

## **The Effects of Problem-based Learning on Students' Learning Engagement in Bangladesh College Education System**

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**Abstract:** This study aims to compare Problem-Based Learning (PBL) with the conventional lecture method in terms of student learning engagement within the Bangladesh college education system. Employing an explanatory mixed-method strategy, both qualitative and quantitative data were integrated. A true experimental design was employed for collecting and analyzing quantitative data. The research questions and hypotheses were formulated, addressed, and examined using a post-test manipulated learning engagement questionnaire (reliability coefficient,  $r = 0.77$ ). A statistically significant difference ( $p=0.00$ ,  $p<0.05$ ) was observed in the mean post-test learning engagement scores between participants in the PBL-based experimental group and those in the traditional lecture-based control group, indicating a significant difference in engagement levels with the implementation of PBL. Participants in the experimental group demonstrated higher mean engagement scores across most items, particularly in cognitive engagement (e.g., analyzing, synthesizing, evaluating, applying knowledge, working efficiently, and critical thinking) and emotional engagement (e.g., interest in collaborative work). However, lower engagement was noted in memorization. This study suggests that PBL could serve as a viable teaching-learning strategy in Bangladesh's educational context.

**Keywords:** Student-centered teaching strategy, problem-based learning, student learning engagement.

### **1. Introduction**

21<sup>st</sup>-century education faces the challenge of preparing students for a rapidly evolving future. Predictions suggest that a substantial portion, estimated at 85%, of the jobs students will perform in 2030 have yet to be created (Dell-IFTF, 2017). Consequently, employees must possess skills to navigate novel ideas, discern patterns, adapt to change, collaborate effectively, and employ reasoning to solve complex problems (Ward & Lee, 2002). Education must align with this dynamic landscape by emphasizing capacity-building for creativity, active listening, self-directed learning, real-world application, teamwork, empathy, and analytical thinking (Rokonuzzaman, 2019).

However, the state of tertiary education in Bangladesh falls short of these ideals. Many educators lack proficiency in modern teaching methodologies, and interactive approaches are rare in classrooms (Al-Faruki et al., 2019; Yasmin, 2018). This deficiency leads to gaps in lecture delivery and limited student engagement (Monem & Mahmud, 2018). Conversely, student-centered learning has been shown to enhance problem-solving, critical thinking, and independent learning skills (McCabe & O'Connor, 2014). Problem-Based Learning (PBL), a learner-centered approach (Alajmi, 2014), is particularly promising in this regard, as it involves students directly in effective problem-solving techniques (Hossain & Sultana, 2019).

Thus, it is imperative for Bangladesh to explore the impact of PBL on student learning engagement. Yet, no research on PBL in the context of college-level tertiary education in Bangladesh has been conducted. This study proposes to fill this gap by conducting a comparative investigation between traditional lecture methods and PBL in terms of their effects on college students in Bangladesh.

Specifically, this research will examine the impact of PBL on learning engagement among students of political science at X Government College, Shariatpur, Bangladesh. Political science was chosen due to the researchers' affiliation with the department, which is one of the largest at the college. The study aims to provide instructors with alternative teaching approaches that enhance student engagement and improve learning outcomes.

**Research Question (RQ):** To what extent does Problem-Based Learning affect the learning engagement of college students?

**Hypotheses:** Ho: There is no significant difference in learning engagement among college students with the implementation of Problem-Based Learning. Ha: There is a significant difference in learning engagement among college students with the implementation of Problem-Based Learning.

## 2. Literature Review

### Problem-Based Learning (PBL)

Problem-Based Learning (PBL), originally developed by Howard Barrows in the 1960s for medical education, is a teaching approach designed to foster self-directed learning and enhance transferable competencies such as problem-solving, critical thinking, and teamwork (Kivela & Kivela, 2005). It engages learners effectively by encouraging analysis, synthesis, and evaluation rather than mere memorization (Guedrri, 2001). Unlike traditional lecture-based instruction, PBL focuses on real-world problems and actively involves learners, making them architects of their own knowledge (Rocard et al., 2007).

