be identified. Suggestions for scaffolds in this area include looking forward to consider possible activities and collaborating with specialists or local experts. Another suggestion if using technology with primary students to research is to use a “WebQuest” (p.7). This is a search template that helps establish parameters as students are researching.

Once a problem is identified and resources are located, Ertmer and Simons recommend the use of “posthole activities” (p. 8) to get started. Postholes are defined as “typically short problems used to introduce students to the problem-based method, including how to work productively in small groups. As “practice” or “mini” PBL units, postholes provide both teachers and students with time and opportunity to adjust to the PBL approach” (p. 8).

Additional scaffolds to teaching include: “1) observe experienced PBL facilitators and 2) practice facilitating a mini or posthole unit. Abbreviated units, conducted by groups of teachers with a
limited number of students, offer another way to initiate teachers into their new role” (p.9). An added strategy is to develop routines or “rituals” that accompany instruction. Examples might include grouping procedures, check in processes for formative assessment, and presentation of initial problem/activities.

Finally, they note that it’s important to be realistic about the changes that will occur in the classroom community. Start with something manageable. Monitor and adjust as you move forward. Take time to reflect along the way.

According to these studies, project-based learning has great potential to enhance learning, communication skills and motivation among learners. Although there is little research on the effectiveness of PBL in primary grades, the studies in this review point to successful implementation in later grades.

Chapter III: Results and Analysis Relative to the Problem

In reviewing the literature, it’s clear that students gain a more substantial level of understanding through PBL strategies than they do with traditional textbook, lecture and discussion strategies. In chapter three, nuances and variations of PBL will be examined. In addition, the viability of implementing these strategies in the primary classroom will be explored.

PBL Defined and Contrasted with Other Constructivist Learning Models

Opinions vary to a substantial degree when it comes to defining project-based learning. Some believe it should be collaborative, while others contend that it should simply focus on authentic problem solving. Distinctions are also present in the use of technology, assessment and implementation. What is generally agreed upon when it comes to teaching young students is that
project-based learning should be: student centered; central rather than peripheral to the curriculum; include authentic problems or questions that have significance to students; incorporate skills and curriculum currently relevant; and should culminate in some type of public presentation (Curtis, 2001; Thomas, 2000).

All PBL type approaches fall under the general category of inquiry-based learning. These learning models have foundations in the constructivist theories of Piaget and others. The term project-based learning goes back to the early 1900’s and is generally credited to William Kilpatrick, a teacher and researcher from Columbia University’s Teachers College. Kilpatrick’s philosophy has its footings in the work of John Dewey (Kilpatrick, 1918). Dewey was an early advocate of constructivist learning and believed that learners actively construct knowledge through engaging the world around them. Sylvia Chard, a current noted expert on project-based learning defines it as “An in depth investigation of a real-world topic worthy of children’s attention and effort” (Curtis, 2001, p.1).

Since inception, variations of this concept have flourished. Expeditionary Learning sometimes referred to as “EL,” is one such example. EL incorporates PBL style teaching with several unique features. Outward Bound, a wilderness adventure based education program, is credited with developing this instructional model. In this model, students engage in long-term investigations based on a problem that has real-world ramifications. These learning expeditions often involve environmental efforts and end with a culminating project or presentation. EL differs from PBL models in the sense that flexible scheduling is required, often requiring teachers to work with a group of students for more than one year. There is also typically a focus on service learning, collaboration and fieldwork (Thomas, 2000).

Another variation of PBL type learning is problem-based learning. This approach in its
inception was used to engage Canadian medical students in difficult case studies. Project and problem-based learning are often confused with one another. While they are similar, they differ in the following ways. Problem based learning tends to be more teacher-centered, with the instructor defining the problem to be worked on. The length of time to work on problem-based learning is typically shorter than project-based models and is often focused on one discipline or content area. Project-based learning, in contrast, often has a cross-curricular focus. One additional difference is that problems can be fictitious or theoretical where projects are authentic and have immediate implications to the learner’s world. (Buck Institute for Education, 2013; Mergendoller & Thomas, 2000; Thomas, 2000). Additional models that fall under the same umbrella, but may vary slightly in setting, scope and style include Studio Based Learning, Service Based Learning and Community Based Learning. Efforts are being made throughout the world today to adapt PBL type learning models in traditional K-12 classrooms.

