JURNAL EDUSCIENCE (JES)
p-ISSN : 2303 - 355X | e-ISSN : 2685 - 2217
PUBLISHED BY : LPPM of UNIVERSITAS LABUHANBATU

Jurnal Eduscience (JES)
Volume 11, No. 3
December, Year 2024
Submit : July 2024
Accepted : November 2024

PROBLEM-BASED LEARNING (PBL) WITH QUIZIZZ: IMPROVING STUDENT LEARNING OUTCOMES IN OPTICAL INSTRUMENTS

[1]IKHWAN ANANDA HUSNA, [2]SYAFRIZAL, [3]HALIMATUSSAKDIAH, [4]MULIANI, [5]TULUS SETIAWAN

[1,2,3,4,5]Department of Physics Education, Universitas Malikussaleh, Aceh, Indonesia
[1]ikhwan.190730010@mhs.unimal.ac.id, [2]syafrizal@unimal.ac.id, [3]halimatussakdiah@unimal.ac.id, [4]muliani91@unimal.ac.id, [5]tulussetiawan@unimal.ac.id,

ABSTRACT

This type of research is a quantitative approach with a quasi-experimental design in the form of a nonequivalent Control Group Design. The sampling technique was purposive sampling with a sample size of 50 students, namely 25 students from class XI-MIA[1] as the control class and 25 students from class XI-MIA[2] as the experimental class. The data collection instrument uses multiple choice questions. Meanwhile, data analysis uses prerequisite tests which include normality and homogeneity tests, hypothesis tests and N-gain tests.The results showed that the average posttest score for the experiment was 82.20 and the average posttest score for the control class was 76.20. Based on the results of hypothesis testing using parametric tests, namely the independent t-test, sig results were obtained. (2-tailed) of 0.026 < 0.05, meaning that H0 is rejected and Ha is accepted or there is an influence of the Problem Based Learning (PBL) model assisted by the Quizizz application on student learning outcomes. Meanwhile, the average N-Gain score for the experimental class is 0.72, which is in the high category. So it can be concluded that there has been an increase in student learning outcomes in the experimental class which implemented the Problem Based Learning (PBL) model assisted by the Quizzizz application.

Keywords: Problem Based Learning (PBL) model, Quizizz, learning outcomes

INTRODUCTION

Education is a fundamental need for every individual in Indonesia. Through education, we can transform the nation's destiny from being left behind to becoming advanced. Education is the key to the progress of the nation, and the curriculum plays a crucial role in this process (Junita et al., 2019). The curriculum is not merely a document but a primary instrument for achieving educational goals. It provides direction and guidelines for all education practitioners in carrying out the best educational processes to achieve national educational objectives (Angga et al., 2022).

The curriculum is something that continuously evolves in line with the development and challenges of the times. As a nation's civilization advances, the challenges it faces become more complex. Therefore, clarity and decisiveness in the curriculum and its implementation are essential to improving the quality of education, which is currently lagging far behind compared to other

JURNAL EDUSCIENCE (JES)
p-ISSN : 2303 - 355X | e-ISSN : 2685 - 2217
PUBLISHED BY : LPPM of UNIVERSITAS LABUHANBATU

developed nations (Kristiani et al., 2023). One such challenge is the subject of physics, which many students find difficult to understand. Physics is a subject that discusses many concepts closely related to daily life. However, many students still face difficulties in learning physics due to their perception of the subject as being solely about mathematical problems to memorize, thus preventing them from applying the concepts learned in real life (Andi & ROMLAH, 2021). Generally, physics learning tends to be teacher-centered, with little active student participation in the learning process. Students simply receive information from the teacher without understanding the meaning of the mathematical equations taught in physics (Faiza et al., 2023).

The rapid development of science and technology today significantly influences human life. In education, technology has a great positive impact on the learning process. Students can easily access information from various sources quickly. The use of technology not only makes learning more innovative and engaging but also improves student learning outcomes. Therefore, besides the teaching model applied, innovation in the use of learning media is also needed to increase the effectiveness of learning, such as using the Quizizz application (Citra & Rosy, 2020).

