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Problem Based-Learning Performance in Improving Students' Critical Thinking, Motivation, Self-Efficacy, And Students' Learning Interest

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Abstrak

Peningkatan mutu pendidikan harus senantiasa dilakukan melalui proses pembelajaran di kelas. Pembelajaran yang baik sangat bergantung pada interaksi siswa dengan proses pembelajaran. Penelitian ini bertujuan untuk mengetahui efektivitas PBL (problem-based learning) melalui media pembelajaran in-shot digital untuk meningkatkan kemampuan berpikir kritis, motivasi, efikasi diri, dan minat belajar siswa. Metode penelitian yang digunakan dalam penelitian ini adalah metode penelitian Quasi Eksperimen. Populasi dalam penelitian ini adalah seluruh siswa sekolah menengah di Pekanbaru, Provinsi Riau. Sampel dalam penelitian ini dipilih secara purposive. Teknik pengumpulan data dalam penelitian ini adalah tes dan non tes. Tes berupa soal yang dirancang untuk level berpikir C4 dan C5, sedangkan non tes berupa lembar observasi untuk melihat motivasi belajar, efikasi diri, dan minat belajar siswa setelah mengikuti kegiatan pembelajaran PBL dengan media digital. Teknik analisis data yang digunakan dalam penelitian ini adalah deskriptif kuantitatif, yaitu tes untuk membandingkan kelas eksperimen dan kontrol. Penerapan media pembelajaran digital dalam pembelajaran kelompok dapat meningkatkan kemampuan berpikir kritis, motivasi belajar, self-efficacy, dan minat belajar matematika siswa.
Kata kunci: Problem Based-Learning; Media Pembelajaran Digital; Berpikir Kritis

Abstract

Improving the quality of education must always be carried out through the learning process in the classroom. Good learning relies heavily on student interaction with the learning process. This research aims to determine the effectiveness of PBL (problem-based learning) through digital in-shot learning media to improve students' critical thinking skills, motivation, self-efficacy, and interest in learning. The research method used in this research is a Quasi-Experimental research method. The population in this study were all secondary school students in Pekanbaru, Riau Province. The sample in this study was chosen purposively. Data collection techniques in this research are test and non-test. The test is in the form of questions designed for C4 and C5 levels of thinking, while the non-test is in the form of an observation sheet to see students' learning motivation, self-efficacy, and interest in learning after participating in PBL learning activities with digital media. The data analysis technique used in this research is descriptive quantitative, a test to compare the experimental and control classes. Applying digital learning media in group learning can improve students' critical thinking skills, learning motivation, self-efficacy, and interest in mathematics.
Keywords: Problem Based-Learning; Digital Learning Media; Critical Thinking

I. INTRODUCTION

Nationally and internationally, students' mathematics abilities in Indonesia are still very sad. From the results of PISA and TIMMS, in 2018, Indonesia was still ranked 72nd out of 78 countries participating in this competition (OECD, 2018). Students in Indonesia are only able to master basic mathematics and have not been able to communicate facts, relate them to various topics, have not been able to apply complex and abstract concepts. (Mullis et al., 2020). These results conclude that the ability and mastery of mathematics at the international level is very sad because Indonesia's ranking is below that of neighboring countries such as Malaysia, Thailand, and Singapore. The low mathematics ability of Indonesian students is due to low interest in studying, understanding, reading, and seriousness in learning (Tuen Veronica Leung et al., 2019). The low performance of students in mathematics is because students have yet to have interesting learning experiences, and teachers only provide monotonous learning (Amir et al., 2021; Harsy et al., 2020). As a result, students do not have the confidence to master competencies in mathematics learning (Kyaruzi & Kyaruzi, 2021). This bad mathematics learning experience increases students' anxiety in learning mathematics, and they do not have challenges in learning mathematics (Dalitz, 2021; Afriansyah et al., 2021). Apart from low math skills, there is something that is no less important, namely the erosion of Malay culture in Riau Province. The rapid development of technology makes students ignore the characteristics of Malay culture (Rezeki et al., 2021). Students prefer playing games rather than taking part in activities with cultural nuances. Many students must learn Malay cultural games, cooking, dance, and other Malay cultures (Rezeki et al., 2020).

