



The Effect of Project Based Learning on Digital Literacy Skills and Conceptual Understanding in an Online-Based Flipped Classroom Environment

¹Miftahus Surur, ²Supiana Dian Nurtjahyani, ³Agusti, ⁴Indah Yana

¹ Economic Education, STKIP PGRI Situbondo, Indonesia

² Biology, PGRI Ronggolawe University, Indonesia

^{3,4} Economic Education, STKIP PGRI Situbondo, Indonesia

Corresponding Author. E-mail: surur.miftah99@gmail.com

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Abstract

Tujuan dari penelitian ini adalah untuk mengetahui pengaruh pembelajaran berbasis proyek terhadap keterampilan literasi digital dan pemahaman konsep dalam lingkungan flipped classroom berbasis online. Metode yang digunakan oleh peneliti metode penelitian kuantitatif. Langkah-langkah metodologis yang digunakan oleh peneliti adalah. Pertama, peneliti merancang desain pembelajaran yang sesuai dengan konsep PBL dan flipped classroom berbasis online. Lokasi penelitian berada di STKIP PGRI Situbondo. Untuk populasi dan sampel penelitian, peneliti menggunakan sampel jenuh sebanyak 105 siswa. Selanjutnya, data akan dikumpulkan menggunakan instrumen uji. Uji coba instrumen meliputi: validitas, reliabilitas, tingkat kesulitan, dan daya pembeda dan dilanjutkan dengan pengujian hipotesis. Hasil penelitian ini didasarkan pada hasil analisis dan pembahasan metode pembelajaran Project Based Learning (PBL) yang mempengaruhi kemampuan literasi digital dan konsep pemahaman di lingkungan flipped classroom berbasis online dengan skor $0,02$ dan $0,03 < 0,05$, maka dapat disimpulkan bahwa terdapat pengaruh variabel X terhadap variabel Y1 dan Y2. Temuan ini juga membuktikan sementara bahwa PBL cocok digunakan dalam pembelajaran melalui dunia digital, sesuai dengan tujuan utama PBL yang mengutamakan pembelajaran konstruktivisme yang melibatkan penggunaan buku klasik dan digital serta kegiatan di lapangan.

Kata kunci: pembelajaran berbasis proyek, literasi digital, flipped classroom berbasis online

Abstract

The purpose of this study was to determine the effect of *project-based learning* on digital literacy skills and concept understanding in an online-based *flipped classroom environment*. Methods used by researchers quantitative research methods. The methodological steps used by researchers are. First, researchers designed a learning design that is in accordance with the concept of PBL and *online-based flipped classrooms*. The research location is at STKIP PGRI Situbondo. For the population and research sample, researchers used a saturated sample of 105 students. Next, the data will be collected using test instruments. Instrument trials include: validity, reliability, difficulty, and differentiating power and continue with hypothesis testing. The results of this study are based on the results of the analysis and discussion of Project-Based Learning (PBL) learning methods that affect digital literacy skills and concept understanding in an online-based *flipped classroom environment* with a score of 0.02 and $0.03 < 0.05$ then it can be concluded that there is an influence of variable X on variables Y1 and Y2. These findings also prove temporarily that PBL is suitable for use in learning through the digital world, in accordance with the main purpose of PBL which prioritizes constructivist learning which involves the use of classical and digital books and activities in the field.

Keyword: project based learning, digital literacy, online flipped classroom

INTRODUCTION

Education is one of the important aspects in the formation of quality individuals, so to achieve this goal, effective learning methods must be applied (A Andry, 2020). One method that has proven effective in developing cognitive skills and social skills is the *Project-Based Learning* (PBL) method. *Project-Based Learning* is a learning approach that involves students in challenging and real projects or tasks, this method focuses on applying students' knowledge and skills in the context of real situations. So that students can develop a deeper understanding of the subject matter and apply it in the context of everyday life (Anggreni et al., 2019, Syakur & Budianto, 2021).

