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## **Project-Based Learning and Student Engagement**

Jennifer Dreyer

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**Project-Based Learning and Student Engagement**

**Jennifer Dreyer**

**Northwestern College**

A Literature Review Presented

in Partial Fulfillment of the Requirements

For the Degree of Master of Education

Dr. Theresa Pederson

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### **Abstract**

Project-based learning (PBL) is a practice underutilized in many school districts despite having many studies demonstrate how project-based learning can positively affect student engagement. The purpose of this review is to improve educational implementation of project-based learning in the classroom setting which will allow for increases in student engagement. This literature review examines research on project-based learning to determine where successful implementation of project-based learning has taken place across various content areas and grade levels. Data was collected from Google Scholar and the DeWitt Library. The research reveals the importance of implementation of project-based learning as a tool to increase student engagement across the entire educational process.

*Keywords:* project-based learning, student engagement

## Introduction

Project-based learning (PBL) is a teaching approach used in many classrooms to allow and promote student learning (Gultekin, 2005). Some schools adopt project-based learning in multiple content areas, whereas others implement it minimally (Creghan & Adair-Creghan, 2015). Foundational researcher, Thomas (2000), states there are five attributes related to project-based learning. More recently, Larmer and Mergendoller (2010) claim there are seven major components of project-based learning. Independent of the number of elements, project-based learning has the potential to make learning meaningful to students (Revelle et al., 2020) (Revelle et al. 2020). According to Larmer and Mergendoller's work, the seven components of successful project-based learning projects are:

- setting a purpose
- asking a meaningful question
- having student input, including 21<sup>st</sup> Century Skills
- requiring inquiry
- encouraging revisions and corrections
- an overall final project students are excited to show off

Although the topic of project-based learning appears frequently in research, the impact is rarely investigated (Duke et al., 2021). Thus, project-based learning is not widely utilized in schools. This literature review will demonstrate the effect project-based learning can have on student engagement. It will answer three questions:

- What in project-based learning is most effective in terms of student engagement?

- What do teachers need to know to effectively implement project-based learning?
- What is the student's role in project-based learning?

Another component this literature review will evaluate is research on project-based learning to determine the most effective grade-levels for implementation, locations of successful project-based learning, and subject areas which allow for positive interactions with project-based learning. This review has the potential to improve educational implementation of project-based learning to improve student engagement.

The research studies reviewed have been found using the DeWitt Library ERIC search engine and Google Scholar. Search terms include, but are not limited to: project-based learning, student engagement, effects of project-based learning, and action research. Many studies reviewed have taken place in the last ten years, with some older studies describe the foundation of project-based learning.

## **Review of the Literature**

### **At the Elementary Level – Nationally**

In elementary schools, project-based learning (PBL) studies are prevalent. One research study examined took place during a six-week unit on the subject of biomes in a first-grade setting (Mitchell et al., 2009). During this study, researchers focused on how a teacher can encourage children to solve their problems during project-based work. The study involved twenty-two students in a veteran teacher's first-grade classroom. Students were given the opportunity to be problem-solvers, explore their curiosity, and participate in a collaborative learning experience with their teacher. The students felt they had a part in picking their topics and how they would present their information through a process called negotiated planning (Mitchell et al., 2009). Success on the biome project was measured by first-grade literacy standards. Data was collected through anecdotal teacher notes. The notes were taken during the biome project as well as after observation of the final project. Through these notes, the researchers verified putting student interests first, providing honest feedback, encouraging mistakes, providing scaffolding, and promoting independence allowed for the students to be successful (Mitchell et al., 2009). This study validates PBL can occur with young students; provided there is proper teacher implementation.

Revelle et al. (2020) conducted research using a specific social studies curriculum called Project PLACE. They analyzed student work in a school with many families of low socio-economic status. Based on the implementation of project-based learning, researchers discovered their second-grade students were able to show more growth in social studies knowledge and reading skills. Teacher observation showed students worked well together, took ownership of

their learning, and due to the nature of the project, included personal aspects. After completion of PBL units, multiple teachers self-reported through their reflection notes a feeling of being more successful in their teaching (Revelle et al.,2020). Educators now have more justification for providing students with authentic experiences. This will not only help them meet the rising number of educational standards but will also provide students with deeper connections similar to Mitchell et al. (2009).

Duke and Halvorsen went on to continue research on this topic a year later, this time with some additional authors. Once more, they used second-grade students in a school with low socio-economic families, but this time they increased the number to 684 student participants and 48 teachers (Duke et al., 2021). This study showed an increase in the social studies and informational reading components. After this study, Duke et al. (2021) remarked:

“There is sufficient evidence to continue the implementation and investigation of project-based learning... as a means to address the often-neglected domains of social studies and informational reading and writing and foster learning by tapping into students’ drive to connect with and make sense of their social world.”

