

## Assessing Students' Learning in Project-based Learning Approach

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### Abstract

Students' passive learning has motivated educators constantly to seek innovative ways to encourage students and improve their learning outcomes. Project-Based Learning (PBL) may be a particularly productive method for transforming practice in ways that support students learning. However, the implementation of PBL is challenging because it requires substantial change to teaching and assessment. The purpose of this paper is to explore new assessment methods that are needed in assessing students' performance in PBL and how teachers can employ these methods in their practices. The insights provided by Project-Based Learning approach are essential for promoting effective teaching and learning. PBL provides students with an opportunity to engage in the learning process by working collaboratively to solve real-world problem. Moreover, PBL offers the potential to help students become reflective and flexible thinkers who can use knowledge to take an action. This paper emphasizes that the formative approach should be integrated throughout the assessment process, but it should be balanced with observation and tests or tasks in order to provide comprehensive information about student progress and outcomes. Sustained project-based learning is not a simple task for teachers, therefore, teachers need to be involved in professional development programs to get more understanding about what and how assessment might be realized in the project-based approach.

**Keywords:** *Project Based Learning, Assessment, Students' Learning*

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## **INTRODUCTION**

Students' passive learning has motivated educators constantly to seek innovative ways to encourage students and improve their learning outcomes. Project-Based Learning (PBL) may be a particularly productive method for transforming practice in ways that support students learning. It offers promise as an instructional method that affords authentic learning tasks grounded in the personal interests of learners (Grant, 2009). With the roots in constructivist theories (Liu & Hsio, 2002), PBL encourages knowledge construction by starting each learning experience with a complex real-life problem that is presented to a small group of students. Students take responsibility for their own learning by working collaboratively to investigate, examine a variety of resources and solve the problem as well as negotiate and share solutions (Grant, 2009). These circumstances show that PBL promotes student-centered learning by providing opportunities for a diverse of learners to engage in interesting and challenging tasks. This learning pedagogy seems to be more effective in motivating students in learning. As a result, PBL has been used widely as an innovative approach for teaching instruction. However, Grant (2002)

argued that the implementation of PBL is challenging because it requires substantial change to teaching and assessment (Doppelt, 2009). The purpose of this paper is to explore new assessment methods that are needed in assessing students' performance in PBL and how teachers can employ these methods in their practices. Therefore, the discussion of this paper is divided into two parts. A brief outline of PBL is firstly provided. Some definitions will be reviewed with regard to its theoretical underpinning as well as its benefits. The last part will discuss some assessment methods needed in implementing PBL as an innovative instruction in the classroom. This paper concludes by suggesting that teachers need to be involved in in-service training in order to be able to optimize their effort in employing project-based approach and its assessment.

### **PBL: definition, Theoretical Underpinnings and Benefits**

Project-based learning is a promising approach for transforming the teaching practice in a way that supports student learning. Even though it originates from a medical discipline, nowadays PBL is widely used in teaching other subjects including mathematics, science and technology education. There are a number

of definitions of PBL given by different scholars. According to Blumenfeld, Soloway, Marx, Krajcik, Guzdial and Palincsar (1991 p 369), "PBL is a comprehensive approach to classroom teaching and learning that is designed to engage students in investigation of authentic problem". Grant and Branch (2005) state that PBL is a student-centered learning pedagogy that encourages students to explore and examine a variety of problems and resources to construct personal strategies to solve the problems as well as negotiate and share solutions. For DeFillippi (2001), PBL refers to the theory and practice of utilizing real-world assignments on time-limited projects to achieve mandated performance objectives and facilitate an individual and a collective learning. Therefore, it can be said that PBL is a model that organizes learning around projects that drive students to learn and encounter what they need to learn.

From these definitions, five characteristics of PBL can be identified (Thomas, 2010). It concludes (a) centrality, (b) a driving question, (c) authenticity, (d) constructive investigation, and (e) students autonomy. A number of theories that support PBL have been reviewed. These include Kilpatrick (1918) who has advocated project work, Dewey

(1938) cited in Grant and Branch (2005) who has promoted learning from experience, Vygotsky (1962) who suggested that teachers need to create the most effective learning environment, and Brush and Saye (2000) who proposed that learning has to afford learners personal interests and opportunities to negotiate meaning from others. These theories have laid a foundation of the PBL approach.

