How Teachers Use Project-based Learning in the Classroom

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Abstract

A purposive sample of six teachers, grades four through 12, in public and private schools, participated in a study that explores their use of project-based learning (PBL) in the classrooms. Four major uses emerged: initiation of learning, extension of learning, reinforcement of learning, strategic navigation. Interpretations and implications of the findings are also presented.

Introduction

Project-based learning is an instructional model that is based in the constructivist approach to learning. Some key concepts of constructivism are discovery learning, zone of proximal development, scaffolding, cognitive apprenticeship, coaching, context, collaborative learning, and the nature of assessment (Duffy & Cunningham, 2005). Not only does constructivism aim at the construction of knowledge, but it also entails the construction of knowledge with multiple perspectives and within a social activity, it is context dependent, and it allows for self-awareness of learning and knowing (Duffy & Cunningham, 2005). Project-based learning is one instructional model, among others, that encompasses all these aspects of constructivism.

Advantages of PBL

As a constructivist model, (PBL) targets the building of the learner as a whole and not simply a model that aims at increased knowledge about specific content areas. Katz and Chard (1992) posit that PBL achieves four goals: acquisition of knowledge, acquisition of skills, dispositions, and feelings. Through PBL, students become intrinsically motivated, more focused, and they develop a range of abilities and skills (Griva, Semoglou, & Geladari, 2010; Wolk, 1994; Wurdinger, Haar, Hugg, & Bezon, 2007).

Teachers find many advantages to PBL. They believe that it enables them to teach skills beyond the content, making learning more personalized and more varied, and it enables them to teach academic content more effectively (Ravitz, 2008). In addition, they perceive PBL to build students’ creative thinking skills as they acquire a deeper level of learning and understanding of the subject-matter (Akinoglu, 2008).

Studies show positive effects of PBL on students’ learning outcomes (Akinoglu, 2008; Chu, Tse, & Chow, 2011; Griva, Semoglou, & Geladari, 2010). Students are able to move from novices to experts in the domain of knowledge (Grant & Branch, 2005). Their critical thinking abilities, their presentation skills, their communication skills, and their ability to work effectively on a team are also enhanced (Neo & Neo, 2009; Wurdinger et al., 2007). Additionally, students value the fact that their projects are situated in real-life contexts (Gubacs, 2004).

Challenges of PBL

Using PBL in the classroom does impose certain challenges on the teachers who use it.

Taking on the constructivist approach. Thomas (2000) reports that one important challenge is the conflict PBL brings to the deep-seated beliefs of teachers in their approach to teaching and the degree of balance needed between student control and teacher control over the activities. As teachers get introduced to PBL, they tend initially to rely on the transmission of knowledge approach (Blumenfeld, Krajick, Marx, & Soloway, 1994). They need time to transition towards the constructivist approach of PBL, whether it is in sharpening their skills or changing their beliefs. Teachers must be able to recognize and accept a shift in their function and become comfortable with implementing student-centered pedagogies, such as PBL (Grant & Hill, 2006; Rogers, 2010).

Additionally, teachers must also be able to tolerate the ambiguity and flexibility of the dynamic environment created by the student-centered approach. Teachers may doubt their ability to complete the required curriculum because of the time needed to spend on projects. In addition, the teachers may be concerned of losing control over the topic and the behavior of the students, which might prevent them from allowing students to work in small groups. Therefore, teachers have difficulty giving their students the time needed to build their skills; instead, they feel that they need to teach the students the skills before starting the project (Hertzog, 2007). On the other hand,
Ravitz (2003) posits that even when teachers show enthusiasm about the constructivist teaching approach after participating in professional development workshops, they might not find it easy to implement it in their classrooms.

