E-Learning: Direct Effect of Student Engagement through Project-Based Learning Effectiveness

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Abstract

The synergistic effects of project-based learning was examined by looking at its direct effects on how well students learning, and engagement. Hierarchical regression analysis was used with the SPSS-25 statistical software for data analysis to get the findings of the testing of hypotheses. 275 graduate and undergraduate business students provided quantitative data based on their involvement, observations, and personal experiences, which was used to empirically validate the study model. Project-based learning (PBL) was proven to have a favorable direct influence on student learning engagement. However, communication and creativity showed increased positive significantly through effects in student learning engagement and critical thnking and colloboration negative effects on engagement. Additionally, the study aims to develop the use of the project-based learning (PBL), which offers many benefits to both individuals and society, contrasts with the positive and significant effects The goal of the proposed study was to improve teaching and student learning quality while also improving retention and providing practice-based insights.

Keywords: Project-based learning, Student learning, Learning environment, Direct effects.

I. Introduction

In project based learning (PBL) critics argues that concentrating on practicing activities teachers to pursue a skill acquisition style rather than teaching enviroment. Matter of the facts, project based learning (PBL) is strongly acclaimed for use by students in higher education and promoted by institutions. Nowadays, when emphasis is placed on high school seniors' education and student involvement takes precedence over instructor peers, students, and the subject matter being taught, it is crucial to demonstrate learning by active engagement. Teachers should present a comprehensive mechanism to improve student learning, including an exceptional approach to teaching materials that are engaging and appropriate for the student's instruction (Bergmann et al., 2012). Individual student settings are affected by classroom learning interactions (Eom et al., 2006). Students with learning activities, engagement, ambition, and the desire to contribute in learning procedure. Interactive students have been shown to strengthen their concentration and attention, inspire them to apply stronger critical thinking abilities, and provide excellent learning opportunities. Students who are taught to adopt a student-centred approach to education have higher degrees of importance, which helps them complete the course's learning goals. Under this study learning is defined as the fulfillment, real achievement, confidence, information transfer, and the team's potential to build and keep a high degree of learner effectiveness. Students devote time and energy to overall learning and exchange opportunities provided by institutions (Uitdewilligen et al., 2018). A beneficial relationship for the advantages of this research study is an interdisciplinary study of student, teacher interactions and student, student connetivity with effectiveness of project based learning.

This research study will look at the following predictable outcomes:

- How much do, critical thinking, communication, collaboration, and creativity have direct effects on student learning engagement?
- How much does project based learning directly effects engagement?

This study looks at three important elements of learning effectiveness, by analyzing a class as specified

in the methodology, the study increases the quality of learning by proving, perhaps the effects of the student learning.

PBL is an innovative teaching strategy that fosters collaboration, self-reliance, and creativity both within and outside of the class. Students are capable to contribute in the teaching-learning activities with a lot more enthusiasm because to the importance of project-based learning. A genuine, engaging, and challenging issue, problem, or work is studied and responded to over a lengthy

period of time by students using the project based learning (PBL) teaching technique. The most important elements of project-based learning activities that help students grasp concepts better. Through PBL, students may access knowledge from a range of academic disciplines, which helps them understand the core issue.

In PBL includes a collaborative approach fantastic tool for promoting collaboration and working together. Undoubtedly, learners may first find it difficult to connect with cross-functional group. The eradication of these inconsistencies, however, may be one of the amazing benefits that project based learning (PBL) offers. It is justify that students may run across a variety of problems while completing projects or tasks, but only consistent practice and critical thinking may assist students get over these challenges. Similar to real-life situations when ambiguity is inevitable, PBL enables students to confront the facts with a lot more confidence. Project based learning (PBL) puts students on the path to become life-long learners by empowering them to take control of their education. Project based learning (PBL) allows educators to analyze students' progress while simultaneously assisting them in broader way. As a consequence, they receive valuable feedback that helps them sharpen their learning skills and, more importantly, stay engaged in the session. Strong communication skills are required for project-based learning, which is another crucial feature. It allows a student to take a number of approaches to an openended problem. This approach helps with the development of several skills, like problem-solving, creativity, and critical thinking. These abilities are thus not constrained by the four walls that surround the classroom. They may be used by students to resolve issues in a range of academic disciplines, such as those that arise in real-world situations. Many studies contend that the ultimate benefit of project based 105 | Page

learning (PBL) is the promotion of rewards. The advantages of project-based learning go beyond just doing well on an exams. By taking on a big challenge, such as solving a problem, coming up with finding innovative solutions, students build their self-esteem.