Another study occurred in a fourth-grade classroom which explored whether there were significant effects of PBL pertaining to students’ understanding of the science topic of electricity (Karacalli Saide & Korur, 2014). Researchers wanted to focus on how PBL could impact a students’ academic, achievement, attitude, and retention of knowledge. After a semester of PBL, researchers were able to conclude there was a large difference between pre-and post-test scores for the experimental group, and only a small difference for the control group (Karacalli Saide & Korur, 2014). This study provides proof of long-term retention of information due to PBL.



Similar to Karacalli Saide & Korur (2014), another study took place with fourth-graders covering a social studies unit (Tasci, 2015). There were 143 students selected randomly from a group of 1,300 students, half of which were part of the experimental PBL teaching and the other half served as a control with traditional teaching. The results indicated academic achievement was impacted. When the pre- and post- scores of the topic test were compared between the experimental group and the control group, the pre-test showed a difference of less than two points. However, the post-test showed a difference of 27.17 points between the two groups. In addition, students were affected in regard to their learning agility. The post-scores indicated a difference of over 40 points between the two groups. This study supports the goal of adding PBL into daily lessons to create a positive impact on students' learning and improve key detail comprehension.

### **At the Elementary Level – Internationally**

PBL has a place in education even before children enter the traditional school system (Aral et al., 2010; Gultekin, 2005; Filippatou & Kaldi, 2010). In Turkey, research was done using fourteen preschool students to assess how a project-based curriculum impacts each child's conceptual development (Aral et al., 2010). Students were given a pretest and posttest to collect data. The scholars concluded while all students improved their school readiness composite scores, the experimental group had slightly more of an increase on the posttest of a one-point difference. However, on the total concept score, the experimental PBL group had a significant difference in their scores with a mean difference of seven points (Aral et al., 2010). For more effective instruction, the researchers recommended PBL implementation two or more times per week for months at a time, which is valuable for teachers to keep in mind.

In a foundational study of PBL, a fifth-grade classroom in Turkey compared academic achievement between a project-based classroom and a traditional approach to teaching (Gultekin, 2005). They also sought to learn about the students' and teachers' opinions of the process. Using a mixed-method approach, Gultekin (2005) derived data showing the approach being enjoyable, improving research skills, and helping develop the essential skills of students. The researchers' data used two-sided t-testing of the pretest and posttest scores which had a score of 0.05 significance level (Gultekin, 2005). For teachers, this research effectively demonstrates a link between keeping students engaged and making connections to improve academic achievement.

Also taking place in Europe, a study was conducted in Greece. This study used mixed method research for eight weeks with twenty-four fourth-grade students who had learning difficulties (Filippatou & Kaldi, 2010). The research question evaluated how effective project-based learning was with students who exhibited learning disabilities. In this study, implementation results demonstrated the mean scores and standard deviations of the pre- and post-test scores increased significantly on the knowledge test (Filippatou & Kaldi, 2010). Findings supported those who took part in PBL gained in academic performance (effect size of 1.89), motivation (effect size of 0.53), and group work engagement (effect size of 0.61). For educators who seek to broaden opportunities with learning difficulties, PBL could be the answer.

### **At the Secondary Level – Nationally**

Despite multiple studies demonstrating the effectiveness of PBL, there are barriers (Wurdinger et al., 2007). Initially, PBL advocates sought to uncover barriers to successful integration in Minnesota schools (Wurdinger et al., 2007). These researchers focused on the

effectiveness of PBL in a middle school setting. Qualitative data was collected using surveys and interviews. In the first survey, researchers determined although teachers were aware of the benefits of PBL, the teachers were not implementing it in their classrooms. According to the researchers, this was due to three things: time, fairness, and control (Wurdinger et al.,2007). This research study brings up valid points about the problems. However, the observed benefits of the amount of student engagement outweigh those problems. This research provides educators insight into the planning and effort PBL requires and the sacrifices need to be made for students.

A study completed in Indiana with 370 students and 21 teachers shows how PBL can look different at the high school level (Cho & Brown, 2013). In this study, the researchers' goal was to determine which of the essential elements of PBL were in their school, as well as map the upsides, downsides, and potential limitations of PBL (Cho & Brown, 2013). They determined teachers were able to take on the role of facilitator, which ultimately resulted in greater job satisfaction (Cho & Brown, 2013). Thus, this study showed teachers themselves ended up being happier when implementing project-based learning, which is important for educators to know.