Based on observations conducted with the physics teacher at SMA Negeri 1 Rantau Selatan, it was found that the curriculum used in the school for grades XI and XII is the 2013 curriculum, while grade X has already implemented the Merdeka Curriculum. The teaching model applied in the school uses a lecture system with minimal interaction with the teacher, and the learning media used by the teacher is mainly sourced from textbooks available at the school. This leads to student boredom and disinterest in physics, which impacts their learning outcomes. This issue is reflected in the students' daily task scores, which remain relatively low. Among 25 students, 20 students (80%) did not meet the Minimum Completeness Criteria (KKM) score of 82, and only 5 students (20%) achieved it. Therefore, an innovation in teaching is needed, specifically using the Problem-Based Learning (PBL) model. The implementation of a teaching model should be tailored to the students' conditions, such as learning materials and media, to improve the quality of learning and student outcomes (Patimah, 2021).

Problem-Based Learning (PBL) is a teaching model that presents real-life problems to be solved. PBL helps students enhance their understanding of concepts, analysis, and the ability to seek and use appropriate learning resources (Nazira et al., 2024). The PBL model prioritizes problems as the starting point of learning, where students independently gather and integrate new knowledge inspired by real-world situations. This model emphasizes active student participation in finding solutions to the problems they face, unlike conventional approaches that tend to dictate the

JURNAL EDUSCIENCE (JES)
p-ISSN : 2303 - 355X | e-ISSN : 2685 - 2217
PUBLISHED BY : LPPM of UNIVERSITAS LABUHANBATU

material in a linear fashion. With PBL, the learning process is expected to flow naturally, strengthen students' problem-solving skills, and increase their independence (Walenta, 2022). To maximize the learning process, interactive learning media are needed, one of which is through the use of applications. Quizizz is an interactive game-based application used as a medium in the teaching and learning process. This application offers various types of quizzes from different aspects that can be utilized by both educators and students. Quizizz allows student-centered learning by making students more active in the learning process. This application can be accessed by both teachers and students using various devices, such as gadgets, notebooks, computers, or laptops.

Tabel 1. Syntax of Problem-Based Learning Model

Syntax of Problem-Based Learning	Teacher Activities
Phase 1: Orient students to the problem	The teacher finalizes the learning objectives, explains the logistics required, proposes a phenomenon or demonstration or story to raise a problem, motivates learners to engage in selected problem solving.
Phase 2: Organizing students to learn	The teacher helps learners to define and organize learning tasks related to the problem.
Phase 3: Guiding individual/group experience	The teacher encourages learners to gather appropriate information, conduct experiments to obtain explanations and solve problems.
Phase 4: Developing and presenting work	The teacher assists learners in planning and preparing appropriate works such as reports, videos and models and helps them to share their work with others.
Phase 5: Analyzing and evaluating the problem-solving process	The teacher helps learners to reflect or evaluate their investigations and the processes they use.

Source: (Masleni Harahap, 2021)

Quizizz is an online E-learning educational media that is based on a free, game-like platform, used in teaching and learning activities to enhance enthusiasm, motivation, and the outcomes of the student learning process. It aims to stimulate students' interest in revisiting lesson materials and engaging in group discussions. Quizizz is considered an effective online media when used in learning. It can serve as an alternative evaluation tool for students, and the analysis of each question can be monitored, making it suitable for assessing learning outcomes (Muliani, 2022). Quizizz offers several significant advantages. First, the quizzes presented in this platform have a

JURNAL EDUSCIENCE (JES)
p-ISSN : 2303 - 355X | e-ISSN : 2685 - 2217
PUBLISHED BY : LPPM of UNIVERSITAS LABUHANBATU

time limit, teaching students to think quickly in solving problems. Another advantage is the varied use of colors and interesting images in the answer choices. Additionally, the display of questions and answers is automatically adjusted on both the educator's (operator's) and student's devices, providing an interactive and engaging experience in the teaching and learning process (lamsari purba 2019).

METHODOLOGY

The research type used in this study follows a quantitative approach, as the data obtained from the research results are in the form of numbers, which will be analyzed using statistical methods. The method used is quasi-experimental to determine the independent and dependent variables. The research design applied is the Nonequivalent Control Group Design (Sugiyono, 2019). The research was conducted at SMA Negeri 1 Rantau Selatan for the 2023/2024 academic year. The population sample consists of all students from class XI MIA, totaling 167 students, divided into 6 classes. The sample selection was done using purposive sampling, meaning the sample was chosen based on certain considerations, such as the average student scores and input from the teacher. This resulted in two classes: XI-MIA2 (25 students) as the experimental group and XI-MIA1 (25 students) as the control group.