2. Literature Review

2.1 Project-Based Learning (EPBL)

Many project based learning (PBL) promoters think that this type of approach is an actual way to increase students' participation and impart even if the evidence for this claim is not very strong. (Krajcik et al., 2006). The failure of effective instructional professionals come to consensus on what qualifies as proof for student learning while PBL is applied restricts the discussions of project based learning (PBL) success. When PBL is used from outside computational thinking and experimental studies, in which learning is harder to assess, the challenge of establishing information becomes more challenging (Kingston, 2018). The phrase "project-based science" was created in response to support for PBL in STEM subjects (PBS). Project-based science (PBS) is just project-based learning PBL implemented in a science classroom. (Krajcik et al., 2006) students who participated in more Project-based science (PBS) sessions had considerably greater competence than those who participated in just one PBS session. For instance, the obligation to adhere to health, fire, and construction laws Although some supporters of Public education may argue that (PBL) emphasis on real life situations makes students more prepared for careers, the evidence for this claim is not very solid (Jollands et al., 2012). Furthermore, this can cause a conflict between how learning occurs in PBL and how learning is assessed.

2.2 Critical Thinking

Critical thinking offers a review of a project's capacity to be there completed on schedule. Learning activities will help give learning strategies, tools, and individualized aid by considering their views. The contrasts between intellectual and impetuous cognition types are reflected in pupils' abilities to think more deeply. Students improve their overall capability to reason logically by adding analytical reasoning,

increased institutional development, and institutional selection into the learning experience. (Cash, 2017), according to the authors, critical thinking and project-based learning is affected both inside and outside; students might have views about projects, technological tools, learning objectives, and outputs. According to this research, strong critical thinking abilities also include the ability to rationally reflect on facts and misunderstandings, focus on strategies, and discover information relevant to real-world situations. In the contemporary digital age world, identifying students' views about helpful thoughts and emotions of any given organization is crucial. Critical thinking offers pupils the ability to decide in a fast-changing environment, find answers to social justice issues and become lifelong learners (Tsui, 1999). Prior studies adding that students' capacity to gain information and skills by performing projects, confronted several difficulties.

2.3 Communication

To the previous studies suggest that communicating influence their ability to ask relevant questions, do research and publish, create products, present, assess, and reflect. Communication portraits may reflect pupils' self-perceptions and social capability (Saenab et al., 2018). Most of the findings in this area are encouraging. Due to poor communication abilities, students face

lagging behind their peers, becoming mentally sad, or retreating from school, while communication can improve students' learning capacity. Such exercises offered improved communication skills that skills learned to describe to classmates and other public members. Communication has developed the learners' expertise in using and sharing thoughts and ideas. Some researchers argue that the everyday training approach is preferable because it significantly develops communication skills and adapts the material knowledge to real practice. (Krips et al., 2011), argue that social competence comprises personality, appropriateness, communication, and public relations aspects, illustrating a key framework for sociometrics.