Research indicates that PBL promotes active learning environments where students are central to the learning process, whereas traditional lectures tend to foster passivity and rote memorization (Catalano & Catalano, 1999). Despite the

prevalence of traditional methods in many universities and colleges, student-centered strategies like PBL have been shown to enhance real-world problem-solving skills (Lujan & DiCarlo, 2006).

In PBL, small groups of learners collaborate to solve assigned problems, drawing upon past knowledge, reflection, and cooperation to arrive at solutions (Mohd-Yusof et al., 2011). While some studies have reported positive outcomes, such as increased motivation and interest (Vernon & Blake, cited in Sahin, 2009), others have noted challenges, including cultural barriers and limited evidence of critical engagement (Hussain et al., 2007).

### **Issues of Problem-Based Learning (Past Studies)**

Research on PBL's impact on learners' attitudes, engagement, and performance reveals mixed findings. While some studies report positive attitudes and improved achievement (Smith et al., 2007; Al Rukan et al., 2010), others suggest no significant advantage over traditional methods (Tan, 2011; Beers, cited in Sahin & York, 2009).

Challenges associated with PBL implementation include the need for modified materials, teacher motivation, and time constraints (Bayard, 1995; Edwards & Hammer, 2007). Lack of prepared materials and curriculum support can hinder effective implementation (Torp & Sage, 1998), although PBL learners may retain knowledge better when directly engaged in class activities (Wood, 2003).

Despite these challenges, PBL has been shown to enhance learner satisfaction and promote active engagement (Berry, 2008; Klegeris & Hurren, 2011). In Bangladesh, preliminary research suggests promising results in primary education, though challenges such as time constraints for instructors persist (Hossain & Sultana, 2019).

### **Learning Engagement**

Student-centered learning paradigms have transformed learners' engagement, shifting from passive participation to active involvement (Ahlfeldt et al., 2005). Engagement encompasses cognitive, behavioral, emotional, and agentic dimensions (Schaufeli, 2013; Reeve, 2013), with PBL shown to enhance all aspects (Johnson & Delawsky, 2013).

Despite its potential, engaging learners remains a challenge in Bangladesh, where students may be physically present but lack psychological engagement (Ahmed et al., 2007). PBL holds promise for improving cognitive, affective, and agentic engagement, as evidenced by research in primary education (Hossain & Sultana, 2019).

However, research on PBL's impact on tertiary education engagement in Bangladesh is lacking, highlighting the need for further investigation in this area. This study aims to address this gap by examining the effects of PBL on college students' learning engagement in Bangladesh.

### **3. Research Methodology**

An explanatory mixed-method strategy was adopted for this study, aiming to provide a comprehensive understanding of the research problem by incorporating both qualitative and quantitative data (Creswell, 2012). A true experimental strategy was employed for collecting and analyzing quantitative data, while qualitative data served to support and enrich the quantitative findings. The primary objective was to investigate the impact of Problem-Based Learning (PBL) on college students' learning engagement, as well as to test hypotheses regarding differences in engagement between students exposed to PBL and those following traditional lecture methods.

**Quantitative Data Collection and Analysis:** Quantitative data collection and analysis were conducted using a true experimental research design, specifically a Post-test Only Control Group Design. This design minimizes threats such as testing, instrumentation, and regression by not utilizing a pre-test (Creswell, 2012). Sixty students were randomly selected from a pool of 145 first-year political science students and divided into experimental and control groups. The experimental group received instruction via PBL, while the control group received traditional lecture-based instruction. Both groups covered the same topics, with lesson plans tailored to each method. After eight sessions, learning engagement questionnaires were administered, and qualitative data were collected through five focus group discussions with the experimental groups. The questionnaire consisted of fourteen items, divided into three parts, and responses were recorded on a four-point Likert-type scale.