**Curriculum and selection of topic.** Another challenge facing teachers is the creation of a balance between district curriculum, testing policies, and the large content that needs to be covered within a fixed schedule (Krajcik, Blumenfeld, Marx, & Soloway, 1994; Snyder & Snyder, 2008). Moreover, selecting meaningful project topics that engage students could also be challenging (Akinoglu, 2008; Howard, 2002; Wirdinger et al., 2007). On the other hand, teachers may not have enough expertise on the subject they are teaching to be able to coach the investigation properly or students might explore areas that are not necessarily familiar to the teachers (Grant & Hill, 2006; Howard, 2002). Therefore, once teachers hone their skills in PBL and become creative in planning the related activities, they will overcome their concerns of not following the curriculum strictly and choosing the appropriate topic (Wirdinger et al., 2007)

**Management and design in project-based learning.** The successful orchestration of all the features of PBL is one more challenge teachers face when they carry out PBL activities (Krajcik, Blumenfeld, Marx, & Soloway, 1994; Snyder & Snyder, 2008). Teachers need to orchestrate several elements in order to manage a project: a variety of resources, information sources, learning contexts, participants, time, tasks, and arrangements. This is in addition to planning, monitoring, scaffolding, adjusting, and troubleshooting strategies (Thomas & Mergendoller, 2000). Kolodner et al. (2003) discuss the ability of the teacher to manage projects in a large classroom, all the while maintaining the engagement of all students, in addition to maintaining a balance between the investigative aspect of the project and the interpretation and reflective activities. Moreover, teachers may be challenged by their inexperience of designing adequate project-based activities or by their lack of training in critical thinking methodology (Akinoglo, 2008; Snyder & Snyder, 2008). Therefore, teachers working in PBL need to gain skills in managing environments that are not stagnant, that draw on several resources, and that guide the learners in inquiry as much as partner with them in choices.

**Assessing project-based learning.** Assessing student achievement in PBL is an additional challenge that teachers must address. Marx, Blumenfeld, Krajcik, and Soloway, (1997) state that, in some instances, teachers ask students to produce artifacts that do not require the use of critical thinking and assessing these artifacts does not measure understanding. They add that assessing artifacts quality is difficult because of the several features that must be taken into account, such as design, organization, and accuracy. Additionally, Grant and Hill (2006) argue that assessment should include several learning products and not only the final artifact. They suggest portfolios as a learning product where students reflect on their learning experience as they go through the phases of the project. Similarly, Barron and Hammond (2010) stress the importance of formative assessment and suggest rubrics, solution reviews, whole class discussion, performance assessment, written journals, portfolios, weekly reports, and self-assessment as other forms of assessment. Moreover, Grant (2011) posits that teachers need to provide their students with clear expectations about the project requirements for better assessment. Therefore, teachers need to look at assessment in PBL as multifaceted. It targets individual and group performance, concrete products and cognitive and metacognitive skills, as well as learning and social skills.

**The nature of collaboration.** The collaborative work needed in PBL is one of its most difficult aspects (Kapp, 2009). It is essential for teachers to create a classroom culture of collaboration, where students feel responsible of helping each other, and of iteration, where they expect to make mistakes in order to learn from them (Kolodner et al., 2003). Also, it is important to create a classroom environment that supports mastery and develop a constructive view of error, especially since students might defeat the learning goals of the project if they are worried about failing more than succeeding (Meyer, Turner, & Spencer, 1997).

Teachers perceive that PBL can bring many advantages to the learning experience of the students; however, as they implement it in the classroom, they may face certain challenges and they need to adjust their teaching accordingly.

**Methodology**

The purpose of this study was to investigate how school teachers implement project-based (PBL) learning in their classes.

The research questions were as follows

1. How do teachers define project-based learning?
2. How do teachers choose to use project-based learning?
3. How do teachers use technology to support their project-based activity?
**Design**

A case study approach was used to answer the research questions. The unit of analysis was teachers in the bounded system of activity of the implementation of PBL. A collective (or multiple case) approach was adopted where several teachers were selected in order to get a broader view on the topic (Creswell, 2007). In addition, having multiple cases allowed for finding particularities of cases and also common features between them (Stake, 2003).

**Participants**

Six teachers were selected for the exploration of the research questions. The criteria for selection were as follows:

1. Teachers had to be involved in project-based learning for more than one school year.
2. Projects involved some form of technology integration.
3. Teachers were willing to participate in the study.

Personal contacts were used to identify teachers who satisfied the selection criteria. Teachers were contacted by email to introduce the research topic and set the appointments for the interviews. The resulting sample of teachers covered grades 4 through 12, included four females and two males, and represented three public schools and one private school. The teachers selected ensured variation in the sample between gender, types of schools, and grade level. Following is a description of each teacher.