Potential Drawbacks to PBL Implementation

Attitudes about PBL tend to be overwhelmingly positive among teachers and students. The concept of students working collaboratively on engaging projects that are authentic in nature is popular. In addition, the research reviewed here clearly indicates that students learning in this manner demonstrate increased content knowledge, motivation and problem solving skills. Research also indicates, however, that implementation presents many challenges. One of the most significant and frequently referenced challenges is teacher preparedness. Teachers frequently have difficulty giving up familiar teaching styles and habits. Without proper training many projects tend to be teacher driven and derived from elaborate lesson plans. Essentially, teachers often work harder than necessary to compensate for uncertainties in effective implementation (Thomas 2000; Yuen, 2012). Teachers are excited about the prospect of change,
but are unprepared from a pedagogical standpoint. This thought sums up this primary obstacle, not only in this study, but also in many instances where the success of project-based learning is considered. “The potential problem lies in the fact that teachers are not only being asked to change their roles and take on increased responsibility, but they are also being asked to change previously held attitudes and beliefs” (Yuen, 2012, p. 485). Teachers clearly need to be supported with adequate opportunities for training in this method.

When it comes to roadblocks in implementing PBL, teachers aren’t the only obstacles. Support for change has to come from parents, administrators and community members as well. Vision regarding expected outcomes and goals have to be shared. Our traditional education paradigm is quite different than this reform initiative. It focuses on a more academic teacher directed model and a narrow set of skills. PBL methods in contrast require flexible scheduling, a shift in management techniques and increased collaboration. All stakeholders must have a clear concept of changes in pedagogy, scheduling, and assessment for implementation to be successful. (Hertzog 1994, Katz and Chard, 1999).

Other factors that researchers identified as hindrances to PBL implementation include; time- taking a project from inception to creation of a culminating product can take weeks and the time commitment involved in teacher planning and execution can be considerably more intensive than traditional lecture methods; assessment design- developing assessments that truly gauge student achievement proves challenging; availability of resources- project facilitators must be able to access or provide adequate resources to evaluate and research intended outcomes; and technology support- research repeatedly points out that technology use and PBL often work hand in hand. Opportunities to research and create culminating presentations or artifacts are examples. (Halat, 2013; Thomas 2000; Thomas and Mergendoller, 2000)
Viability of PBL in Primary Classrooms

Research on PBL in secondary and post-secondary education is prevalent and essentially points to success when implemented carefully. Research on PBL in primary grades is more difficult to come by. There are instances in this review, however, that do indicate success in primary grades as well. Providing teachers have adequate support and students have proper scaffolding along the way, this research indicates project-based learning is viable in primary grades. Several of the studies compared experimental PBL groups with control groups focused on the same content and with many variables, such as instruction time, instruction personnel, and demographic data being as equal as possible. In each case, students in the PBL groups outperformed those with more traditional lecture and discussion type learning models. (Drake & Long, 2009; Wirkala & Kuhn, 2011, Zhou & Lee, 2009) In addition, there is evidence to suggest: that students spent more time on task and were more successful with problem solving, (Drake & Long, 2009); had increased confidence and capacity for “self-directed learning” (Zhou & Lee, 2009); and increased retention, comprehension and application skills (Wirkala & Kuhn, 2009).