**Qualitative Data Collection:** Qualitative data were collected through focus group discussions using a predetermined protocol. These discussions aimed to gather additional insights into engagement issues raised by the quantitative findings.

**Data Analysis:** Quantitative data were analyzed using SPSS 25, with a significance level set at .05. Descriptive statistics (mean, standard deviation) and inferential statistics (Independent Samples t-test) were utilized. Qualitative data were analyzed qualitatively through thematic analysis.

**Validity and Reliability:** Content validity was ensured through expert review of the questionnaire. Instrumental reliability was established through a pilot test involving 20 students, with a Cronbach's alpha coefficient of .880, exceeding the recommended threshold of 0.70 (Nunnally, 1994).

**Table 3.1**  
*Summary of Research Question and Data Analysis*

Research Question (RQ)	Instruments	Analysis Technique
To what extent does Problem-based Learning affect the learning engagement of college students?	Learning Engagement Questionnaire & FGD Protocol	Descriptive Statistics (Mean, Standard Deviation), Inferential Statistics (Independent Samples t-test), Qualitative Analysis

The mixed-method approach employed in this study ensures a comprehensive exploration of the research question, combining the strengths of both quantitative and qualitative methodologies to provide a nuanced understanding of the impact of PBL on student learning engagement.

**Table 3.2**  
*Reliability of Engagement questionnaire (pilot test)*

Case Processing Summary				Reliability Statistics	
		N	%	Cronbach's Alpha	N of Items
Cases	Valid	20	100.0	.880	14
	Excluded <sup>a</sup>	0	.0		
	Total	20	100.0		

a. Listwise deletion based on all variables in the procedure.

**4. Findings & Discussion**

To what extent does Problem-based Learning affect the learning engagement of college students?

This section presents the results addressing the research question. The detailed findings are displayed in the tables below.

**Table 4.1**  
*Mean and Standard Deviation of Learning Engagement Post-Test Results*

Item	Learning Engagement Statement	Experimental Group (n = 30)	Control Group (n = 30)
		Mean	SD
1	Asking questions during class	3.03	0.71
2	Working with other students during class time	2.53	0.93

Item	Learning Engagement Statement	Experimental Group (n = 30)	Control Group (n = 30)
3	Working with other learners outside class	2.77	0.89
4	Tutoring class materials to other learners in the class	2.37	0.99
5	Memorizing information and repeating them in same format	1.57	0.67
6	Analyzing the main elements of an idea	3.53	0.50
7	Synthesizing and organizing ideas	3.20	0.61
8	Evaluating the value of information and arguments	3.43	0.72
9	Applying concepts in new situations	2.73	0.78
10	Acquiring career-related knowledge and skills	3.23	0.77
11	Writing clearly, accurately, and effectively	3.23	0.72
12	Thinking critically and/or analytically	3.30	0.75
13	Learning effectively to complete a given task	3.30	0.79
14	Working effectively with other individuals	3.33	0.88
<b>Overall</b>		<b>3.14</b>	<b>0.42</b>

Table 4.1 demonstrates the mean and standard deviation for each item measuring learning engagement in both the experimental and control groups.