**Greg.** Greg is a Caucasian middle-aged teacher who teaches 12th grade English in a public school, in a relatively small city. He has been teaching for eight years and using project-based learning with his students for six years. His class size is big, comprising thirty students.

**Audrey.** Audrey is a young African American teacher who teaches 9th grade English in an inner city school. She has been teaching for two years and doing project-based learning for a year and a half. Audrey teaches a special course in English targeting struggling readers. Her class size is small, comprising twelve students that she divides into different activity groups.

**Diane.** Diane is a young Caucasian teacher who teaches 5th grade Math and Science in a campus school in the city. She has been teaching for five years and using project-based learning all through her teaching career. Her class size is medium, comprising twenty-four students.

**Martha.** Martha is a middle-age Caucasian teacher who teaches 5th grade Social Studies in a private school in the outer city. She has been teaching for twenty-two years at the 4th grade level and has been using project-based learning all through her teaching career. Her class size is relatively small comprising seventeen students.

**Brenda.** Brenda is a young Caucasian teacher who teaches 4th grade Reading, Math and Social Studies in a private school in the outer city. She has been teaching for four years at the 4th grade level and has been using project-based learning for two years. Her class size is relatively small comprising fourteen students.

**Scott.** Scot is a middle age Caucasian male who teaches 6th grade Math and Science, in a public campus school in the city. He has been teaching for eight years and he has been using project-based learning all through his teaching career. His class size is medium ranging between 18-28 students.

**Data Collection**

Two data collection methods were used.

**Interviews.** A semi-structured individual interview was carried out with each of the participants. Each interview lasted between 20-45 minutes and was conducted during school hours. The interviews followed a protocol determined by the research questions. These interviews provided room for the exploration of the research questions with the teachers allowing them to describe in-depth their perceptions and experience with project-based learning. The interview protocol was pilot tested prior to data collection.

All interviews were recorded using computer software called Audacity. The audio files were stored on a laptop to be retrieved later for transcription. Each file was transcribed and saved as a Word document. Two of the transcriptions were done by the researcher, two were done by a high school student, and one was done by a college student.
Document collection. Planning materials such as lesson plans and evaluation instruments were also collected from some of the teachers. The analysis of these documents followed the document protocol. The collected materials varied in the type of information they provided. Nevertheless, they were helpful in corroborating the data collected from the interviews.

Data analysis

Analysis of the data followed a constant comparative method (Glaser & Strauss, 1967). The inductive process of data analysis started by the researcher gathering information through open-ended questions and fieldnotes. These were put into themes and categories that became broader through analysis (Creswell, 2003).

Iterative rounds of data reduction began with open coding directly from the interviews. Similar codes were grouped into categories and similar categories were grouped into themes. For example, raw codes were highlighted on the text printout of the transcripts then cut out. Each code was referenced by the initials of the participant’s name and the line number of its location on the transcript. Following, similar codes were grouped together. Then, these codes were transferred to the online visual thinking tool Webspiration that allowed the creation of a concept map. Codes were typed in boxes and boxes of similar codes were grouped together to branch into the same category. On Webspiration, codes and categories were color coded to facilitate their identification (see Figure 1). Later, similar categories were grouped together to form a theme. This process was followed by a peer debriefing where, using a whiteboard, themes and subthemes were reviewed and organized.

The resulting codes and themes allowed for the identification of teachers’ profiles that relate to their use of PBL. These profiles were supported by the reflective notes taken by the researcher after each interview, highlighting personality traits and first impressions of the teacher’s approach to PBL.

Lastly, the documents collected from the teachers were studied to look for similarities with the content of the interviews on the design of the PBL lessons or activities, evaluation methods, technology integration, or examples of artifacts.

Rigor and trustworthiness

Four strategies were used to ensure the rigor and trustworthiness of this study.

Triangulation. In this study, two sources of data collection were used in order to ensure triangulation: semi-structured interviews and documents. The semi-structured interviews were based on the interview protocol and consisted of open-ended questions. This way, the teachers were able to elaborate with their responses by giving their own perceptions and interpretations without much interference from the researcher. The researcher probed and redirected the focus of the interview to the research questions. As for the documents, they were studied to look for corroboration on the content of the interviews.

Member checks. Here, the transcripts were sent through an email attachment asking the teachers to review them and make changes. Only one teacher responded with no changes.