PBL derived its theoretical underpinning from constructivist epistemology, which emphasizes on providing a rich context for knowledge construction (Liu & Hsi0, 2002). The richer and more complex the context is, the more opportunities are afforded by learners in building their knowledge. Rich contexts include authentic tasks with real-world relevance. PBL encourages learners' cognitive involvement and entails the use of higher-order thinking skills (Diezmann, 2004). When learning occurs in such context, the learning goals become meaningful and relevant to learners (Grant, 2009).

The potential benefits of the project-based learning approach are substantial. One of them is the emphasis of the project on in-depth investigations over memorization of a broad content

knowledge (Grant, 2009). Project-based approaches also offer learners opportunities to guide, manage and monitor their learning through self-direction and self-regulation. This is essential for developing students' critical thinking (Ullah, 2010). Moreover, PBL improves learners' motivations in learning when projects are personally relevant (Grant, 2009). Project-based learning also has potential to integrate collaboration and cooperation meaningfully, where a group of students remain intact throughout a project or individuals use peer reviews and more informal social negotiation (Doppelt, 2009). Additionally, lessons employing project-based learning also use a variety of resources, tools and scaffolds (Grant, 2002). Next, some project-based learning lessons make use of reflection (DeFilippi, 1994). This reflection is essential to learning because it facilitates students convert tacit experience into explicit knowledge. Finally, PBL is engaging the learners in the assessment. Therefore, it can be summarized that PBL is potential for promoting active learning among students by providing them opportunities to build their own knowledge with deep content understanding, encouraging students' motivation to learn through

collective work as well as raising academic achievement.

Considering above benefits, many education institutions and practitioners adopt this approach to their teaching practice. However, the implementation of PBL requires keen assessment methods (Doppelt, 2009) in order to produce better learning for students. The following section will discuss assessment methods that are needed in assessing students' performance in PBL.

## **ASSESSMENT**

In traditional learning process, learners are viewed as passive receivers of knowledge, in contrary, PBL theory of learning suggest that students are not passive of knowledge, but they actively construct knowledge in a rich context with-world relevant (Liu & Hsio, 2002). This changing view of learner and the way they learn have broadened the way in which a subject is assessed. In PBL, students are required to explore and examine resources, then use the information to solve real-world problems, formulate the solutions into a draft, share the solutions through presentation followed by self-reflection. This type of learning approach needs to adopt new assessment methods in order to exactly

measure the authentic outcomes of the learning process. Furthermore, this complexity of students' involvement in their own learning indicate that summative assessment, which is mainly used in traditional approaches, is not enough to measure students' performances within PBL frameworks. Therefore, more supportive role of formative assessments is needed (Broadfoot & Black, 2004). However, balanced evaluation system that blends summative and formative as well as observation is better is providing comprehensive information about students' performance. As applying these assessments can be a challenging practice for teacher (Grant, 2009), a good understanding of assessment approaches in PBL might help teachers to properly use assessment methods.

To examine kinds of assessment needed in project-based approach, understanding students' activities in PBL teaching and learning process is important. As Pearlman (2009) proposed, a design process of PBL has general structure which includes seven stages

a. Defining the problems and identifying the need. The first stage begins with project information when students are presented with a

complex and standard based problem.

- b. Grouping planning. In this stage, students discuss with peers to establish roles and norms that are necessary to assign the tasks.
- c. Collecting information. After planning the activities, students use computers, text books, interviews, and experiments to gather information related to their project.
- d. Then formal teaching is needed to help students understand the project with lectures, assignments, readings, and other activities that are tied to the project.
- e. Create and draft solutions. After collecting enough information both from group investigation and teachers' direction, students formulate a draft of solutions through the stages until time runs out.
- f. Then students are required to share their solution through debates, skits, panels, and presentations. In this stage, their works are evaluated by peers and teachers.
- g. Reflection. This last critical stage gives students opportunity to reflect on their learning, on their

performance and provide teacher with feedback on the project.