- **Asking questions during class (Item 1):** The experimental group ( $M = 3.03$ ,  $SD = 0.71$ ) scored higher than the control group ( $M = 2.43$ ,  $SD = 0.97$ ).
- **Working with other students during class time (Item 2):** The experimental group ( $M = 2.53$ ,  $SD = 0.93$ ) also scored higher compared to the control group ( $M = 1.77$ ,  $SD = 0.81$ ).
- **Working with other learners outside class (Item 3):** The experimental group ( $M = 2.77$ ,  $SD = 0.89$ ) outperformed the control group ( $M = 1.77$ ,  $SD = 0.97$ ).
- **Tutoring class materials to other learners in the class (Item 4):** The experimental group ( $M = 2.37$ ,  $SD = 0.99$ ) had a higher mean than the control group ( $M = 1.53$ ,  $SD = 0.73$ ).
- **Memorizing information and repeating them in the same format (Item 5):** The experimental group ( $M = 1.57$ ,  $SD = 0.67$ ) scored lower than the control group ( $M = 2.83$ ,  $SD = 0.87$ ), indicating less reliance on rote memorization in the experimental group.
- **Analyzing the main elements of an idea (Item 6):** The experimental group ( $M = 3.53$ ,  $SD = 0.50$ ) showed higher analytical skills compared to the control group ( $M = 2.90$ ,  $SD = 0.84$ ).
- **Synthesizing and organizing ideas (Item 7):** The experimental group ( $M = 3.20$ ,  $SD = 0.61$ ) again scored higher than the control group ( $M = 2.50$ ,  $SD = 0.93$ ).
- **Evaluating the value of information and arguments (Item 8):** The experimental group ( $M = 3.43$ ,  $SD = 0.72$ ) had a higher mean than the control group ( $M = 2.63$ ,  $SD = 0.55$ ).
- **Applying concepts in new situations (Item 9):** The experimental group ( $M = 2.73$ ,  $SD = 0.78$ ) scored slightly higher than the control group ( $M = 2.60$ ,  $SD = 0.72$ ).
- **Acquiring career-related knowledge and skills (Item 10):** The experimental group ( $M = 3.23$ ,  $SD = 0.77$ ) scored higher than the control group ( $M = 2.77$ ,  $SD = 0.85$ ).
- **Writing clearly, accurately, and effectively (Item 11):** The experimental group ( $M = 3.23$ ,  $SD = 0.72$ ) outperformed the control group ( $M = 2.63$ ,  $SD = 0.85$ ).
- **Thinking critically and/or analytically (Item 12):** The experimental group ( $M = 3.30$ ,  $SD = 0.75$ ) scored higher than the control group ( $M = 2.87$ ,  $SD = 0.90$ ).
- **Learning effectively to complete a given task (Item 13):** The experimental group ( $M = 3.30$ ,  $SD = 0.79$ ) scored higher than the control group ( $M = 2.63$ ,  $SD = 0.71$ ).
- **Working effectively with other individuals (Item 14):** The experimental group ( $M = 3.33$ ,  $SD = 0.88$ ) scored higher than the control group ( $M = 2.23$ ,  $SD = 0.93$ ).

Overall, the grand mean of the experimental group ( $M = 3.14$ ,  $SD = 0.42$ ) was higher than that of the control group ( $M = 2.45$ ,  $SD = 0.39$ ), indicating that students in the experimental group had higher learning engagement post-test scores compared to those in the control group.

### Hypothesis Testing

- **Null Hypothesis (Ho):** There is no significant difference in learning engagement among college students with the implementation of Problem-based Learning.
- **Alternative Hypothesis (Ha):** There is a significant difference in learning engagement among college students with the implementation of Problem-based Learning.

An independent-sample t-test was conducted to evaluate the difference in learning engagement between the experimental and control groups. The results are presented in Table 4.2 below.

**Table 4.2**

*T-test Results for Learning Engagement Post-Test Scores*

Group Statistics	Categories of the Students	N	Mean	Std. Deviation	Std. Error Mean
	Experimental group	30	43.97	5.928	1.082
	Control group	30	34.33	5.473	0.999
Independent Samples Test		Levene's Test for Equality of Variances		t-test for Equality of Means	
Summation of the participants' response		F		Sig.	
Equal variances assumed		0.207		0.650	
Equal variances not assumed					

An independent-samples t-test was carried out to compare the mean scores of learning engagement between the experimental and control groups. The experimental group ( $M = 43.97$ ,  $SD = 5.928$ ) scored significantly higher than the control group ( $M = 34.33$ ,  $SD = 5.473$ ),  $t(58) = 6.540$ ,  $p < 0.001$ . These results suggest that the learning engagement for the experimental group is significantly



different and higher compared to the control group. This finding rejects the null hypothesis and supports the alternative hypothesis that Problem-based Learning significantly improves the learning engagement of college students.