One way to increase motivation, literacy, and numeracy in mathematics is to create exciting learning with media that attracts students' interest in learning. Media is a solution to improving mathematics performance by increasing interest or motivation. (Lombardi et al., 2019). This high interest in learning or motivation to learn will increase the desire to master mathematics (Hikmah, 2021). Abstract mathematical material can be visualized using engaging animation media, which can stimulate students to understand more complex lessons (Matsun et al., 2019). Digital learning through media with animation can increase interest or motivation so that student literacy and numeracy will improve. Besides that, cultural maintenance can be carried out optimally with the integration of culture and education.

Learning media is a learning tool that is used to improve student learning outcomes in class (Ge, 2019; Mulyadi & Afriansyah, 2022). Media is an effective learning tool for improving learning progress in schools (Nagel et al., 2021) Digital learning media can change the

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success of learning that was initially not good or unsatisfactory (Wood et al., 2021). Digital learning media is an effective solution for bridging uninteresting learning and improving student learning outcomes (Yang & Chen, 2021). Utilizing digital media to increase motivation and mathematics learning outcomes is an effective way (Rutherford et al., 2021). Utilizing digital media to increase motivation and mathematics learning outcomes is an effective way (You et al., 2021; Zhou et al., 2020). The motivational values in students enable them to learn in any condition and solve any problems in their learning (Tossavainen et al., 2020). The motivation that comes from students to learn is a determinant of learning success (Ning, 2020).

Based on the statement above, learning media development is essential in improving learning outcomes, critical thinking abilities, motivation, self-efficacy, and students' interest in learning mathematics. A learning media-based learning model that is optimally designed and has strict procedures will produce the learning objectives to be achieved. Therefore, it is essential to carry out this research to facilitate teachers and students interacting optimally in the learning process. The research aims to answer whether the PBL learning model with digital mathematics learning media video in-shot can improve students' critical thinking skills, motivation, self-efficacy, and interest in learning.

Many researchers have researched the effect of PBL on learning outcomes (Rinaldi & Afriansyah, 2019; Puspitasari et al., 2023). However, research explicitly conducted to measure the influence of PBL on learning outcomes, critical thinking, learning motivation, self-efficacy, and interest in learning has never been carried out by any researcher. Research involves complex measurements because it measures more than one variable in an experiment at the same time. This research also involves more than one measurement instrument to maximize measurements with the variety of data obtained. Combining PBL with in-shot digital learning media can maximize the learning process through valuable experiences for students (Ramadoni & Admulya, 2023). Students not only listen to the teacher's speech during the learning process but can enjoy enjoyable learning activities through animated images that speak directly about the subject matter on a particular topic.

II. METHOD

The research method used in this research was quasi-experimental. The population was all junior high schools in Riau Province. The sample was a portion of schools taken purposively according to the problem criteria found. The sample in this study was a private school that had been surveyed and had problems with mathematics learning involving motivation, self-efficacy, and critical thinking skills. The sample of this study consisted of 88

students, 44 of whom were in the control class and 44 of whom were in the experimental class. The sample selection procedure was to check students' abilities from the two classes through homogeneous analysis. Homogeneous checks were carried out to ensure that ethics in research had been carried out correctly so that the experiment's success occurred absolutely because of the treatment of learning strategies, not because of uncontrolled factors. The research instrument was an observation sheet to check motivation and self-efficacy while participating in learning in the experimental class. Instruments in the form of tests were used to obtain data on learning outcomes, namely students' critical thinking abilities during the learning process in class. Content and construct validity were proposed to ensure the instruments were valid categories. Aikens' formula showed that every item of the four variables used to get data was in the middle and high categories. Every expert gave relevant and very relevant information regarding the items of the researched variables. There were 3 data analyses used in this research: first, descriptive statistical analysis of the categories of motivation, self-efficacy, interest in learning, and critical thinking skills after participating in learning in the experimental class; second, t-test inferential statistical analysis to see whether there were differences between the control class and the experimental class; and third, Mancova analysis to see whether simultaneously, problem-based learning with the help of Inshot learning media could increase motivation, self-efficacy, interest in learning, and critical thinking abilities. The research procedure began by determining two homogeneous classes. Determination of homogeneous classes was carried out by analyzing previous exam data from the teacher. After the class was declared homogeneous, the next stage determined the control and experimental classes. The control class received the classic teaching method, namely the conventional method. To maintain quality and accurate data, the research was not conducted by researchers but by teachers who provided treatment. This was done to maintain the researcher's intervention in obtaining accurate data. Teachers taught experimental and control classes and measured students' success abilities after participating in research activities. In contrast, the experimental class used the cooperative learning method, equipped with animated digital learning media, namely Inshot. Each class was given the same material with different learning methods. The final results showed which method was more effective in increasing learning motivation, self-efficacy, interest in learning, and critical thinking skills.