The PBL method is derived from the philosophy of constructivism in education, which emphasizes the importance of student-centered learning. According to constructivism, effective learning occurs when students are actively involved in the learning process, building knowledge independently through experience and reflection (Banawi, 2019). According to (Ishak et al., 2021) In the PBL method, students take a more active role in learning, students are not always passive recipients of information, but also become creators of their own knowledge through the problem-solving tasks they work on. The assignment is designed in such a way that students must conduct research, analyze data, and overcome challenges that arise.

One of the main objectives of PBL is to develop 21st century skills in college students, such as problem solving, collaboration skills, creativity, communication, and critical thinking skills (Pradipta et al., 2022). In a PBL environment, students are exposed to situations that require them to work together in teams, communicate well, and use higher-order thinking skills to achieve project goals. In addition, PBL also provides a real context for students to connect and implement the knowledge they learn. In everyday life, students are rarely faced with isolated problems and are limited to one subject. By using PBL, students can see the relationship between various subjects and apply their knowledge more holistically. During the PBL process, lecturers play the role of facilitators or mentors who assist

students in understanding project objectives, providing guidance, and providing constructive feedback. Lecturers can also use this opportunity to identify individual student needs and provide additional support according to their needs (Bafadhol, 2017).

The advantages of the PBL method are not only limited to developing students' skills, but also include aspects of motivation and development of student learning interests. In PBL, students have an active role in determining the project or topic they are interested in. They have the freedom to explore topics relevant to their interests, thus increasing their intrinsic motivation in learning. In addition, PBL also gives students the opportunity to develop important life skills, such as time management, problem-solving, and adaptability. In the context of projects, students are faced with challenges that require good planning, task organization, and the ability to overcome obstacles that arise.

This learning method also encourages students to develop student creativity. In working on projects, students must think innovatively to find effective and unique solutions. PBL gives students the freedom to explore various approaches and new ideas in problem solving. In addition, PBL can also build connections between students with the real world and the surrounding community. In projects that involve interacting with people off campus, students can broaden their understanding of existing social, cultural, and environmental issues. They can learn about diversity, respect each other, and work together to achieve outcomes that benefit the community.

However, although PBL has many advantages, there are also challenges that need to be overcome in its implementation. Some of the challenges include efficient time organization, effective group management, and fair evaluation of project outcomes. Lecturers need to have careful planning, facilitate discussion and collaboration between students, and provide adequate guidance to ensure the achievement of learning objectives. In order to implement PBL effectively, adequate support and resources are also needed. Adequate facilities and infrastructure, software and equipment, and access to

relevant information resources can help students better run their projects.

According to Mayasari et al., (2016) the PBL learning method prioritizes a constructivist approach and has been proven to be able to improve 21st century skills for students and according to their needs. While the results of research Susanti et al., (2019) PBL method that the implementation of project-based learning has a positive correlation with students' mathematical communication skills.

Based on the results of previous research, this study aims to explore the influence of the *Project Based Learning* (PBL) method on digital literacy skills and concept understanding in the context of an *online-based flipped classroom* environment. This research is important because there have not been many studies that specifically investigate the effect of PBL on digital literacy and the application of *flipped classrooms*. PBL has been shown to be effective in improving student engagement, concept understanding, and critical thinking skills and providing an active learning experience. Where students are involved in real projects relevant to their daily lives. However, in the context of an *online-based flipped classroom* environment, PBL can be used as an innovative approach to improve students' digital literacy and understanding of concepts.

Digital literacy itself is the ability of individuals to use digital technology effectively in obtaining, evaluating, and using information (Agustini & Sucihati, 2020). In today's digital era, digital literacy is a very important skill for students. By implementing PBL in an *online-based flipped classroom* environment, students will be faced with challenges and projects that require digital literacy skills (Widyaningrum & Sondari, 2021). They will learn to search, sort, and evaluate information online, as well as use a variety of digital tools to produce creative and collaboratively well-crafted work.