The activities suggested by Pearlman (2009) above show that projects are designed to challenge students and engage them in doing a particular subject activity. The appropriate level of challenge is important to provide adequate opportunity to learning and high level thinking and reasoning (Diezmann, ). The challenge and project are interrelated because the cognitive value of the project resides in the opportunity to that it provides for students to explore and to solve problem as well as to present the solutions. Therefore, teachers need an assessment that provides them meaning of the students' performance, thinking or knowledge, learning potential and motivation (Ginsburg, 2009). Within the project-based approach, the assessment can be used to determine students' preparedness to engage in projects, to monitor performances on relevant aspects of engagement during project, and to benchmark and establish a particular performance. This implies that teachers can be use formal or informal assessment. Additionally, teachers can engage students in assessing both their own work and their peers.

An effective assessment program uses multiple strategies to demonstrate growth and performance, and should be closely correlated to goals (Black & William, 2009). Project in which students create multimedia presentations, Web pages, artwork or songs may be evaluated differently than traditional written, typed, or even word-processed paper (Doppelt,). Assessment strategies can include performance tasks, teacher observations, personal communication, standardized testing, and student and teacher developed evaluation rubrics, and others. There fundamentally three basic methods of assessment that can be employed to assess students' outcome through PBL approach.

### 1. Formative Assessment

Formative assessments refer to tasks given to students throughout a unit of work to check progress and to help fine-tune the teaching approaches and learning arrangements for the students so that they remain on target (March, 2000). Some formative methods that can be employed are:

#### 1.1 Written and verbal work assignment

The main pedagogical construct for implementing PBL in the classroom is the

project, which may appear in various configurations from a singular activity lasting several weeks, to an evolving activity to be completed along the constrained time. The projects are based on real-world problems. Through the projects, students are required to provide solutions to such problems. In this circumstance, teachers can use written work assignments, journal and literature review to prompt students to make connections between their research and designs to the relevant subject matter. Teachers and students can use both activities to take note of the concepts and connections to carry forward the next stage or activity. Additionally, teachers can also assess this students' work through presentations and debates to demonstrate their ability to communicate the ideas verbally. Therefore, applying these methods of assessment can help students connect content to the need of projects.

## 1.2 Rubrics and feedback

To help students to do their assignments successfully, rubrics and feedback are needed (Fang, Chiang, lih-Jiuan, Wang, Tsai, & Chen, 2008). Firstly, the most common assessment and evaluation tools used for collaborative learning are rubrics (Thaler, Kazemi, & Huscher, 2009). Rubrics are

standards for students to know exactly what is expected and what goals should be met. A rubric simply lists a set of criteria which defines and describes the important components of the work being planned or evaluated. Developing meaningful rubrics can be a challenge (Thaler, Kazemi, & Huscher, 2009). Because rubric determines the quality of assessment or projects (fang at al, 2008), therefore, it obligates teachers to design the rubric carefully. Nevertheless, teachers might be helped by involving students in the development of rubrics which then can help them with their thinking, taking parts and clarifying expectations. For instance, teachers may ask students to carry a set of assignment which include essay and presentation by designing a rubric for both essay and presentation together. It is believed that these activities enhance better understanding of the content that is needed for the project. Furthermore, as an assessment tool, rubrics can also be used by teachers to assess projects, student groups, or individual students. Additionally, students can use the same rubric for self-assessment as individuals, in groups, and or assessment.

In addition, students will get a feedback. Based on the rubrics standards, teachers and other students should mark

the students' works clearly, accurately and honestly and provide fair feedback (Hattie & Kimberley, 2007). In short, class presentations, essay, designing rubric, conversations with teachers and group members, and teacher responses to such set of assignments, all give students valuable feedback that provides them with practices and knowledge to better assess themselves and find answer to the project solutions as well as to help them plan their next step. Thus, it can be said that the rubric and feedback help students to plan their projects.

### 1.3 Portfolio

Another formative method that can be applied in project-based approach is portfolio assessments, a method based on records of students' activities (Doppelt, ). Portfolios offer one alternative to capture many aspects of the learning process and the learning product. In addition, it can be used to encourage students to be critical of their abilities and progress (Parson, 1994). Portfolio reflects what students have learned, how they question, analyze, synthesize, solve problems and create new ideas or design and build useful products or system. It also shows how students interact intellectually, emotionally, and socially with others (Doppelt, ). This

reflection will be effective for student learning when it is used by students to highlight what they have learned, explain important decisions they have made, and articulate plan for incorporating feedback and moving forward, rather than just comment on what the students have done (No name 2010). Therefore, it is necessary for teachers to use portfolio to monitor students' activities and progress. From the discussion above, it shows that formative assessment should be integrated throughout the PBL unit.

