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Enhancing Mathematics Learning Outcomes Through The Implementation of The Problem-Based Learning Model With The Assistance of The Quizizz Application

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ABSTRACT

This study aimed to enhance mathematics learning outcomes by implementing the Quizizz-assisted Problem-Based Learning teaching approach. The research focused on ten first-grade students at SD Negeri 12 Bengkulu City. It employed a classroom action research design consisting of two cycles, each comprising four stages: (1) planning, (2) implementation, (3) evaluation, and (4) reflection. Research tools included observation sheets and learning achievement tests. Data analysis involved calculating averages, highest and lowest scores, score differences, and the range for each criterion using the observation sheets. Test data were analyzed by determining average scores and the percentage of students meeting the set learning criteria. The findings demonstrated an improvement in learning outcomes in each cycle. In the first cycle, the students achieved an average score of 69.44, 70% of which met the learning criteria. There was a significant enhancement in the second cycle, with an average score of 86.11 and 90% of students meeting the learning criteria. The Quizizz-assisted Problem-Based Learning model effectively enhanced student learning outcomes in mathematics for first-grade students at SD Negeri 12 Bengkulu City.

Keywords: Learning outcomes, Quizizz, Problem-Based Learning

A. INTRODUCTION

The success of education hinges significantly on the achievements of students in their learning endeavours. The primary aim of the educational system in schools is to attain favourable learning outcomes. Enhanced learning outcomes contribute to an overall improvement in the quality of education. Thobroni in Dakhi (Dakhi, 2020) defines learning outcomes as patterns of actions, values, understandings, attitudes, appreciations, and skills. In a similar vein, as articulated by Nurrita (Nurrita, 2018), learning outcomes encompass the abilities that students develop as a result of engaging in the learning process, encompassing cognitive, affective, and psychomotor skills. Furthermore, drawing on the perspective of Hamalik, as cited in Nurrita (Nurrita, 2018), learning outcomes manifest when an individual undergoes a transformation in their behaviour due to the process of learning. In summary, these definitions collectively emphasize that learning outcomes entail behavioural changes following a learning process, encompassing knowledge, attitudes, and skills.

In the second semester of the 2023/2024 academic year, there are significant challenges in teaching mathematics to first-grade students, resulting in poor academic performance. Classroom observations reveal that students are not actively engaged in their learning activities. They lack motivation for mathematics because it is often perceived as a difficult subject due to its heavy emphasis on numbers, formulas, and calculations. Many teachers continue to use traditional teaching methods that primarily involve passive activities, such as listening to lectures, responding to the teacher's questions, copying notes, and completing textbook exercises, which makes the learning process teacher-cantered. Initial statistics indicate that students are scoring only 50.00 on tests, with a learning success rate of just 30%. These scores are below the school's minimum passing grade (MPG) of 60.00 for the subject of mathematics.

To enhance the learning outcomes of first-grade mathematics students, it is essential to employ suitable teaching model that cater to their individual needs, thereby optimizing the learning process and improving their educational achievements. One of the models is problem-based leaning. Problem-based learning is teaching that uses real world problems as a context for students to learn critical thinking and problem solving skills, as well as to obtain essential knowledge and concepts from the subject matter (Mambrasar et al., 2010). According to Arends in Darma, et.al (Rahayu et al., 2022), Problem Based Learning (PBL) is an approach where students are faced with authentic (real) problems so that they are expected to be able to build their own knowledge, high skills and inquiry, make students independent, and strengthen their self-confidence.

Furthermore, According to Warsono and Hariyanto in Ratnasari (Ratnasari et al., 2022), *Problem-Based Learning* offers several notable advantages. Firstly, it familiarizes students with problem posing and encourages them to tackle a wide range of problems, both in the context of classroom learning and real-world situations they encounter in their daily lives, thereby fostering a problem-solving mindset. Secondly, it promotes social solidarity and facilitates group discussions, enhancing collaborative learning. Additionally, it strengthens the mentor-student relationship, leading to a closer connection between educators and learners. Finally, it instills a practice of experimentation in problem-solving, encouraging students to explore innovative solutions.

Aside from its benefits, the PBL model has certain shortcomings within the learning process. To effectively implement learning activities based on the PBL model, it is necessary to provide students with appropriate learning resources, including literature, multimedia materials, internet technologies, and more. This ensures that students have access to a wider variety of knowledge sources. Given the drawbacks of the PBL model, it is essential to employ strategies that utilize media as a learning resource in order to attain the desired learning objectives.