Peer debriefing. Several peer debriefing sessions were held with a professor where codes, categories, and themes were discussed as well as the construction of the teacher’s profiles. These discussions were based on concept maps and outlines displayed on a white board. Additionally, discussions covered how rigor was achieved.

Audit trail. In this study, the researcher kept a journal on the coding process and the creation of categories and themes. Furthermore, after each interview, the researcher documented her reflections on the personality traits of the teachers and their reactions during the interview. These reflections helped in the construction of the teachers’ profiles.

Findings

The teachers in this study differed in their beliefs on how and when to use PBL. While the sample was small, four profiles of PBL teachers emerged from the data. By using PBL, teachers reinforce learning (reinforcer), they extend learning (extender), they initiate learning (initiator), or they can navigate among these three trends according to need (navigator).

Table 1 displays the four profiles of the teachers, their names, the type of school they worked in, the grade level, and the subject-matter they taught.
Table 1
Profiles and characteristics of teachers

<table>
<thead>
<tr>
<th>Profile</th>
<th>Name of teacher</th>
<th>Type of school</th>
<th>Grade level and subject-matter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinforcer</td>
<td>Greg</td>
<td>Public</td>
<td>12th grade English</td>
</tr>
<tr>
<td>Extender</td>
<td>Audrey</td>
<td>Public</td>
<td>9th grade English</td>
</tr>
<tr>
<td>Extender</td>
<td>Diane</td>
<td>Public</td>
<td>5th grade Math and Science</td>
</tr>
<tr>
<td>Initiator</td>
<td>Martha</td>
<td>Private</td>
<td>5th grade Social Studies</td>
</tr>
<tr>
<td>Initiator</td>
<td>Brenda</td>
<td>Private</td>
<td>4th grade Reading, Math and Social Studies</td>
</tr>
<tr>
<td>Navigator</td>
<td>Scott</td>
<td>Public</td>
<td>6th grade Math and Science</td>
</tr>
</tbody>
</table>

Reinforcers

A reinforcer, indicated by Greg, perceives the benefit of PBL as its potential to supplement and reinforce content that has been completely taught.

**Greg.** Greg is a teacher who enjoys the use of projects in his classes. He strongly believes that it is a good approach to motivate students. He uses PBL to increase the students’ interest in the material they are learning which they sometimes perceive as dry. In addition, Greg takes advantage of their high technology skills and opens the door for his students to make use of them, in another attempt to motivate them. However, Greg uses projects to supplement and reinforces his teaching. In this regard he says:

Well, I think, what I try to do is a supplement to what I’m already teaching. For example, if we’re reading a novel or a play, then I will test them, of course, over their knowledge of the content. But then, in addition, what I try to do is some sort of project-based learning, it sorts of supplements and reinforces the content.

On using technology he says:

The way I do that is to do technology and most students do like technology. So, the basic assignment is this: they have to find a published poem… then they are to determine the theme of that poem and then they are to find a song that matches that theme, and then we go into the computer lab and using iMovie and then find pictures to match that theme and then marrying all together into an the iMovie….. So, it just sort of supplements to them that they have got to identify the theme and then they’ve got to find the song that also matches that.

This idea of reinforcing and supplementing his teaching with projects is recurrent all through the interview. The projects come in after the content has been taught to the students and their knowledge on it has been tested. Greg perceives the benefit of PBL in its potential to supplement and reinforce a content that has been completely taught. In that sense, Greg reinforces learning through PBL.

Extenders

An extender, exemplified by Diane and Audrey, uses PBL by having students problem-solve and use critical thinking skills to take their learning a step further from what had been already taught.

**Audrey.** Defining PBL, Audrey reveals her constructivist approach to teaching. She says, “Basically it’s an opportunity for the students to learn in a different way and to investigate things and work together and put it together and just come up with their own solutions.” Audrey chooses to use project-based learning in her class because she believes it motivates the students, it engages them in critical thinking and creative work, and provides them with authentic learning experiences. However, Audrey sees that project-based learning is best suited to complement the content material she is covering in class. She says:

I find something that is really interesting to them from what we read about that they have some good discussion on. And I just think what would be a good project to create out of that…. It is complimentary to what we are working on already because to me, sometimes it’s difficult to just open a whole new can of worms and then, we still have this material to cover. So I go from whatever we are reading or doing in class, and then whatever I think can complement that, and help them understand it better.
In this respect, Audrey extends learning through PBL.