### 2. Observation.

Because of applying portfolio is time consuming in organizing and reflecting about each type of activity and the whole process (David, 2010), these might contribute to students' frustration. Consequently, this may affect the authenticity of their reflection in the portfolio. Employing another method of assessment, that is observation, is needed. This enables teachers to directly monitor students' progress. A keen observation provides teacher much information (Ginsburg, 2009). For instance, teacher may see a student synthesizing the information from the different resources or playing with experiments to find the solution for the project. Then teachers may

offer some advises when students are facing difficulties. To be able to monitor students' progress, teachers can use multiple and systematic observations as one of the components of assessment process (Fortuny, Gimenez, & Alsina, 1994). Within this framework, teachers are required to observe students while doing project in order to analyze the result of student activities, record stipulated characteristic regarding motivation, self regulation and intention and write a corresponding report regarding students' progress. This documentation might provide comprehensive information about student' progress by combining with their portfolio. This is in line with Ginsburg's (2009) view in which observation may provide valuable information when it blends with other methods (Ginsburg, 2009). Through observation, teacher gain insights of what the students are learning and what needs to be addressed before moving on. Therefore, this assessment helps teachers plan their next steps for teaching.

### 3. Summative Assessment

Summative assessments refer to task given to measures and records overall achievement in systematic manner (Marsh, 2002). The evaluation approach is based

on tasks or test. Although this method is typically used in traditional approach, applying it in project-based approach is also needed, as concerning that teachers also need to know about students' understanding of the work covered and how well they have learned the planned outcomes. To be able to do this, teachers may ask students a number of questions and the students provide the correct answer. The teacher may use standard administration to give several students the same exact tests, or teachers may give different student tasks (Ginsburg, 2009). In all these cases, the teachers choose the problem and the students have to deal with it.

Much can be learned from responses to tasks or items. If all students receive the same items administered in a standard fashion, then teachers can learn about performance differences (Ginsburg, 2009). From students' response to the items, teachers can learn about students' accuracy of responses, their right and wrong answers and their strategies of solution. The teacher may ask the students to define a concept, or may observe what they write on paper to solve a problem, thus obtain information about strategy. Additionally, as Ginsburg (2009) suggests, to clearly indicating students'

misconceptions or specific incorrect strategies of solution, teacher may design multiple-choice tests. By looking at wrong answers, teacher can identify students' difficulties in understanding a particular concept. This is important to be considered regarding PBL's principle which emphasizes in-depth understanding of contents. In short, using summative methods in PBL can help teachers to identify students' difficulties. Additionally, if this method is used properly, it may provide feedback that move learning forward (Black & William, 2009).

As project-based learning has been adopted widely in many disciplines' instruction, considering it as an innovative approach in teaching might improve students' performance. This demands teacher quality (Chang & Lee, 2010), especially, teachers' ability of employing assessment methods. Therefore, teachers need extensive in-service training to learn and work on assessment techniques. This can be provided through professional development programs.

## **CONCLUSION**

In conclusion, the aim of this paper was intended to examine the assessment methods that are needed to assess students'

performance in project-based approach. The insights provided by Project-Based Learning approach are essential for promoting effective teaching and learning. PBL provides students with an opportunity to engage in the learning process by working collaboratively to solve real-world problem. Moreover, PBL offers the potential to help students become reflective and flexible thinkers who can use knowledge to take an action. As project-based approach changed, the way students learn is also changed. Then this demands new assessment methods that can measure the students' outcomes authentically. There are fundamentally three basic methods for assessment: formative approaches, summative approaches and observation. However, PBL needs more focus on formative approaches such as essay, presentation, debate, rubric, feedback and portfolio. This paper emphasizes that the formative approach should be integrated throughout the assessment process, but it should be balanced with observation and tests or tasks in order to provide comprehensive information about student progress and outcomes. Sustained project-based learning is not a simple task for teachers, therefore, teachers need to be involved in professional development programs to get

more understanding about what and how assessment might be realized in the project-based approach.

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