Like Cho and Brown (2013), Ravitz (2010) chose to study how PBL impacted teachers regarding teacher culture, student culture, and instructional reforms in a small high school setting. This research surveyed 395 public high school teachers who taught a core subject. Questions covered the topics of teacher culture, student culture, and their current use of PBL. The survey demonstrated there was no correlation between PBL and teacher culture. Additionally, it pointed out project-based learning's effectiveness differs due to no two teachers teaching the same (Ravitz, 2010). This researcher indicates how educators need to be aware of their future project-based learning projects and determine with colleagues how to provide

authentic experiences. These findings counters those of Cho and Brown (2013) who determined teacher happiness increased with PBL which improves teacher culture in a school.

In the Northwestern United States and parts of Canada, various high schools studied the benefits students had when teachers asked to compare PBL to traditional teaching (Saunders-Stewards et al., 2015). In this study, there were 181 participants. Responses were collected using rubrics, teacher interviews, student interviews, and student questionnaires. Results demonstrated a positive correlation between students who took part in project-based learning and students who had success. Students who took part not only felt they achieved educational outcomes set for them, but more importantly, they also provided high-quality responses throughout the interviews (Saunders-Stewards et al.,2015). Moreover, the students reported increased levels of achievement and made comments regarding the connections they formed between schoolwork and their own experiences (Saunders-Stewards et al.,2015). Based on this, students can be expected to feel more engaged and devoted during the PBL process.

In Texas, researchers examined project-based learning's impact on student attendance rates for impoverished students at the high school level (Creghan & Adair-Creghan, 2015). Data was collected for 65 randomly selected students each year for three years and compared to data from non-PBL schools. In the first year, attendance rates for the non-PBL school was a mean score of 148.2 compared to the PBL school which had a mean score of 165.88 (difference of 17.68) . The second year the difference was 19.91 and the third year had a difference of 19.59. This data demonstrated PBL improved school attendance for economically disadvantaged students. Results such as these demonstrate PBL appears to motivate and engage students, which encourages attendance.

**At the Secondary Level – Internationally**

A different study at the high school revealed how PBL influences students' achievement, engagement, technological knowledge, and attitudes towards technology (Mioduser & Betzer, 2008). For this study, 120 high school students in Israel had their projects analyzed. Through this analysis, researchers found students in the experimental group performed better on the post-test, had positive changes in attitude, and took the learning into their own hands. Notably, these students sought additional resources to assist in their project (Mioduser & Betzer, 2008). The results showed the increase in achievement between the control group (52%) and the experimental group (84%) was significant (Mioduser & Betzer, p. 68). This study demonstrates increased engagement continues to raise achievement.

PBL at the middle school level can take a more individualized approach (Grant & Branch, 2005). In a foundational study of project-based learning, researchers tried to determine how project-based learning allows learners to focus on their different skill sets (Grant & Branch, 2005). Data was collected through interviews, self-reflected ratings, observations, and a final project. Although an older study, results demonstrated some skills are utilized more in project-based learning, whereas some are not utilized. In this case, skills refer to the multiple intelligence abilities of verbal linguistic, mathematical/ logical, visual/ spatial, bodily/ kinesthetic, musical, interpersonal/ intrapersonal, and natural. One skill not utilized was kinesthetic and multiple participants indicated they did not see a connection between kinesthetics in their history project. However, PBL did allow for students to capitalize on a majority of their multiple intelligence abilities (the highest being reported in verbal linguistics, logical, and natural) and have a meaningful connection during the unit using computers. The findings of this study demonstrate how students can experience individualized learning and still meet the needs of teachers.

**At the Undergraduate Level – Nationally**

Project-based learning at the college level has been studied multiple times (Beier et al. 2019; Vogler et al. 2018; Wurdinger & Qureshi, 2015). One study evaluated whether engaging college students in client-centered projects in STEM coursework increased those students' interest in STEM careers (Beier et al., 2019). This study was completed in the southern United States at a private university with 492 participants surveyed. The results of the study showed PBL was mostly positively received and STEM skills' efficacy and utility value of PBL participants was different from those which were not PBL participants. They also determined students' perceptions of their skills had a future positive impact (1.8% variance) to their career aspirations (Beier et al., 2019). These results are similar to Mioduser and Betzer (2008). In both cases, students' engagement and self-perception was altered positively. Based on these surveys, PBL enables the students to possess greater confidence in themselves and be more engaged with the topic because they felt it was meaningful.