Diane. For Diane, PBL is a way for students to learn by doing and produce a product or an artifact that shows what they have learned. On the other hand, Diane views the potentials of PBL to be in its use as a culminating activity to the units taught in class:

I have typically put projects towards the end of the unit. I feel like it is more of a culminating activity… so that they can take everything that they have learned throughout that unit and put it into a project.

Therefore, Diane does not teach her content through PBL, but her approach is to cover the content first and then move to the project next. However, in doing so, her projects are not repetitive of the content but they allow students to delve farther, reaching the objectives through critical thinking and learning by doing:

We wanted to do something where the kids were taking things from different subjects…. We knew that we wanted them to be thinking critically. We looked at the objectives that were our state standards, what skills we wanted the kids to be able to accomplish through this project and then we looked at the materials that they have already learned about and what new skills they might need to be taught before they would be able to accomplish the project…. Because they don’t have a lot of exposure to city planning, we did a few lessons on what is city planning, what kind of components need to go into that…. like a hospital or the schools, those types of things, but then we also gave them some choice in terms of optional items…. We told them the components that needed to be presents but how they laid that out was up to them…. So those kinds of things that they discovered were done all on their own so.

So, basic knowledge and skills were covered before the project. For Diane, this is a necessary step that enables the students to use higher order thinking skills and deepen the focus of the content. As a result, students would then show their knowledge and skills in the artifact they produce. In this sense, Diane extends learning through PBL.

Initiators

The profile of an initiator, indicative of Martha and Brenda, launched a unit of learning for their students with research questions, continued with a journey of discovery and critical thinking, and led to the production of an artifact.

Martha. Martha explains her use of project-based learning as a method through which learning takes place. Talking about a project on Canada, she says:

[Project-based learning is] the way we cover the unit. We did use our textbook to cover background reading on Canada…. But I found out that if you do let them search for the information and work with the information rather than reading out of the textbook they tend to remember it better and they are learning and they are exposed to some many more skills that way…. I just try to introduce them to it and then provide them with different places to go to do their own research. But typically, when they find it on their own, they learn more from it, and they are more drawn into it.

Therefore, with PBL, Martha takes her students to where they construct their own knowledge through research. In addition, Martha puts an effort in scaffolding their learning, as well as including the element of reflection in her PBL activities. On the other hand, a strong element in Martha’s implementation of PBL is her multidisciplinary approach towards it. Supported by the whole 5th grade teaching team, Martha is fully aware of how a multidisciplinary approach to projects enriches the learning experience of the students and makes it more authentic.

Therefore, Martha is the teacher who uses PBL to guide the learning of her students with research questions that takes them on a journey of discovery and critical thinking, leading to the production of an artifact that demonstrates their learning. Therefore, she initiates learning through PBL.

Brenda. The first impression one gets when talking to Brenda is the vivaciousness of her personality. She describes her experience with PBL with great excitement and details. In doing so, Brenda reveals a deep understanding of the potentials of project-based learning, even without having had any professional development on it. This is how she explains how learning happens through her PBL:

The way I see project-based learning is you need to have a focused idea or set of ideas that you want the students to learn but the approach is students learn through different projects…. It is hands-on learning and
learning by doing. That is the way that I would in a nutshell describe it…. We [teachers] think, okay, here are our goals and then we get into the unit and see that the kids have taken it in in a whole other direction. So then, we have to shift with them because that’s their train of thinking… they feel successful and proud of themselves about what they’ve produced…

Brenda explains how she implemented a PBL activity in covering a unit on Space:

So my teaching partner and I came up with a set of learning goals that we wanted our students to learn. In the beginning, we talked with our science specialist and he mapped out a few specific labs that they can do in his classroom to get them started. Then the students did some research in groups about the different craters of the moon … and then they did something called a VoiceThread on the computer, in partners, about a couple other different ideas about the moon… they’re currently working on a 3D model of the moon…. and then after we finish that, we are going to go to The Space and Rocket Center, and they are going to do a moon experiment, hands-on experiment. So that’s just one unit we do and we actually do four different units throughout the year with project- based learning, so that’s just one example.