One element that was inconclusive was whether or not working in a socially collaboratively way (or in teams) resulted in better performance. In one instance students were split into three like groups. One group received lecture/discussion type instruction, while the other two used PBL strategies. Of these two groups, one worked in a team format and the other an individual work format. While both PBL groups were more successful with retention and application, there was not a significant difference between the two PBL groups. (Ciftci, 2013; Wirkala & Kuhn, 2009)

Two of the studies reviewed focused on the effectiveness of PBL instruction with struggling or disadvantaged learners. One focused on the potential for success with students who
have documented learning disabilities, and the other studied PBL effectiveness with schools deemed as “low-achieving.” Both instances produced positive results in terms of academic performance, motivation, self-efficacy and the capacity for social collaboration. (Filippatou & Kaldi, 2010; Halverson, et al., 2012). An additional noteworthy benefit found that students from low SES schools had an increased level of civil awareness. They refer to it as narrowing the “civic empowerment gap” (Halverson et al., 2012, p. 30). This has the potential of taking learning beyond the classroom and into the community as they have more tools to affect change in their environment over time.

**Support for Implementation**

As teachers and schools contemplate adapting PBL type strategies, there is much to consider. Fortunately, a good deal of research exists to support these efforts. Effective classroom management is a key aspect of success in any classroom and PBL classrooms are no exception. While classroom management is typically concerned with keeping students on task and managing time in a traditional classroom, PBL classrooms put more of the impetus on the students in these regards. Teachers have more responsibility when it comes to planning meaningful tasks throughout the project. They also need to identify resources and support student’s inquiry as they research. Specific examples of management tips include: heterogeneous grouping, developing rubrics to clearly communicate expectations, be flexible with scheduling and build in additional time for unforeseen occurrences (technology problems, weather, guest speakers, etc.). (Blumenfeld, et al., 1991; Thomas & Mergendoller, 2000)

An additional aspect that influences success with PBL is the project itself. As projects are being considered, care must be taken to ensure the learning is sufficiently meaningful to engage students. Thought should also be put into ensuring curricular goals are being met and that
the content is developmentally appropriate. Authentic learning is the goal. Authentic pedagogy refers to teaching that incorporates real world problem solving and focuses on content that has real relevance to the learner both in and out of the classroom. Authentic pedagogy promotes a higher level of equity among learners and has more potential to promote social justice. (Blumenfeld et al., 1991; Ertmer & Simons 2005; Newman & Wehlage, 1995; Robbins, 2005)

Several researchers advocate the use of technology with PBL. Technology has the power to engage students, provide variety, aid in helping students work collaboratively, and is a great tool for creating artifacts or aiding in presentation. The point is also made that it can aid teachers in acquisition of knowledge and resources. It has the potential to enhance pedagogical knowledge through research of effective PBL programs and networking with others who have had success. (Blumenfeld et al., 1991; Halat, 1995; Hernandez-Ramos & De La Paz, 2009) One specific tool teachers may consider, as a technological aid is a WebQuest. This is defined as “A computer-based learning and teaching model in which learners are actively involved in an activity or situation, and use the Internet as a resource” (Halat, 1995, p. 69). This research device has potential to be especially useful as an assessment tool.

Just as students need proper scaffolding to be successful, scaffolding has been suggested for novice PBL teachers as well. Giving teachers the opportunity to observe experienced PBL facilitators in action is one such measure. Another is to consider changing the scope of the project. Consider a mini project, one limited to a specific content area, or one that takes place with a smaller group of students. Finally, establish protocols that will accompany instruction. Students find security in routine. Examples might include grouping procedures, check in processes for formative assessment, and presentation of initial problem/activities. Ultimately, it’s important for new PBL teachers to be realistic about the changes that will occur
with management and learning. Start with something manageable. Monitor and adjust as you move forward and take time to reflect along the way (Ertmer & Simons, 2005).

Given the potential constructivist strategies, and PBL in particular, have for teaching students to become lifelong learners, further research in primary classrooms would seem a worthwhile venture. In Chapter four, instructional recommendations will be given for implementation in primary classrooms as well as for future research possibilities.