The role of media in learning is an important part of the world of education. According to Tafonao in Azzahra and Pramudiani (Azzahra & Pramudiani, 2022) that learning media can help teachers in delivering learning material, increasing students' creative thinking abilities and students' attention to learning. Learning media that is easy to make and use is really needed by teachers today. This makes the role of the teacher not only explain lesson material, the teacher becomes able to also use technology as a learning medium.

Instructional media plays a vital role in enhancing teaching techniques, serving as an educational tool aimed at enhancing students' learning results. Quizizz, available on both Android's App Store and mobile apps, stands out as an excellent option among various learning mediums. Additionally, it can be accessed through a computer browser (Sodiq et al., 2021). As stated by Rusmana (Agustina & Martha Rusmana, 2019), Quizizz is a web-based tool designed for creating interactive quiz games for classroom use.

The educational content provided by the Quizizz app can be accessed offline and does not require a mobile phone. Instead, it can be utilized in a paper-based mode where answer codes sync with the Quizizz app. Additionally, Quizizz offers features that assist teachers in creating assignments and streamlining the evaluation process. These data can be downloaded in Excel format. The utilization of educational media through the Quizizz application is intended to simplify the comprehension of the teacher's instructions for students.

Furthermore, it is anticipated that this instructional media will enhance students' learning achievements.

Chaiyo in (Lider, 2022) express that Quizizz is an application that can help teachers create quizzes that students take by joining with the code provided. Students join by opening the quizizz.com application and entering the game code along with their name and can be used without the help of a projector because players see the question-and-answer options on the screen themselves. The order of questions is randomized for each student, so it is not easy for players to cheat.

The preceding information suggests that improving academic achievements is of utmost importance for students in primary school. Based on the provided details, it is evident that enhancing learning outcomes is a crucial goal for elementary school students. To boost student performance, a potential approach is to use Problem-Based Learning in conjunction with the Quizizz application as a teaching tool. Consequently, the researcher is keen to investigate the impact of employing the "Implementation of Problem-Based Learning Model Assisted by the Quizizz Application" on the advancement of Grade 1 students' mathematics learning outcomes at SD Negeri 12 in Bengkulu City.

B. METHOD

Classroom Action Research (CAR) is the chosen research approach, which Mcniff and Jack (Mcniff & Whitehead, 2016) define as a form of action research aimed at enhancing the quality of classroom learning. The purpose of this study is to enhance the overall quality of learning, specifically focusing on students' engagement and academic performance. This research is being conducted in a first-grade Mathematics class at SD Negeri 12 in Bengkulu City, and it was conducted from March 20th to April 8th, 2023.

This classroom action research comprises two interconnected and continuous cycles: Cycle I and Cycle II. Each cycle encompasses four key stages, namely planning, implementation, evaluation, and reflection. In the event that the results of Cycle I do not meet the desired level of success, the research will proceed to the subsequent cycle until the desired conditions are attained. The execution phase of classroom action research is illustrated in the provided graphic (Figure 1).

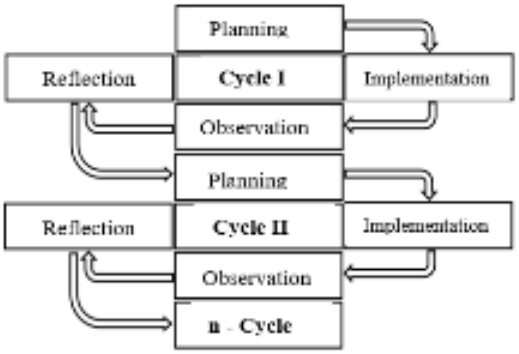

Figure 1. Action Implementation Flow in CAR

Research instruments are devices utilized by researchers for gathering research data through measurements. In this study, the instruments employed for data collection include observation sheets for implementing the Problem-Based Learning model with Quizizz and test sheets administered at the conclusion of the final cycle. The objective of this assessment is to evaluate students' comprehension and academic achievements when utilizing the Problem-Based Learning approach along with Quizizz. The examination comprises multiple-choice questions.