In addition, this study investigates the effect of PBL on students' understanding of concepts in a *flipped classroom* environment, students will obtain learning materials through materials provided online beforehand. The application of PBL will allow students to apply the understanding of concepts they have gained independently through the projects they work on. Through this practical experience, it is

hoped that students will have a deeper understanding and be able to relate these concepts to real life. This research was conducted through quantitative and qualitative approaches. Data will be collected through test instruments to measure students' digital literacy skills and concept understanding before and after PBL interventions. In addition, observations and interviews will also be conducted to gain a deeper understanding of student experiences during the learning process. It is hoped that the results of this study can make a new contribution to our understanding of the influence of PBL on digital literacy and concept understanding in the context of (Fitria, 2020) *online-based flipped classrooms*. The results of this research can also provide a foundation for lecturers in policy makers to develop learning strategies that are more effective in preparing students to face the demands of the growing digital world.

METHOD

The method used in this study is quantitative research method. The methodological steps used by researchers are. First, researchers designed a learning design that is in accordance with the concept of PBL and *online-based flipped classrooms*. The research location is at STKIP PGRI Situbondo in the Learning Media course. For the population and research sample, researchers used a saturated sample of 105 students. Next, the data will be collected using test instruments. Instrument trials are carried out to determine their validity, reliability, level of difficulty, and distinguishing power. Instruments can be used if their validity, reliability, and differentiating power values are met. An instrument is said to be valid if it is with a significant level (α) of 5%. While the question whose valid value is not used (Jannah, 2019). Instruments are said to be reliable according to (Darmawan, 2013) if the correlation number is above 0.60 and less than 1, then the instrument has a high correlation or reliable, while if the correlation number is below 0.50, then the instrument is low or unreliable. The benchmark for interpreting the difficulty level of each question item is used difficult criteria with an index of 0.00-0.30, medium with an index of 0.31-0.70, and easy with criteria of 0.71-1.00. The questions used are questions that have a difficulty index of 0.31 to 0.70.

According to (Jannah, 2019) good question items are question items that have a differentiating power index of 0.4 to 0.7, this study uses questions that have a differentiating power index of 0.4 to 1.0.

Digital literacy tests will measure students' ability to find information online, evaluate the authenticity of information sources, and use digital tools effectively. The concept comprehension test will test students' understanding of the learning material they have received through the *flipped classroom* approach. After the data is collected, statistical analysis will be conducted to test the effect of PBL on students' digital literacy skills and understanding of concepts using the help of SPSS version 16. This research is

expected to provide a comprehensive understanding of the influence of PBL on digital literacy and concept understanding in an online-based *flipped classroom* environment. The results of this research can make a different and relevant contribution to the world of education, help improve the quality of online learning, and prepare students to face the demands of technological advances and digital developments in the future.

RESULTS AND DISCUSSION

Based on the results of the analysis using SPSS version 16 for validity and reliability tests as follows;

Table 1. *Validity Test Result*

Item-Total Statistics				
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted
X	113.0675	50.612	.514	.753
X	113.2875	51.742	.539	.753
X	113.3375	52.452	.475	.760
X	113.4475	53.188	.415	.756
X	113.3800	53.537	.487	.757
X	113.4725	51.556	.563	.752
X	113.3875	51.494	.565	.752
X	113.2025	48.560	.645	.749
X	113.2625	51.329	.565	.752
X	113.3200	52.907	.442	.755
X	113.4025	52.058	.491	.754
Y1	113.4400	51.528	.319	.750
Y1	113.4075	52.465	.488	.754
Y1	113.4600	51.114	.389	.751
Y1	113.3775	50.501	.383	.751
Y1	113.3850	50.799	.329	.753
Y1	114.3225	51.658	.467	.755
Y1	114.1975	51.813	.447	.755
Y2	114.2650	50.987	.533	.753
Y2	114.2950	51.647	.462	.755
Y2	114.3300	51.475	.512	.753
Y2	114.3600	50.672	.595	.751
Y2	114.3075	52.138	.442	.755
Y2	114.3275	52.211	.405	.757
Y2	114.3525	52.114	.433	.756