2.4 Collaboration

The author argued that (Rais, 2010) student-teacher practice, cross experience, and cross-relations contributed to positive moral interaction. When professors and students cooperate, they gain more information and abilities, which results in positive feedback (Chen et al., 2015). Peer tutoring, among many other things, can assist students to develop their greater cognitive abilities, effective communication skills, and even self-management. The experiment results also looked at the process of learning outcomes in a set of people who collaborated (Al-Rawahi et al., 2015). It is beneficial for enhancing students' understanding and for a better understanding of information. It also helps to motivate students to study and increase collaboration between students and teachers. Researchers have proven with traditional classroom settings that adopting collaborative projects promotes better learning depth. Various studies findings that shared knowledge is more likely for students to get a profound information from different subjects. Some research on PBL showed evidence that students who used collaborative PBL achieved academic outcomes compared to the other learning methods. Collaborations better demands of engineering students, which is critical for developing effective pedagogical techniques to help them succeed in engineering school. Previous study suggested students may learn a various set of skills, including research, collaboration, project management, communication, and abilities in metacognition have been reported to engaged with interpersonal skills growth is also noticeable.

2.5 Creativity

In this study, the study of innovation and imagination helps to understand creativity. Creativity increasingly encourages students to use their imagination to be ready for tomorrow. Creativity provides a learning atmosphere that encourages learners to use the resources available to discover creative approaches to ever-changing issues. (Ku, 2009), creativity will hold promise as the

pedagogical solution to reacting to the call to foster the imagination vital for the students' possible triumph. Students' potential is boosted when novel technology is used. It should be incorporated through a learning system; it can even be presented as a different subject that prepares students for success. The main problem with student innovation is that it consumes resources over time. Creativity would be the educational reaction to the requirement for the vision necessary for just a student's potential achievement.

2.6 Engagement

According to (Uitdewilligen et al., 2018) the process of learning how to think is referred to as cognitive. The degree to which students are engrossed in their learning activities can be referred to as engagement. (Schmutz et al., 2015). Based on earlier research, it is important to reconsider the conventional learning pattern since children have various thought processes when it comes to academic activities. It looks like the use of both formal and informal approaches to provide learning support was beneficial. But one of the issues was establishing personal connections with the students, which made it challenging to get the cohort interested in studying (Jeffery, A et al., 2008).

3. Research Model and Hypotheses

In our research study, examining the relationships between students learning engagement with effectiveness of project based learning. A study model was suggested to examine sub factors of the constructs to determinants the effectiveness of student learning. In research model, we classified in 2 classifications for getting best results and determinants of the outcomes variables and hypotheses.

3.1 Model Descriptions

- Engagement = Critical thinking + Communication + Collaboration + Creativity
- Project Based Learning(PBL) + Engagement

The model concept is an attempt to figure out the qualifications of constructs effectiveness in respect of student participation in roles, by emphasizing and integrating the influence of project-based learning. We are convinced by huge quantity of evidence that confirms, strategic planning methods to increasing the participation of various student populations, particularly valuable endeavor. The benefits of consequences are much significant to be gender equality is doubtful to succeed; if some learners

benefit from the involvement and some do not. (Graham et al., 2001), argue that the importance of boosting student learning via participation is not a new concept presented in student participation but rather a long-standing one.



Figure I. Research Model

3.2 Hypotheses Development

Our qualitative study suggests that effectiveness of student learning environment, including selfabnegation and reward potentials, will likely enhance student participation. According to (Sintema, 2020), due to fewer contact time for students but a lack of relations with the teachers when experiencing learning and comprehension challenges, students' results and internal assessment. Engaged students have obtained a thorough awareness of the personal and social processes required to be successful learners. The successful learner is engaged and purposeful in their approach to learning, proficient in interaction, discussion, and information sharing with each other, and capable of developing goals and strategies (Burroughs et al., 2019). Its goal is to identify the key predictors of traditional classroom efficacy, using academic achievement, knowledge, and design factors as explanatory variables, with learning goals as response variables (Kintu et al., 2017).

Hypothesis (H1): Critical thinking affect positively effectiveness of engagement Hypothesis (H2): Communication affect positively effectiveness of engagement. Hypothesis (H3): Collaboration affect positively effectiveness of engagement. Hypothesis (H4): Creativity affect positively effectiveness of engagement. Hypothesis (H5): Project-based learning affect positively effectiveness of engagement.