For Brenda, the importance of project-based learning lies in students learning by doing, learning in different ways, and showing what they know in different ways, all the while emphasizing strongly a student-centered approach. In addition, Brenda sees the potential of PBL in providing the students with authentic learning experiences. To her, collaboration and teamwork are of great importance for they prepare her students for the true nature of work in the real world. Moreover, Brenda emphasizes the importance of showcasing her students’ work, which aligns with her efforts to offer her students authentic learning experiences. She is very resourceful in providing showcasing opportunities for the students’ projects. For that purpose, she shares the artifacts with several members of the school community, her colleagues, students from other grades, and parents.

Therefore, Brenda uses PBL to bring authentic learning experiences to her students. The aim of her teaching is not only to enrich the student’s knowledge and skills, but she takes it a step further to prepare her students, even at a young age, to real life. Brenda also adds the element of reflection to her PBL, and in creative ways such as journaling, drawing, and debriefing. Another strong element in Brenda’s use of PBL is her multidisciplinary approach and her collaboration with other teachers. On collaborating with other teachers she says, “You have to work very closely with your teaching partner, for sure and decide that this is for sure what we want our students to learn and what our students need to learn.”

In conclusion, Brenda is the type of teacher who embraces project-based learning because it aligns with her conviction and understanding of what learning is about. With project-based learning, Brenda can bring her students to where they learn by doing, use higher order thinking skills, discover, collaborate, reflect, and produce authentic artifacts that stem from the different representations of learning among them. She does not use PBL to supplement her teaching. On the contrary, she teaches through the use of PBL. In that sense, she initiates learning through PBL.

Navigator

A navigator, evidenced by Scot, uses PBL in any of the forms described earlier according to the learning needs of the students.

Scot. Listening to Scot discuss how he integrates project-based learning in his class, one notices his use of the term “it depends” almost for every stage of implementation. Whether asked about how he decides to do a PBL activity or how he assesses it, or how he forms the PBL groups, his answers are always based on the need for every situation. For Scot, project-based learning seems to be a fluid and malleable process. This “it depends” reflects his level of comfort in designing project-based learning in his classes. He is continuously assessing where his students are and acting accordingly, using projects to fulfill their learning needs. As a result, he sees two potentials for project-based learning. One potential is to strengthen weaknesses and insecurities about content matter among students. He explains:

It depends on the children….Like I wouldn’t necessarily have picked up on the phases of the moon till we started talking about it, and you get that kind of a glazed-over look, so you just kind of, oh, we need to come up with something on this, and that’s what I do.

The other potential is to deepen their level of understanding beyond curricular demands, allowing them to “fly.” He tells them, “We’re doing this because you guys are very secure in this, so I’m going to give you a chance to really, really fly, really get a chance to show what you know.” In this sense, Scot shows his skills in navigating through the curriculum, weaving project-based learning through it, with the ease of an expert.
On the other hand, and in order to motivate his students in addition to using PBL, Scot is keen on integrating technology in the projects whenever possible. He says, “Well, I tell you what, when it comes to technology, they are dialed in, they are amped, they have more available to them and they can move through it quicker than you would ever believe.”

In essence, Scot aims at bringing his students to master their learning by discovery and exploration. For him, this becomes possible when students are motivated. He knows that he can achieve both motivation and mastery through project-based learning. His eight-year teaching experience enables him to navigate and place his projects strategically in the curriculum where needed. Therefore, Scot is the “navigator.”

Summary

The profiles of the participants reveal that those teachers who were selected for this study for their exemplary work in project-based learning share common characteristics in some aspects of it but differ in others. They all aim at making the learning experience of their students more interesting and more meaningful, and they all involve their students in hands-on activities. However, they differ on their perceptions of how PBL should support learning.

These participants reveal that PBL can be used at different points in the process of learning. It can be used to initiate the construction of learning from minimum background knowledge, it can be used to extend learning after core elements have been taught, it can reinforce learning and strengthen it after the content has been taught, or it can be used in any of these three forms to meet the needs of the students.