Interestingly, a different study on PBL focused its attention on student's perception of the PBL experience. The study by Vogler et al. (2018) was based on PBL implementation through the creation of a hospitality app in a college course. The research was completed in the Midwest over two years with fifty-six undergraduate students. The results showed despite some difficulties, students reported it was worth the extra effort (Vogler et al., 2018). The researchers were able to conclude the nature of this assignment allowed for and supported important characteristics of student learning which are not often addressed in traditional classroom settings (Vogler et al., 2018).

Another study completed at the college level targeted life skill development in a project-based learning course (Wurdinger & Qureshi, 2015). This study took place in Minnesota with fifteen participants in their mid-twenties over four months. Participants were given surveys and three took part in interviews. After course implementation (using PBL), the results showed mean differences of the surveys in five areas: responsibility (0.333), problem-solving (0.391), self-direction (0.375), communication (0.275), and creativity (0.401) (Wurdinger & Qureshi, 2015). Students were more motivated and observed taking ownership of their learning through the project (Wurdinger & Qureshi, 2015). According to this study, teachers can expect to see their students engaged after usage of PBL.

#### **At the Undergraduate Level – Internationally**

Writing is a typical subject which benefits from PBL according to Affandi & Sukyadi (2016). In their research, they studied seventy-eight participants who were in their second year of college by comparing project-based learning and problem-based learning (Affandi & Sukyadi, 2016). On the pre-test there was a p-value of 0.68 and mean scores of 71.71 (project-based) and 72.69 (problem-based). On the post-test, project-based learning participants had a p-value of 0.00, where anything under  $p=0.5$  deems a noteworthy difference. Findings portrayed project-based learning's ability to improve students' writing achievements. Also, low, mid, and high achievement students all noted project-based learning captured their attention. When in the educator mindset, this shows students are engaged in writing, which is not anecdotally prevalent. Additionally, achievement increased which is a goal worthy of action research (Affandi & Sukyadi, 2016).

At the University of Athens, Papanikolaou and Boubouka (2013) collected mixed-method research using the platform of MyProject, an online project-based resource. They collected data from forty undergraduate students who responded had the ability to see their peers' ideas, receive relevant and helpful responses to their ideas, and revise their ideas appropriately aided them greatly in the course. Mean collected data was all positive (Papanikolaou & Boubouka, 2013) For students, this study is a reminder creative revision is a part of the PBL processes and can be enhanced when interactions are relevant and multi-faceted.

### **Strategies of successful programming – Results for Students & Regulators**

Based on the literature review alone, the incorporation of PBL into content areas benefit students. Research has taken place in several national and international locations around the world. A popular location is in the United States. In the southwestern USA, a study was conducted with 134 preservice and in-service teachers (Hovey & Ferguson, 2014). For educators, it is insightful to learn from the experiences of their perceived peers. In this case, research centered around teachers' existing knowledge of PBL and their expectations of implementation. Most participants did not feel they understood the purpose of PBL (Hovey & Ferguson, 2014). The teachers with knowledge of PBL reported positively and felt their students who were a part of special student populations, such as gifted or having a learning disability, also felt positively about PBL. Consequently, educators should know PBL is a process and doesn't create expertise overnight. As additional exposure and training in PBL is desirable, Duke et al. (2021) point out professional development is an essential part of effective project-based teaching.

On the other side of the world, the Middle East has completed many studies related to PBL and the engagement of students (Hugerat, 2016; Kiliñç, 2010). In an Israeli study of 458



students who completed a questionnaire of 38 items was employed to study how project-based learning can be used in a science curriculum setting (Hugerat, 2016). PBL Participants were placed into groups of six and tasked with investigating a scientific problem and conducting an experiment. The remaining students, not in PBL, were sat in roles with the teacher explaining and students listening. This study is similar in outcomes as those done by Saunders-Stewards et al. (2015), Duke et al. (2021), and Gultekin (2005). After completion of PBL, Hugerat (2016) collected results demonstrating students who learned science using PBL found their classroom climate to be more enjoyable (mean difference of 1.84), perceived their teachers as more supportive (mean difference of 6.22), and evaluated teacher-student relationships holistically (mean difference of 8.1). For an educator, results such as these are proof of student engagement.

In Turkey, thirty-three participants who were in the process of becoming teachers, were researched to examine the effectiveness of PBL on how students felt about and interacted with the environment (Kilinç, 2010). Survey and questionnaire data was analyzed and showed the project-based process resulted in the students being more environmentally conscious. The survey showed there was a difference in pre-behaviors of not being interested in environmental pollution to post-behaviors of collecting waste and trying not to use as many resources. The questionnaire had a mean post-behavior score of 6.27. Results such as this demonstrate to teachers not only can project-based learning impact students in the classroom, but it can also affect how they behave in the real world.