It has been demonstrated that project-based learning (PBL), which centers instruction on pertinent, immediate goals, helps pupils develop a "need to know" mindset. Pupils are inspired to learn more in order to tackle a problem that matters to them. There have been significant increases in the use of project-based learning (PBL) and grave reservations about its introduction. Critics of project-based learning (PBL) wonder if the focus on practice makes it easier for teachers to employ a technical teaching method rather than encouraging instruction that is responsive to students' views.

4. Data Collection and Statistical Analysis

4.1 Sample and Procedure

The supervisor analyzed the questionnaire survey, establishing the information requirements, agreeing on a questioning subject, and creating the inquiry material for this study. The data collection has been divided into two sections, online and onsite classes. The participants' understanding of the question's goal and objective just the requirement for the survey. Before beginning the assessment, each class was given an introduction overview of the questionnaire and its objectives. A survey is a quantitative survey instrument containing a series of questions intended to gather information from the respondents. Total respondents of the survey questionnaire 275. Our respondents of online data have been collected from 125 students' questionnaires were sent through personalized online links, we used to Google online format form and 150 students in onsite classes some of them student enroll in first semester, some of them second, third years' students, and some of the final year project at Chonnam National University, South Korea

To achieve a high response rate, undergraduate and master students were each given an on-site questionnaire individually different class timing. Students required to reply to queries about team cohesiveness, flipped learning, and project-based learning. English language was used to conduct the surveys. The statistics on data processing were produced using statistical software application software SPSS 25.

4.2 Frequency Distribution

Table I shows a summary of the participants. In terms of gender frequency were two hundred and seventy-five in order. 66.9% were male 33.1% were female, respondents. Participants belong from the different departments at Chonnam National University.

		Frequency	Percent
	Male	184	66.9
Valid	Female	91	33.1
	Total	275	100.0

[Table I] Frequency Distribution N=275

4.3 Descriptive Items

The number of valid values is known as Valid N (listwise). Variable with a minimum value of 9.00 to 15.00, the variable's maximum value is 25.00 to 35.00. Commonly referred to as the large or small average value of the mean, the arithmetic mean across all observations is a widely used indicator of central tendency. Its range is from 19.51 to 27.15. The variance's square root stretched out throughout the range of data, which ranges from 2.604 to 3.311, is the standard deviation, which quantifies the dispersion of a collection of observations.

	N	Minimum	Maximum	Mean	Std.
					Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic
Engg	275	9.00	25.00	19.5164	2.89391
PBL	275	13.00	27.00	20.4618	2.60428
CT	275	13.00	30.00	24.4800	3.11615
COMM	275	15.00	35.00	27.1527	3.31199
COLL	275	15.00	30.00	24.1855	2.86786
CR	275	11.00	25.00	19.9600	2.9364I
Valid N	275				
(listwise)					

[Table 2] Descriptive Statistics

4.4 Measurement Items

To collect data on research variables, a survey instrument was created. In order to complete the research objectives, quite a few changes to the questionnaire are performed. A 5-point Likert scale was employed in the survey, which allowed statistical techniques to be used to examine the results. Table 3 shows all build operational definitions, measure items, and related sources. It is appropriate to ask them questions about project-based learning (PBL), as the majority of participants are working on a final-year project. We select a set of variables that transformed into a new set of factors based on a common element that they all contain. We used literature, previous study, or other researchers' expertise to aid with certain aspects. Reduces the number of variables on a factor with extreme loadings (high or low), Varimax reduces the correlation between variables. Allows us to associate a variable with a factor. It's worth noting that variables are quantifiable on a 0.5-interval scale. Another crucial part of the factor analysis is determining the sample size employed in this research. In the factor analysis model, the principal component approach used in data analysis.