The data collection techniques and instruments include tests, which consist of 20 multiple-choice questions validated by validators. Additionally, a questionnaire was used to assess students' responses to learning using the Problem-Based Learning (PBL) model supported by the Quizizz application. After obtaining data from the test instruments, prerequisite data analysis tests were conducted, including normality and homogeneity tests. The analysis then focused on the impact of the PBL model supported by the Quizizz application on students, using a t-test or independent sample T-Test at a significance level of 0.05 to determine whether there was an effect of the PBL model supported by Quizizz on optical instruments in class XI, conducted with SPSS Statistics Version 25.

RESULT AND DISCUSSION

The results of the research conducted at SMA Negeri 1 Rantau Selatan with 50 students in class XI were obtained from pretest-posttest data to assess student learning outcomes in each class. The pretest scores were obtained before students were taught using the Problem-Based Learning (PBL) model supported by the Quizizz application to assess students' initial understanding of optical instruments. The posttest data were obtained after the students received instruction using

JURNAL EDUSCIENCE (JES)
p-ISSN : 2303 - 355X | e-ISSN : 2685 - 2217
PUBLISHED BY : LPPM of UNIVERSITAS LABUHANBATU

the PBL model with the Quizizz application to compare the pretest and posttest scores of both the experimental and control classes.

Table 2. Mean scores of experimental and control class students

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest Experimen	25	20,00	55,00	36,40	8,231
Posttest Experimen	25	65,00	100,00	82,20	9,138
Pretest Control	25	20,00	55,00	37,20	8,047
Posttest Control	25	60,00	95,00	76,20	9,274

From table 2, it can be seen that the minimum value on the pretest of the experimental and control classes has the same value, namely 20.00 and 55.00. The posttest value of the experimental class has a minimum value of 65.00 and 60.00 for the control class, while the maximum value of the posttest in the experimental class is 100.00 and 95.00 for the control class. Based on Figure 1, it can be seen that experimental class students have an average pretest score of 36.40 and an average posttest score of 82.20. While in the control class, students have an average pretest score of 37.20 and an average posttest score of 76.20.

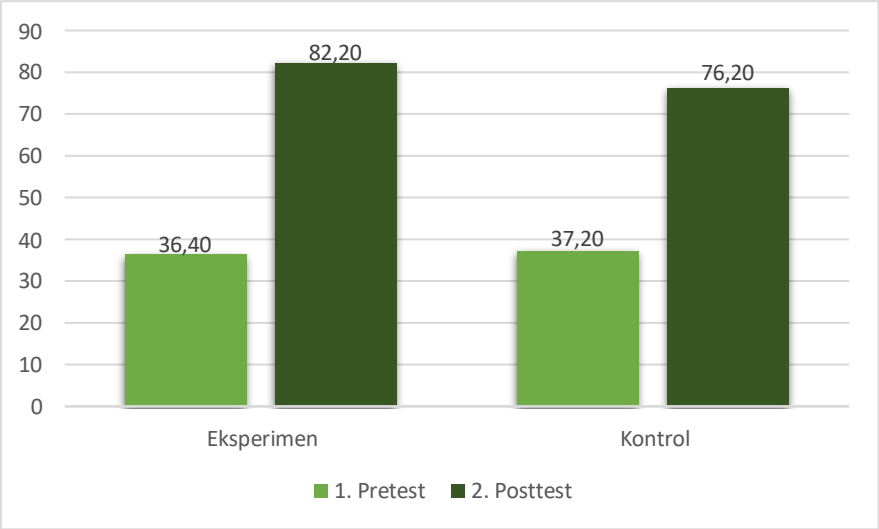

Figure 1. Graph of the average pretest-posttest scores of students

Normality Test

The normality test is carried out to determine whether the data obtained by the researcher is normally distributed or not. The normality test used is Shapiro Wilk using SPSS for Windows

JURNAL EDUSCIENCE (JES)
p-ISSN : 2303 - 355X | e-ISSN : 2685 - 2217
PUBLISHED BY : LPPM of UNIVERSITAS LABUHANBATU

Version 25 with criteria. If sig> 0.05 then the data is normally distributed. If sig. 0.05 then the data is not normally distributed.