Implications

In the absence of professional development in PBL, the teachers in this study practice PBL based on their perceptions and beliefs on how optimal learning can be achieved. It is apparent that they appreciate the constructivist characteristics of PBL. They use it in their classes because of the advantages it brings to the learning process when compared to the traditional didactic approach. They want their students to use higher order thinking skills, they initiate social learning, they ask their students to show their knowledge through the production of authentic artifacts, and they assess the outcome of learning outside the limitations of traditional testing. This is precisely what the literature on constructivism implies in that it aims at the construction of knowledge with multiple perspectives and within a social activity. It is context dependent, and it allows for self-awareness of learning and knowing (Duffy & Cunningham, 2005).

However, the differences observed in how teachers implement PBL, whether reinforcers, extenders, initiators, or navigators, reflect their teaching and learning philosophy which is shaped by their beliefs about the effective use of PBL. Ertmer (2005) points out the confusion around labeling and defining the beliefs of teachers. She states that this confusion is due to the difficulty in determining the difference between pedagogical beliefs and knowledge. She also states that beliefs carry an affective element absent in knowledge. These differentiations are of particular importance in this study in explaining why teachers differ in how they use PBL.

At the affective level, all the teachers embrace PBL as a teaching model. Therefore, they carry positive pedagogical beliefs about it. At the knowledge level, these teachers understand constructivism, but they are not as equally knowledgeable about the systematic implementation of PBL. They implement PBL to the best of their abilities without any professional development in its particularities. Therefore, the difference observed in how they implement PBL may be due to the lack of an in-depth exposure to what it can bring to the learning process. This difference may also be due to a strong belief about where PBL can best be placed on the continuum of the learning process.

Moreover, teachers’ use of PBL may reflect their comfort level in creating a balance between curriculum and testing needs on one hand and their aspirations towards employing constructivist strategies on the other. To that regard, Ertmer (2005) notes the importance of sorting out how teachers’ beliefs affect their practice. Whether reinforcing, extending, initiating learning, or navigating through all of three uses, the teachers’ perceptions are that the manner with which they use PBL is proving to be beneficial and successful in their respective classes.

An important question that poses itself here is whether all teachers should be encouraged to become initiators or if PBL could in fact be implemented effectively in any of these uses? Moreover, can PBL use be regarded on a continuum starting from reinforcement of learning ending in initiation of learning? Thomas (2000) states that for a project to be considered a project-based learning activity, it should be central and not peripheral to the curriculum, where students struggle with the concepts of a discipline, and where they construct and transform new skills and understandings. However, do Thomas’ recommendations contradict the concept of PBL’s use over a continuum? Comparing learning achievement of students between the different uses of PBL emerging from this
study as well as providing professional training for teachers in PBL followed by tracing changes in their use may shed the light on these questions. Ravitz (2010) posits, “no two teachers implement PBL the same way” (para. 10). He also states, “it does not seem reasonable to expect teachers to learn about and use this approach entirely on their own…. Effective use of PBL requires extensive planning and professional development” (para.12).

Professional development offers teachers with the strategies, confidence and guidance that they need in order to incorporate PBL effectively in their classrooms (Ravitz et al., 2004). In addition, professional development can provide teachers with the skills needed to overcome some of the barriers they face, such as time limitations (Hertzog, 2007) and striking a balance between curriculum requirements, testing policies and PBL (Krajcik et al., 1994; Snyder & Snyder, 2008). Moreover, professional development may also lead to a shift in the teachers’ beliefs on how PBL can be best placed on the learning continuum. Finally, professional development may sort out the reasons behind the different uses of PBL observed in this study, whether it is knowledge-based or belief-based.

Limitations

This study has several limitations. First, because of the purposeful sampling and the small sample size, its findings cannot be generalized to all teachers unlike a study in which the sample has been randomly selected. Second, for some participants, the duration of the interviews was short. Since these interviews were done on site and during school hours, the length of the interview was limited to the time available for teachers in between classes. A longer interview would have allowed for more probing and would have generated more data. Third, only one interview per teacher was carried out. Subsequent interviews would have permitted follow-up on the preliminary findings with the teachers and would have enriched the data further. Fourth, the data was collected through interviews and document collection. However, in-class observation of how PBL is being implemented would have also added another perspective on the findings. The limitations in the data collection process were due to the data being collected towards the end of the school year that would have made scheduling subsequent visits difficult.

References

Understanding teacher stress in the age of accountability (pp. 19-42). Greenwich, CT: Information Age Publishing.