### **Qualitative Findings**

This section presents the qualitative findings from the Focus Group Discussions (FGDs) regarding the effect of Problem-based Learning (PBL) on the learning engagement of college students. Participants shared their experiences and views on how they engaged in PBL class activities.

- **Participant from FGD-4:** "During group work, we can analyze the concepts, and that analyzing helps us to raise questions to the teacher."
- **Participant from FGD-1:** "Through group discussion, we can solve problems collectively, and when we discuss with others outside the class, we can link the issues to new situations."
- **Participant from FGD-5:** "The most important part of the method is that through this process, we become active participants in class activities."

### **However, some challenges were noted:**

- **Participants from FGD-2 & FGD-3:** "The lack of group leader's efficiency and repeated absence of group members hamper the smooth process of the collaborative activities."

The combined quantitative and qualitative findings indicate that Problem-based Learning significantly enhances learning engagement among college students. The quantitative data reveals substantial improvement in engagement scores for students in the experimental group using PBL, while the qualitative feedback highlights the positive experiences and active participation fostered by PBL, despite some challenges related to group dynamics. These insights can help educators and institutions understand the benefits and address the challenges of implementing Problem-based Learning strategies to enhance student engagement and learning outcomes.

The findings presented in Table 4.1 reveal that the experimental group, which engaged in Problem-based Learning (PBL), recorded higher mean scores in several key areas of learning engagement. Specifically, participants in the experimental group outperformed the control group in cognitive engagement items, such as analyzing (item 6), synthesizing (item 7), evaluating (item 8), applying knowledge (item 9), working effectively (item 14), and thinking critically (item 12). Furthermore, the experimental group demonstrated greater emotional engagement, as evidenced by their interest in working with other students (items 2, 3, 4) and their proactive involvement in asking questions (agentic engagement, item 1).

The independent sample t-test results (Table 4.2) confirmed that PBL had a significant effect on learning engagement, echoing the findings of Pirrami (2009),

who reported positive student engagement in PBL activities. This study's results also align with Ahlfeld et al. (2005), who found that PBL enhances higher levels of engagement through its instructional approaches, and Duch (2001), who identified PBL as an effective strategy for increasing classroom engagement.

However, some contrasting views were noted. Mossuto (2009) reported that participants found PBL challenging for their thinking patterns in response to the problems presented. Similarly, some participants in this study's FGDs pointed out that inefficiencies in group leadership and frequent absences of group members hindered smooth collaboration and active engagement.

Despite these challenges, cognitive theory (Ertmer & Newby, 1993) and constructivist theory (Ugwuegbulam & Nwebo, 2014) emphasize the importance of active student participation for successful learning engagement. The positive responses from participants (Table 4.1) and the significant effects found in the t-test (Table 4.2) underscore the effectiveness of PBL in fostering engagement. These findings highlight the importance of implementing PBL strategies in educational settings.

## **5. Conclusion and Limitations**

This research aimed to examine the impact of Problem-based Learning on the learning engagement of college students. Using an explanatory mixed-method strategy, the study found that PBL significantly enhances learning engagement. This instructional approach, grounded in cognitive and constructivist theories, provides a conducive environment for cooperation, creativity, engagement, and teamwork. Participants showed strong support for cognitive engagements such as analyzing, synthesizing, evaluating, working effectively, and thinking critically. Therefore, PBL is a viable and effective instructional strategy for improving learning engagement in Bangladeshi higher education contexts.

Several limitations were identified in this study. The lack of familiarity with innovative educational strategies among both students and teachers posed a significant challenge. This unfamiliarity delayed the start of the research and required considerable time to overcome. Additionally, the lack of administrative support, due to inexperience with PBL, presented obstacles. This included the absence of appropriate classroom design and insufficient financial support needed to create the required learning environment. Furthermore, the researcher faced difficulties balancing the demands of the research with other scheduled activities. Thus, time constraints, the limited application of innovative educational approaches, and inadequate administrative support were major limitations impacting this study.

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