Table [3] Measurement Items	Source
Effectiveness of Project-based Learning	

I. Share their knowledge and resources with team members.			
2. Enhances time management abilities.	(Frank et al.,		
3. Increased my learning ability.	2003); (Franket		
4. Learned and analysis process, completing a task, and multiple	al., 2004)		
plans.			
Critical Thinking			
I. Student think more deeply.			
2. Become independent thinkers.	(Stedman et al.,		
3. Achieve better learning outcomes.	2012)		
4. Higher-order thinking. (Analysis, synthesis, and evaluation).			
Communication			
I. Active participation.			
2. Presentation skills.			
3. Communicate with teachers and friends.	(Saenab et al.,		
4. Communicate direct, open, and honest.	2018)		
5. Enhance student's communication skills.			
Collaboration			
I. Cooperate with anyone.			
2. Collaborate with teachers.			
3. Enjoy with classmates.	(Chen et al.,		
4. Productive, worthwhile, and yield good results.	2015)		
Creativity			
I. Students develop ideas, making learning.	(Eragamreddy,		
2. Cognitive process, methods, perspectives, perceive.	2013);		
3. Addressing problems, innovative thinking.	(Birgili, 2015);		
4. Awareness of knowledge, assumptions, and past experiences.	(Kutlu et al.,		
5. Enhances your intellectual thinking.	2015);		
	(Jahnke et al.,		
	2017)		

5. Research Results

5.1 Model Analysis

In model I, revealed that value of $R^2 = 0.176$, that signifies the 17% variance explained by dependent variable. R-squared is a metric that measures how well the data resembles the regression model's fit and how much variance is represented by predictor variables, which is a percentage of the independent variable. The value of adjusted $R^2=0.164$ it identifies the percentage of change and 16% fraction of the change for a dependent variable with determination closely the data approaches and regression model fitted.

In model 2, revealed that value of $R^2 = 0.046$ variance is being explained 4.5% by the model and Adjusted $R^2 = 0.043$ showed 4% variance percentage explained to the dependent variable.

		Engagement = CT + Comm + Coll + Cre Model I	Project Based Learning(PBL) + Engagement Model 2
R		.419ª	.215ª
R Square		0.176	0.046
Adjusted R Square		0.164	0.043
Std. Error of the Estimate		2.64657	2.83158
	R Square	0.176	0.046
	Change		
	F Change	14.402	13.196
	dfI	4	I
	df2	270	273
Change	Sig. F	0.000	0.000
Statistics	Change		
Durbin-Watson		1.861	1.790

Table [4] Model Sur

5.2 Regression Analysis

In model I, revealed that the research variables critical thinking (β = .019) positive affect and 2% increase the effectiveness of learning engagement amount of change in a dependent variable. Communication (β = .246*) had a positive and significant effect and also 24% increase the effectiveness learning engagement amount of change in a dependent variable. Collaboration (β = .026) had an effect on effectiveness learning engagement and represent 02.5% increase the effectiveness learning engagement change in dependent variable. Creativity (β = .204***) had a positive significant effect and also 20% increase the effectiveness learning engagement change in a dependent variable. In model 2, revealed that the research variable project based learning (PBL) (β = .239***) positive significantly affect and 23% increase the effectiveness of learning engagement amount of change in a dependent variable.

5.3 Hypotheses Analysis

The outcomes of hypotheses analysis with regression analysis. We discriminate to make a direct link between research factors. Therefore, in this study, we developed hypotheses our research method and verified our hypotheses with a regression model. In table 5, HI project based learning (PBL) to engagement (β = .239***, p<0.1), therefore we accepted. H2 Critical thinking (β = .019, p < 0.05), and H4 Collaboration (β = .019, p < 0.1) were rejected. Other hand, H3 Communication (β = .246***, p < 0.01), and H5 Creativity (β = .204***, p < 0.01), positively effects and statically significant on student learning effectiveness, therefore we accepted both H3, H4.

Unstandardized Coefficients		Standardized Coefficients			
	Std.				Accepted or
В	Error	Beta	t	Sig.	Rejected

Table [5] Testing Hypotheses with Regression Analysis

Hypothesis (HI)	PBL to Engg	0.239	0.066	0.215	3.633	0.000	Accepted
Hypothesis (H2)	CT	0.019	0.055	0.021	0.345	0.730	Rejected
Hypothesis (H3)	COMM	0.246	0.055	0.281	4.510	0.000	Accepted
Hypothesis (H4)	Coll	0.026	0.064	0.026	0.404	0.686	Rejected
Hypothesis (H5)	CR	0.204	0.061	0.207	3.333	0.001	Accepted

Note: *** p < 0.01; ** p < 0.05; *p < 0.1.