Europe has also organized a handful of research projects about PBL (Jaime et al., 2016; Peterson & Nassaji, 2016). A study at a university in Spain consisting of 154 participants sought to determine how different teaching methods affect different levels of performance (Jaime et al., 2016). This study mirrors Hugerat (2016); however, this study compared PBL to spiral learning

and peer assessment. Results demonstrated PBL in conjunction with peer assessment and spiral learning provided improvement at all levels through the four projects assessed. The mean difference between control and PBL was 9.049. These results showed peer assessment provided significant student engagement which reinforces the rigors of lesson planning.

Another study, conducted by Peterson and Nassaji (2016), sought to collect data on three research questions: what are ESL students' beliefs about project-based learning, how do their beliefs differ from teacher beliefs, and what do students think of the frequency of project-based learning features? The researchers' first conclusion was teachers had more positive attitudes compared to students towards PBL (mean of 4.75 for students and mean of 5.43 for teachers). This connected to the researchers' second conclusion: students rarely felt they had the opportunity to choose topics for their projects nor get to use the Internet for research frequently (Peterson & Nassaji, 2016). During the majority of the study, the teachers' and students' viewpoints aligned; however, an educator has to be aware of how students perceive the lessons and the amount of student input taken.

Over fifteen years later, a remarkably similar study took place in the United States in a handful of elementary schools with families of low-socioeconomic status (Duke et al., 2021). This study compared the implementation of PBL to the traditional model of instruction. In this study, teachers received some professional development and then integrated eighty lessons into their social studies instruction to determine student differences in motivation, informational reading, social studies comprehension, and informational writing. Results demonstrated the experimental project-based group performed better in informational reading (23% gain) and social studies comprehension (63% gain), but there were no noticeable differences in writing or motivation (Duke et al., 2021). These uneven results demonstrate the power PBL can have

regarding meeting standards which is important for students as they need to be aware of in terms of making connections between the curriculum and their lives.

Similar to Hovey & Ferguson (2014), a Canadian study used teachers as participants to see how PBL impacts the learning of 21<sup>st</sup>-century skills (Ravitz et al., 2012). In this study, 21<sup>st</sup>-century skills were classified as: critical thinking skills, collaboration skills, communication skills, creativity and innovation skills, self-direction skills, global connections, and using technology as a tool for learning. Sixty teachers were surveyed after a weeklong summer professional development session. From these surveys, researchers found teachers who used PBL and had professional development in the subject of PBL taught and assessed 21<sup>st</sup>-Century skills more (z score of .56 compared to -0.59 from teachers who did not implement PBL). These teachers also had better student results in those areas skills (Ravitz et al., 2012). Educators should keep results like this in mind, as 21<sup>st</sup>-Century skills are vital skills for students and keep them more engaged in school.

In the end, the almost thirty research studies demonstrate PBL is a valid tool for students at multiple educational levels and provides an improved ecosystem in which educators foster engagement and personal achievement.

### **Future Research**

One idea repeatedly mentioned by studies was the need for future studies related to teacher buy-in (Revell et al., 2020). Without teacher buy-in, there is a low likelihood of proper implementation of PBL. According to Revell et al. (2020), teachers need to be aware of the time commitment related to PBL related to planning and implementation in order to buy into the process.

Another area requiring more studies would be the amount of time PBL should be implemented (Ravitz, 2010). Although a more foundational study done by Ravitz (2010), in the ten years since published, there have not been a lot of long-term PBL studies. This is a gap in the available research for educators to examine. The majority of the studies examined in this literature review took place for a semester or less. Educators need to know how long PBL takes to show student engagement or if there is a plateau where achievement no longer increases. It is important for teachers to have insight to prevent short-term trials of low risks and then moving onto a different instructional strategy. Additionally, studies need to go into the frequency of PBL into the school day, regarding daily, weekly, etc.

In an age where standardized testing plays a large role in education, it is recommended future research goes into how implementation of PBL influences standardized testing. This research would ideally be a multiple year study, following a multitude of students in order to provide enough data. After the initial study, other studies could take place in either low-socioeconomic communities or high-socioeconomic communities to determine if results differ based on socioeconomic status of school districts' communities.

### **Conclusion**

The current review of the literature uncovered studies and analyses which showcased an improvement of student engagement in relation to the implementation of project-based learning (PBL). Several of the studies demonstrated an increase in academic achievement, as well as gave educators ideas on how to make project-based learning successful in their classroom. The studies gave insight into the knowledge students needed to possess as they go through the process of completing project-based learning activities. However, there were gaps related to recent studies

on PBL and the need for future research in the subjects of teacher buy-in, length and frequency of implementation, and the impact of standardized testing with the implementation of PBL.

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