Table 3. Pretest Post-test Normality Test Results

Kelas	Shapiro-Wilk		
	Pretest	Posttest	Description
Experiment	0,549	0,210	Normal
Control	0,108	0,201	Normal

The results of the pretest normality test obtained data from the pretest results of the experimental class and control class were normally distributed with a significant value greater than 0.05. From table 3 it is known that the pretest value in the experimental class has sig. 0.549> 0.05 means that the pretest is normally distributed. While the pretest in the control class has a sig. 0.108 > sig. 0.05 means that the pretest is normally distributed. The results of the posttest normality test obtained data from the posttest results of the experimental class and control class were normally distributed with a significant value greater than 0.05. From table 3 it is known that the posttest value in the experimental class has sig. 0.210 > sig. 0.05 means that the posttest is normally distributed. While the posttest in the control class has sig. 0.201> 0.05, meaning that the data is normally distributed.

Homogeneity Test

Test the homogeneity of student learning outcomes for experimental and control classes using the Levene Test (Test of Homogeneity of variances) with the IBM SPSS 25 For Windows program with testing criteria if the significance value is 0.05 then the data is homogeneous, whereas if the significance value is <0.05 then the data is not homogeneous. Based on the homogeneity test using the IBM SPSS 25 for Windows application, the following results were obtained:

Table 4. Homogeneity Test Results

Homogenity Test		
Pretest	Posttest	Description
0,887	0,992	Homogen

Based on Table 4 above, it is found that the pretest significance value is 0.887 which means that the significance value is 0.05. So it can be concluded that the data obtained is homogeneously distributed. In table 4 above, it can be seen that the homogeneity results obtained a significance value of 0.992 with a significance level of 0.05, which means that the significance value is greater

JURNAL EDUSCIENCE (JES)
p-ISSN : 2303 - 355X | e-ISSN : 2685 - 2217
PUBLISHED BY : LPPM of UNIVERSITAS LABUHANBATU

than the sig level. 0,05. So the posttest data on student learning outcomes can be said to be homogeneous in the experimental and control classes.

Hypothesis Test

This test was carried out with the help of the IBM SPSS 25 for windows application using the Independent Sample t-Test for normally distributed data. For complete information can be seen in the table below.

Table 5. Independent Samples T-Test test results

		F	Sig.	t	Df	Sig. (2-tailed)
Learning outcome	Equal variances	0,000	0,992	2,304	48	0,026
	Equal variances not assumed			2,304	47,998	0,026

Based on Table 5. above shows that there is a significant effect of the posttest results of student learning outcomes in the experimental and control classes. This can be seen from the posttest value of the experimental and control class sig (2-tailed) is 0.026 <0.05 which means (Ho) is rejected and (Ha) is accepted. So it can be concluded that there is an effect of the Problem Based Learning (PBL) model assisted by the quizizz application on student learning outcomes.

N-Gain Test

For the results of the N-Gain score test calculation, it shows that the average value of the experimental class N-Gain Score is 72.13 while the average value of the N-Gain score for the control class is 61.57. This shows that the results of the N-Gain Score test in the experimental class that applied the PBL model assisted by the quizizz application with an average N-Gain Score of 72.13 with a high category, while the average N-Gain Score value found in the control class by applying the Direct Instruction (DI) model with the help of the quizizz application was 61.57 with a medium category.

Discussion

Based on the research results, it was found that the average posttest scores of student learning outcomes in the experimental class were higher compared to the control class posttest results. The average pretest score of the 25 students in the control class was 37.20, and the average posttest score was 76.20. Meanwhile, the average pretest score in the experimental class was 36.40, and the average posttest score was 82.20. According to the data shown in the table, the normality test of the pretest in the control class showed a significance (sig) value > 0.05, with a value of 0.108, which

JURNAL EDUSCIENCE (JES)
p-ISSN : 2303 - 355X | e-ISSN : 2685 - 2217
PUBLISHED BY : LPPM of UNIVERSITAS LABUHANBATU

is greater than 0.05. The normality test for the pretest in the experimental class showed a sig value of 0.549, also greater than 0.05. Based on the data in Table 3, the normality test for the posttest showed a sig value > 0.05, with a value of 0.201, which is greater than 0.05 in the control class. The normality test for the posttest in the experimental class showed a sig value of 0.210, greater than 0.05, indicating that both the pretest and posttest data are "normally" distributed.