Note: *** p < 0.01; ** p < 0.05; * p < 0.1.



6. Conclusion

6.1 Discussion of Findings

This study focused on some of the key elements of project based learning (PBL), such as the links between communication, and creativity success of project based learning (PBL). Results indicate that the

approach enhanced project-based learning, which contributed to requiring additional hard work. Projectbased learning (PBL), according to our viewpoint, encourages students to contribute their skills and resources among teammates. Project based learning (PBL) generally improves time management skills. According to (Almulla, 2020), the aim of the study is to improve and expand the potency of project based learning (PBL) as a strategic plan for engaging students. (Tsybulsky et al., 2019), examines the benefits of adopting a project based learning (PBL) method to engage learners in learning. We believe in students can share knowledge, improve their time management skills, complete a project, and focus on themselves through project-based learning with research components to increase engagement of leaning effectiveness. Our results in the effectiveness of project based learning (PBL) research have revealed that communication is highly correlated among variables. Our finding suggests that critical thinking, which enables deeper thought and better learning outcomes, is possible by using analytical thinking. Because critical thinking occasionally involves students' this means that critical thinking is dominant in project based learning. Communication, like talking to people while practicing my presentation abilities therefore, we like being a part of the project because it lets me talk to my professors and friends. We believe that communication motivates learners to actively engage in project-based learning. Our finding suggests that collaboration is supported in project based learning and is correlated with project based learning (PBL). Effectiveness in teamwork comes naturally when working with peers and interacting with them. On the other hand, creativity supports and increases the effectiveness of project based learning (PBL). Our finding is that students' analytical ability is enhanced by creativity. Creativity needs to be more promoted; it is important to develop, discuss, and share ideas. Consideration should be given to all ideas, but the majority of the problems were overcome by applying creativity.

6.2 Academic Contributions

We foresee a time when there will be a stronger correlation between effectiveness and project-based learning through collaboration, communication, and critical thinking. This is based on research findings that show relationships, healthy communication, and in-depth project thought are all favorably associated. Project based learning (PBL) allows for the development of individually meaningful objects

and the freedom to pursue one's passions in order to generate positive incentives and ownership (Helle et al., 2006). By integrating aspects of project based learning (PBL), such as choice of material, actions, and difficulties to keep interest (Dembo et al., 2000), the amount of engagement with the activities and the participants' perception of the project's length both appeared to have an effect on student academic outcomes. As some contributions from the academic side suggest, project based learning (PBL) increases attendance, improves attitudes toward learning, and fosters growth in self-reliance. Many students love project based learning (PBL) because it creates authentic experiences that are both fun and memorable, encourages students to share their knowledge and management abilities, think deeply and independently, collaborate, and work in teams, and is both fun and memorable. These characteristics play a vibrant role in student learning engagement and boost the effectiveness of engagement.

6.3 Practical Implications

Teachers may help students by responding to their inquiries through the implementation of an effective project based learning (PBL) strategy in the learning process. The use of project based learning (PBL), which motivates students in the learning process, has to be promoted among teachers at higher education institutions. Teachers should want to be more explicit about how knowledge and abilities can be used across domains and disciplines, particularly in the engineering field. The reason why some students believe project based learning (PBL) is less challenging than passing tests should also be looked into by teachers and educators.

6.4 Future Research

Future research should take into account what academic partners, including teachers and other higher education stakeholders, think about the project based learning (PBL) methodology. As a result, the research's results supported the viability of several ideas. The findings for certain hypotheses were significant, indicating that some do not need to be addressed further and that there is an existing favorable context for the constructs.

Second, various perspectives of the world will surely improve the research; it is advised to examine restrictions and encouraging activities in future work and place greater emphasis on team cohesiveness, coordination effectiveness, and the responsibility of reporting.

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