III. RESULT AND DISCUSSION

The study answers the research hypothesis as to whether there is a significant difference between the

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experimental and control classes. The hypothesis in this study is;

Ho: There is no influence of PBL on students' motivation, self-efficacy, learning interest, and critical thinking

Ha: PBL influences students' motivation, self-efficacy, learning interest, and critical thinking.

The research results describe the prerequisite test results for normality and homogeneity and the T-test results for each control and experimental class for learning motivation, self-efficacy, interest in learning, and critical thinking abilities. Tables 1, 2, and 3 describe the results of the prerequisite tests and t-test inferential statistics.

The normality test is used to see whether the data distribution is normally distributed. The normality test is essential because it determines further statistical analysis, which will be used to decide whether there are differences in students' motivation, self-efficacy, interest in learning, and critical thinking abilities. The results of the Normality test analysis can be seen in Table 1.

Table 1.
Normality Test

Variables	CT	M	SE	LI
N	44	44	44	44
Mean	71.07	49,82	56,91	4,75
Std	1.6	6,5,83	1,0,44	6,44
Absolute	.012	.18	.110	.132
Positive	.089	.18	.110	.132
Negative	-.121	-.08	-.06	-.073
	.121	.183	.110	.132
Sig.	0.145	0.1	.200	0.05

The analysis results obtained a significant value for the critical thinking ability variable of 0.145; the motivation variable obtained a significant value of 0.062. The self-efficacy variable obtained a significant value of 0.11. The learning interest variable obtained a significant value of 0.051. The considerable value of the four variables is greater than 0.05, so it can be concluded that the data obtained from data collection activities is normally distributed. The next prerequisite test is the homogeneity test. Homogeneity results use Levene's Test statistics and can be seen in Table 2.

The homogeneity test is used to check whether the control class and experimental class, which are used as research objects, have the same abilities in terms of learning outcomes, motivation, self-efficacy, and interest in learning. Homogeneity results use Levene's Test statistics and can be seen in Table 2.

Table 2.
Levene's Test Results

Variables	F	Sig.
Motivation	4.777	.053
Self_Efficacy	0.630	.432
Learning Interest	6.980	.125
Critical Thinking	0.639	.427

From the homogeneity test results, a significant value of 0.053 was obtained for the motivation variable. The self-efficacy variable obtained a significant Levene's test value of 0.051. The self-efficacy variable obtained a significant Levene test value of 0.432. The learning interest variable

obtained a significant Levene test value of 0.125. The critical thinking variable obtained a significant Levene's test value of 0.427. The fourth significant Levene test value obtained is greater than 0.05, so it can be concluded that the control and experimental classes have the same abilities. Next is the independent t-test to see whether there are differences in the four variables studied in the control class and experimental class.

Table 3.
Results of Comparative Analysis of Four Variables

Variables	t	df	Sig	Mean Difference
Motivation	3.014	42	.004	549.48
Self-Efficacy	8.953	42	.000	1.675
Interest	5.448	42	.000	820.49
Critical Thingking	4.968	42	.000	-1.705

From the analysis results, the significant value of the motivation variable from the t-test analysis was 0.004, and the t-value was 3.014. The self-efficacy variable obtained a t value of 8.953 with a significant value of 0.000. The learning interest variable obtained a t value of 5.448 with a significant value of 0.000. The critical thinking variable obtained a t value of 4.968 with a significant value of 0.000. The results of the analysis show differences in student learning motivation, student self-efficacy, student interest in learning, and students' high-level thinking abilities in learning mathematics. This result is proven by the significant value of 0.000, and the t-count value is greater than that of the T-Table.