For the homogeneity test shown in Table 4, the result was 0.887 ≥ 0.05, which meets the homogeneity test criteria, thus concluding that the pretest data is "homogeneous." Similarly, the homogeneity test for the posttest in Table 4 showed a result of 0.992 ≥ 0.05, meeting the homogeneity criteria, so it can be concluded that the posttest data is also "homogeneous."

The final test conducted was a hypothesis test using an independent t-test on the experimental class. The t-test results shown in Table 4.6 showed a significance value (sig. (2-tailed)) < 0.05, with a value of 0.026, which is less than 0.05. Therefore, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_a) is accepted, indicating a significant effect of the use of the Quizizz application on students' learning outcomes in optical instruments. It can be concluded that the Problem-Based Learning (PBL) model with the Quizizz application has an effect on the learning outcomes of class XI students.

This research also proves that there was an improvement in the learning outcomes of class XI students in the optical instruments material at SMA Negeri 1 Rantau Selatan. This is based on the average N-Gain score for the experimental class, which was 72.13, falling into the high category, with a maximum value of 100.00 and a minimum value of 65.00. Thus, it can be concluded that the data used in this study is effective. According to (Ariyani & Kristin, 2021) the PBL model has a positive impact on improving students' learning outcomes (Latif et al., 2020; Safitri et al., 2019; Safitri & Hasibuan, 2018; Thovawira et al., 2020). Based on the pretest and posttest results of both classes, it was found that the average learning outcomes for the optical instruments material were higher in the experimental class than in the control class. According to Widyasari (2024) this is because the PBL model enhances student activity by confronting them with a real-life problem to stimulate their thinking process in solving the problem and organizing their knowledge, especially regarding optical instruments.

CONCLUSION

Based on the research conducted, it can be concluded that there is an effect of the Problem-Based Learning (PBL) model, supported by the Quizizz application, on the learning outcomes of

class XI students on optical instruments material at SMA Negeri 1 Rantau Selatan. This is evident from the statistical test results, where the Independent Sample Test showed a posttest significance value (sig. (2-tailed)) of 0.026 < 0.05. This means the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_a) is accepted. The average posttest score shows that the experimental class had higher scores than the control class, with the experimental class achieving a posttest score of 82.20, while the control class achieved 76.20. The N-Gain score for the experimental class was 73.13, which is in the high category, whereas the N-Gain score for the control class was 61.57, which falls into the medium category. Therefore, it can be concluded that there was an improvement in the learning outcomes of the experimental class students who applied the Problem-Based Learning (PBL) model with the Quizizz application on the optical instruments material.

REFERENCE

Andi, H. J., & ROMLAH, S. A. (2021). Pengaruh Model Pembelajaran Discovery Learning Berbantuan Video Pembelajaran Terhadap Hasil Belajar Fisika Siswa Sma. *Jurnal Eduscience*, *8*(2), 1–5. https://doi.org/10.36987/jes.v8i2.2226

Angga, A., Suryana, C., Nurwahidah, I., Hernawan, A. H., & Prihantini, P. (2022). Komparasi Implementasi Kurikulum 2013 dan Kurikulum Merdeka di Sekolah Dasar Kabupaten Garut. *Jurnal Basicedu*, *6*(4), 5877–5889. https://doi.org/10.31004/basicedu.v6i4.3149

Ariyani, B., & Kristin, F. (2021). Model Pembelajaran Problem Based Learning untuk Meningkatkan Hasil Belajar IPS Siswa SD. *Jurnal Imiah Pendidikan Dan Pembelajaran*, *5*(3), 353. https://doi.org/10.23887/jipp.v5i3.36230

Citra, C. A., & Rosy, B. (2020). Keefektifan Penggunaan Media Pembelajaran Berbasis Game Edukasi Quizizz Terhadap Hasil Belajar Teknologi Perkantoran Siswa Kelas X SMK Ketintang Surabaya. *Jurnal Pendidikan Administrasi Perkantoran (JPAP)*, *8*(2), 261–272. https://doi.org/10.26740/jpap.v8n2.p261-272

Faiza, C. R., Idris, S., Muliani, M., Ginting, F. W., & Sakdiah, H. (2023). Pengaruh Model Problem Based Learning (Pbl) Berbantua Video Youtube Terhadap Pemahaman Konsep Siswa. *OPTIKA: Jurnal Pendidikan Fisika*, *7*(1), 72–79. https://doi.org/10.37478/optika.v7i1.2696