Based on the table above, it is known that the number of items is 25 with a construct validity value of 0.30. based on the table above the

Corrected Item-Total Correlation score , all items are declared valid and can be used

Table 2. *Reliability Test Result*

Reliability Statistics	
Cronbach's Alpha	N of Items
.759	25

Information

If the alpha value > 0.70 means *sufficient* reliability while if the alpha > 0.80 this means that all reliable items and all tests consistently have strong reliability and if the alpha > 0.90 then reliability is perfect. If the alpha is between $0.70 - 0.90$ then reliability is high. If alpha 0.50 As for the linear regression test, hail;

-0.70 then reliability is moderate. If alpha < 0.50 then reliability is low. Based on the results of the reliability test above, it is known that the score is 0.859 which means the item is declared to have a high reliability value

Table 3. Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.790 ^a	.372	-.256	.64700

i. Predictors: (Constant), FLIPPED CLASSROOM BERBASIS ONLINE

Information

Based on the output above, it is known that the R Square is 0.610 based on the square of the R value of 79.0 which means it is equal to 79% .

This number means that variable X simultaneously affects Varibael Y1 and Y2.

Table 4. Anova Test Result

ANOVA ^b					
Model	Sum of Squares	df	Mean Square	F	Itself.
Regression	.248	1	.248	.023	.022 ^a
Residual	.419	1	.419		
Total	.667	2			

i. Predictors: (Constant), FLIPPED CLASSROOM BERBASIS ONLINE

o. Dependent Variable: PBL

Information

Based on the ANOVA output table above, it is known that the Sig. value is $0.02 < 0.05$, so as the

basis for decision making in the F test it can be concluded that X simultaneously affects the variables Y1 and Y2

Table 5. Coefficients
Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Itself.
	B	Std. Error	Beta		
Constant)	25.349	2.605		9.731	.022
PBL	.003	.121	.610	.770	.031

i. Dependent Variable: FLIPPED
CLASSROOM BERBASIS
ONLINE

Information

Based on the SPSS **Coefficients** output table above Sig. variable X is 0.02 and 0.03 > 0.05, it

Discussion

Based on the findings above, it was found that the PBL Method affects Digital Literacy and Understanding Concepts in an *Online-Based Flipped Classroom Environment*. This finding certainly strengthens previous research conducted by (Nurohman, 2018) where the results of PBL strategies have stage compatibility with scientific methods. Therefore, the *Project Based Learning* approach can theoretically be used as a means of internalizing the value and spirit of *the Scientific Method* to prospective physics lecturer students.

Meanwhile, the results of research from Wahyuningsih et al., (2021) stated that there is a significant positive relationship between interest in learning and student physics learning outcomes through PBL learning in students. This study produces findings that reinforce previous results, stating that PBL affects digital literacy and concept understanding in the context of an online-based *Flipped Classroom* environment. These findings show that PBL is suitable for

can be concluded that there is an influence of variable X on variables Y1 and Y2.

in learning through the digital world, in accordance with the main objective of PBL which prioritizes learning in the context of constructivism.

PBL is a learning approach that emphasizes active learning experiences and engaging in real-life relevant projects. The main goal of PBL is to develop deeper understanding of concepts and critical thinking skills in students. Several studies have shown that PBL has a positive influence on understanding concepts in students. According to , students involved in PBL showed significant improvement in concept understanding compared to students involved in traditional learning. This shows that PBL can help students to understand concepts better and more deeply. McLoone et al., (2016)

However, there are also some studies that show different results. In one study, no significant difference in concept understanding was found between students involved in PBL and students involved in traditional learning. This suggests that the effectiveness of PBL may vary depending on certain factors

such as project quality and support from teachers. In addition, PBL can also help students develop critical thinking skills that are essential for success in the real world. (Calis & Yildirim, 2020)

Overall, PBL can have a positive influence on students' understanding of concepts and critical thinking skills. However, the effectiveness of PBL can vary depending on certain factors such as project quality and support from teachers. Therefore, it is important for teachers and education practitioners to consider these factors when implementing PBL in learning.