Chapter IV: Conclusions

Recommendation

In our current education culture of standardized testing, it’s easy to lose sight of the significance of holistic teaching. In addition to a focus on content, a learning community should be caring—an environment that is warm and worn; a safe place where potential is fostered and dreams are encouraged. A place where hearts bruised by criticisms, reprimands, and dashed hopes can be healed through celebrated success, affirmation, and encouraging language. Whether we intend to or not, as educators, we will play a crucial role in the development of the whole child—physical, cognitive, social, and emotional. The successes or failures of standardized testing does not take this into account and leaves a child’s education significantly wanting. As educators we should look to fill these gaps.

Among the multitude of constructivist school reform initiatives, project-based learning stands out as having great potential. Studies show that if implemented carefully, PBL has the ability to engage students, increase motivation, and help students to more effectively retain content knowledge. These are important goals as we seek to create a culture of critical thinkers and socially responsible citizens. Additional benefits of a well-structured program also may include
increased problem solving skills, social collaboration skills and the ability to apply what they’ve learned to authentic real-life situations. Although research is not as extensive, there is plenty of evidence to suggest that project-based learning is indeed viable in primary classrooms. As schools and teachers work toward effective implementation, advice and troubleshooting efforts from experts should be taken into consideration. Suggestions include: buy in from the larger community; the use of technology; teacher training; and developing a network of professionals who use this teaching strategy to share ideas.

**Areas for Further Research**

Without a doubt, more research needs to be done on the effectiveness of PBL in primary grades. While it is conclusively successful when implemented with care, many questions remain. PBL has great potential, but problems with implementation persist. The study by Hertzog (1994) seems especially germane in this case. This study focused on a school being started with, essentially, a blank slate. According to Hertzog, the school was established based on the premise it would have a “constructivist approach and a project-based curriculum with emphasis on creativity, problem solving, critical thinking, and interdisciplinary units” (Hertzog, 1994, p.17). On paper, everything looked good. In reality, however, there were significant problems with implementation, primarily due to a lack of understanding regarding the pedagogy and anticipated outcomes. How can hurdles to implementation be overcome? Can a network of effective PBL educators be identified and established? Can teachers be trained and supported effectively. Questions such as these will be critical to the future success of PBL. Schools and teachers who have been successful should be studied. The ingrained philosophies and educational paradigms prevalent in today’s culture play a huge role. Before teachers can implement constructivist pedagogy, they must understand what it means.
Further research should also be done with students in primary grades, particularly in grades K-2. I would recommend a quantitative study that includes a control group and an experimental group. The same instructor(s) would teach both groups for an equal amount of time with the primary difference being the method of instruction. Attempts should be made to ensure as much equity as possible where gender, socioeconomic status and student achievement are concerned. Data should be gathered through use of pre and posttests measuring content knowledge. Administering an additional assessment focused on application of skills learned after time has passed would be a good way to measure retention. Interviews to ascertain attitudes, time on task, and motivation of each group would also be relevant.

**Summary and Conclusion**

The focus of this study was to determine whether PBL is a viable option for implementation in primary classrooms. After an overview of multiple constructivist learning styles and a review of relevant literature, it’s clear that PBL can, in fact, be a viable option in primary classrooms. Studies focused on many aspects of student success, including: motivation, time on task, content retention and problem solving skills. In addition studies were implemented to determine if PBL might be a preferred option for students in multi-grade classrooms and for students with learning disabilities. In both cases increases were evident in student motivation and content knowledge. One aspect of PBL that is inconclusive after reviewing this literature is whether or not it is more effective in groups or in an individual format.

As popular and effective as this learning style seems to be, implementation is often challenging. Attitudes among teachers, administrators and community members have an impact. Appropriate teacher training with access to appropriate resources and investment by the entire community will increase the potential for success. Research has been done on effective methods
and strategies for implementation. Many strategies and “scaffolds” for teachers were recommended.

Regardless of subject, theme, or concept, our intent as educators should be to teach our learners to embrace critical thinking and problem solving, to honestly seek knowledge and truth, and to develop a zeal for this process. In addition, as our global community expands, our aim should be to teach that there are significant lessons we can learn from other cultures, and that there is a great deal we can learn from each other in our own learning communities. Project-based learning, when implemented carefully, could be an important step in this direction.
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