Junita, R., Universitas Labuhan Batu, F., Raja, J. S., & Tapa Rantau Prapat Indonesia, A. (2019). Hal : 67-74 Peningkatan Hasil Belajar PKN Melalui Metode Simulasi Kelas VII SMP Negeri 2 MARBAU Kabupaten Labuhanbatu Utara Tahun Pelajaran 2016/2017 Improvement of PKN Learning Outcomes Through Simulation Methods In Class VII State 2 State Marbau North L. *Edu Science Tfol*, *6*(2), 67–74.

Kristiani, E., Andrianti, P., Enjelie, E., Norjanah, N., & Bulandari, B. (2023). Komparatif Epistemologi-Aksiologis Kurikulum K13 dengan Kurikulum Merdeka. *Jurnal Pengajaran Sekolah Dasar*, *2*(1), 76–92. https://doi.org/10.56855/jpsd.v2i1.337

lamsari purba, leony sanga. (2019). Peningkatan konsentrasi Belajar Mahasiswa Melalui Pemanfaatan Evaluasi Pembelajaran Quizizz Pada Mata Kuliah Kimia Fisika I. *Jurnal Dinamika Pendidikan*, *12*(1), 29–39.

Latif, A., Safitri, I., & Pasaribu, L. H. (2020). Pengaruh Metode Pembelajaran Problem Solving Terhadap Aktivitas Belajar Siswa. *Jurnal Eduscience*, *7*(2), 1–9. https://doi.org/https://doi.org/10.36987/jes.v7i2.1907

Masleni Harahap, E. S. 2021. (2021). *Makalah Model pembelajaran problem based learning*. 1–5.

Muliani, M. (2022). Pelatihan Asesmen Hasil Belajar Digital Terintegrasi Quizizz Dan Google Form Sebagai Solusi Pembelajaran Di Masa New Normal. *Jurnal Pengabdian Magister Pendidikan IPA*, *5*(1), 316–322. https://doi.org/10.29303/jpmpi.v5i1.1165

Nazira, N. K., Idris, S., Novita, N., Setiawan, T., Malikussaleh, U., Konsep, P., & Lurus, G. (2024). *Pengembangan lkpd fisika berbasis pbl untuk meningkatkan pemahaman konsep peserta didik pada materi gerak lurus*. *8*(1), 118–127.

Patimah, N. (2021). Perbandingan Hasil Belajar Siswa Melalui Penggunaan Model Pembelajaran Kooperatif Tipe Concept Sentence dan Complete Sentence pada Subkonsep Vertebrata. *Jurnal Eduscience*, *8*(1), 12–19. https://doi.org/10.36987/jes.v8i1.2111

Safitri, I., & Hasibuan, lily R. (2018). Pembelajaran analogi pada konsep vektor untuk membentuk sikap dan moral siswa kelas x sma negeri 1 rantau utara. *Simposium Fisika Nasional*, 240–249.

Safitri, I., Pasaribu, R., Simamora, S. S., & Lubis, K. (2019). The effectiveness of android application as a student aid tool in understanding physics project assignments. *Jurnal Pendidikan IPA Indonesia*. https://doi.org/10.15294/jpii.v8i4.19433

Sugiyono. (2019). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif dan R & D*. Bandung : Alfabeta.

Thovawira, F. A., Safitri, I., Supartik, Nadila, N., & Anggriani, I. (2020). Systematic literature review: implementasi pendekatan stem (manfaat dan tantangan) di indonesia. *Jurnal Histogram*, *4*(2), 355–371. https://doi.org/10.31100/histogram.v4i2.682

Walenta, R. (2022). Penggunaan model pembelajaran problem bassed learning dalam pembelajaran IPS di sekolah dasar. *Jurnal Multi Disiplin Ilmu*, *1*(1), 33–39.

Widyasari, D., Miyono, N., & Saputro, S. A. (2024). Peningkatan Hasil Belajar melalui Model Pembelajaran Problem Based Learning. *Jurnal Inovasi, Evaluasi Dan Pengembangan Pembelajaran (JIEPP)*, *4*(1), 61–67. https://doi.org/10.54371/jiepp.v4i1.368