The research results have explained significant differences in students' critical thinking abilities between the experimental and control classes. These results show that learning media in the form of shots designed to improve students' thinking abilities has improved junior high school students' critical thinking abilities. These results explain that media developed with specific objectives can achieve maximum results because teachers with high teaching experience have validated this media. Learning media designed with appropriate procedures can play an essential role in improving students' critical thinking and reasoning abilities (Hamid et al., 2021; Johnson et al., 2021). Interactive learning media can encourage students to think critically while actively participating in the learning process. This media can include simulations, games, or problem-based activities requiring critical thinking (Kurnianto & Haryani, 2019). Learning media that involves various senses, such as visual, auditory, and kinesthetic, can help students understand concepts more thoroughly. It can help build connections between different ideas and strengthen their understanding, which in turn can improve critical thinking skills (Gashaj et al., 2023). Learning media often allow the presentation of information in various formats, including text, images, video, and audio. It can cater to different learning styles among students and broaden the way they understand the material, ultimately improving their critical thinking

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abilities. Learning media can provide practical opportunities for students to apply the concepts they learn in relevant contexts. It can help them develop the analytical and evaluative skills of students completing assigned tasks or problems. Some types of learning media can provide direct feedback to students, either through automatic assessment or direct interaction with the instructor or classmates. This feedback can help students improve their understanding, identify thinking errors, and strengthen their critical thinking skills. By designing learning media with these factors in mind, teachers can create a learning environment that effectively stimulates students' critical thinking and reasoning.

From the results of the analysis, it was found that there were significant differences in learning motivation between the control class and the experimental class. These results indicate that the experimental class equipped with inshot media can increase students' motivation in learning mathematics. Learning media can increase students' motivation to learn mathematics (Rodríguez et al., 2019). Interactive learning media has great potential to increase student learning motivation. Interactive learning media allows students to participate actively in the learning process. (Alafgani & Purwandari, 2019). By being directly involved in activities, students feel more involved and active in understanding the lesson material (Bektaş et al., 2020). Interactive learning media often uses various media types, such as images, video, sound, and text (Rafiola et al., 2020). By presenting information through various sensory channels, this medium can capture students' interest more effectively than text-only learning (Shi et al., 2021)

Many interactive learning media allow students to customize the student learning experience according to student preferences and needs (Christiansen & Erixon, 2021). It can include selecting a learning path, level of difficulty, or even a desired visual or auditory style. (Hennebry & Gao, 2021). By controlling their learning experience, students feel more empowered and tend to be more motivated (Andres, 2019). Interactive learning media often provide students with immediate feedback about their performance (Tokan & Imakulata, 2019). It can help students understand where they are in the learning process and give them additional encouragement to improve their performance (Rehman et al., 2020; J. C. Yang & Quadir, 2018) Many interactive learning media include game elements, such as scores, levels, or rewards, which can motivate students to engage and try harder (Khan et al., 2019). The more they successfully overcome challenges or achieve certain goals, the more motivated they are to continue participating (Mabruri et al., 2019). By utilizing the features of the learning media that have been developed, teachers can create a more exciting and meaningful learning experience for

students, which in turn can increase their motivation to learn.

The results of the analysis show that there is a significant difference between the control class and the experimental class on students' self-efficacy in learning mathematics. Well-designed learning media can increase student self-efficacy. Self-efficacy is an individual's belief in their ability to succeed in a particular situation (Zulnaidi et al., 2020). Learning media presents examples or models of others who have successfully overcome challenges or completed tasks (Wu & Wu, 2020). By observing this model, students can gain confidence that they can do the same (Angraini et al., 2024). Through interactive learning media, students can receive positive feedback on student efforts (Chan et al., 2021). Awards, praise, or recognition for their progress can strengthen their belief that they can achieve academic goals (Susanti et al., 2020). Learning media often provide opportunities for students to practice and test their skills in a safe and structured environment (Wakhata et al., 2023). By going through this process, students can develop confidence in their abilities as they see improvements in their performance over time (García-Moya et al., 2023).

Learning media can provide constructive feedback to students about their performance (Liu & Hallinger, 2018). This feedback can help students understand their strengths and weaknesses and provide direction on areas they need to improve (Moreira-Fontán et al., 2019). Learning media can help students set realistic and measurable goals (Niemi & Niu, 2021). By experiencing success in achieving these goals, students can increase their confidence in their ability to overcome more significant challenges (Falcon et al., 2023). By using learning media to strengthen students' self-efficacy, educators can build a strong foundation for students' academic success and personal development.

IV. CONCLUSION

The research results presented show significant differences in students' critical thinking abilities, learning motivation, self-efficacy, and interest in mathematics in junior high schools in Riau province. This difference in results shows that experimental classes using the PBL method with valid and practical digital media can improve students' critical thinking skills, motivation, self-efficacy, and interest in mathematics. Further research can explore various approaches or learning methods that can directly or indirectly improve learning outcomes or the quality of mathematics learning in the classroom.

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