The PBL approach has become a popular choice in education because of its focus on developing critical thinking, problem-solving, and collaboration skills. This method encourages students to learn through real experiences, use the resources that are around them, and work together in groups to solve complex problems. One factor that might influence these outcomes is the similarity in learning environments between conventional (real-world) PBL and PBL in an online-based *flipped classroom* environment. In conventional PBL, students can interact directly with printed books and conduct field activities that enrich their understanding. Meanwhile, in an online-based *Flipped Classroom*, students rely on digital resources to interact directly with the environment or peers.

PBL is a learning method that encourages the realization of activities and collaboration in learning. Students are given the task of completing a project that involves applying skills and knowledge relevant to their field of study. In the context of digital literacy, PBL can be an effective tool to improve students' ability to utilize technology effectively. (Azmi et al., 2022)

One of the main advantages of PBL is that it allows students to learn through experience. In the context of digital literacy, students can be given the task of creating video tutorials, blogs, or websites that involve the use of various ICT tools. In this process, students will learn to maximize the function of tools to produce interesting and useful content effectively. In addition, PBL also promotes student collaboration and involvement in the learning process. In the context of digital literacy, students can work together in teams to create projects that involve the use of various ICT tools. In this process, they will learn how to work in teams, communicate, and collaborate effectively using technology. (Lubis et al., 2020)

However, it is important to note that PBL is not only about the use of technology. Instead, it emphasizes on developing skills and knowledge relevant to the student's field of study. In the context of digital literacy, this means that students must understand how technology can be used to obtain information, communicate, and produce useful content. (Yusuf et al., 2019)

In conclusion, PBL can be an effective tool to improve students' digital literacy. PBL enables students to learn through experience, promotes student collaboration and engagement in the learning process, and develops skills and knowledge relevant to their field of study. However, it is important to remember that PBL is not only about the use of technology, but about the development of skills and knowledge relevant to the student's field of study. (Kustini et al., 2021) (Faridah et al., 2022)

These findings show that PBL affects digital literacy and concept understanding in an online-based *flipped classroom* environment, emphasizing that PBL has benefits in a digital context. PBL can be used to develop critical thinking, collaboration, and problem-solving skills that are becoming essential in today's digital age. This research provides important insights for lecturers and curriculum developers to consider implementing PBL in an online-based *Flipped Classroom* environment. But of course, there needs to be adjustments to learning strategies, the use of appropriate digital resources, and a deep understanding of digital literacy skills needed by students.

CONCLUSION

The conclusion of this study is based on the results of the analysis and discussion of *Project-Based Learning* (PBL) learning methods that affect digital literacy skills and understanding concepts in an online-based *flipped classroom environment* with scores of 0.02 and $0.03 < 0.05$, it can be concluded that there is an influence of variable X on variables Y1 and Y2. These findings also prove that PBL is suitable for use in learning through the digital world, and in accordance with the main purpose of PBL which prioritizes learning in the current context involving the use of classical and digital books and activities in the field.

The PBL approach has become a popular choice in education because of its focus on developing critical thinking, problem-solving, and collaboration skills. This method encourages students to learn through real experiences, use the resources around them, and work together in groups to solve complex problems. One factor that might influence these outcomes is the PBL learning environment conducted conventionally (real world) and PBL in an online-based *Flipped Classroom* environment. In conventional PBL, students can interact directly with printed books and conduct field activities that enrich their understanding, and in online-based *Flipped Classrooms*, students rely on digital resources and interaction through cyberspace.

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