The research employs a data analysis method that focuses on examining observational data related to the utilization of a learning model and the subsequent test results. The observation data is leveraged to assess the various cycles of implementation and identify areas for improvement in subsequent cycles. This data is processed in a descriptive manner to support the implementation of the Problem Based Learning model using Quizizz. In contrast, quantitative data analysis techniques are applied to assess the students' learning outcomes. The research employs specific formulas for this data analysis process.

1. Observer Data Analysis
a. Mean score =
   $\frac{\text{the sum of scores}}{\text{the number observers}}$
b. Highest score = the number of observation items x the highest score for each observation item
c. Lowest score = the number of observation items x the lowest score for each observation item
d. Range of values for each criterion =
   $\frac{\text{the difference in scores}}{\text{between the highest and lowest scorer}}$

2. Learning Test Data Analysis
   To measure the learning outcomes of participants, use the following formula:

$$\times = \frac{\Sigma X}{N}$$

Explanation:
X = Mean
ΣX = Sum of all values
N = Number of students

The criteria for the overall class average are grouped into five categories as follows:

Table 1 Criteria for Class Average

Criteria	Score
Excellent	86-100
Good	71-85
Fair	56-70
Poor	41-55
Very Poor	0-40

The criteria for the level of learning achievement are grouped into five overall categories as follows:

Table 2. Criteria for Student Learning Achievement

Criteria	Score
Excellent	80 – 100%
Good	71-85%
Fair	56-70%
Poor	41-55%
Very Poor	0-40%

C. RESULTS AND DISCUSSION

Based on two cycles of classroom action research, the researcher found that employing the Problem-Based Learning approach in combination with Quizizz improved student learning results.

Table 3: Comparison of Mathematics Learning Outcomes for Students

Description	Cycle I	Cycle II
Total number of students	10 students	10 students
Number of students who took the test	10 students	1 student
Number of students who passed	7 students	9 students
Number of students who did not pass	3 students	1 student
Class average score	69,44	86,11
Classical mastery level	70%	90%

Based on Table 3, the students' learning outcomes in the subject of Mathematics in the class, using the Problem-Based Learning model in conjunction with Quizizz, achieved 69.44% in Cycle I, categorized as "fair." In Cycle II, they achieved 86.11%, categorized as "good." The observation of the implementation of the Problem-Based Learning model in conjunction with Quizizz improved from Cycle I to Cycle II.

Discussion

The research carried out in the first-grade class at SD Negeri 12 in Bengkulu City utilized the Problem-Based Learning model, which comprises five key stages: (1) Introducing students to the problem, (2) Organizing the students' learning process, (3) Providing guidance for both individual and group investigations, (4) Developing and presenting their work, and (5) Analyzing and evaluating the problem-solving process. The utilization of this teaching model has the potential to make students more actively engaged, foster creativity, and promote innovation, all of which can significantly improve their performance in thematic learning. As Ridwan, cited in Kristiana & Radia (Kristiana & Radia, 2021), educational approaches that involve posing problems, encouraging questioning, allowing for exploration, and stimulating discussion are collectively referred to as Problem-Based Learning (PBL). In addition, Problem-Based Learning (PBL) is an instructional strategy centered on real-world problems, providing a framework for students to develop critical thinking and problem-solving skills while also gaining knowledge. PBL is an acronym representing the teaching model called Problem-Based Learning.

After reviewing the initial test results from the first cycle, it was observed that the average score was 69.44, and the pass rate stood at 70%. However, following the implementation of the second cycle, there was a notable enhancement in learning outcomes, with 90% of students successfully meeting the Minimum Mastery Criteria (KKM), and the average score increased to 86.11. This improvement was attributed to the utilization of the Problem-Based Learning model combined with Quizizz support, indicating that students experienced progress and successfully met the study's predetermined success criteria.

The provided information demonstrates an enhancement in students' mathematics learning outcomes. As indicated by Nurrita (Nurrita, 2018), learning outcomes encompass the abilities that students develop as a result of engaging in the learning process, encompassing cognitive, affective, and psychomotor skills. Furthermore, as noted by Punia (2020), the utilization of Problem-Based Learning can lead to an improvement in mathematics learning outcomes. To attain favorable learning results, it is essential to employ a suitable teaching model that aligns with students' everyday experiences, such as the Problem-Based Learning approach. This approach ensures that the learning outcomes not only meet but also potentially surpass the predefined educational standards.

The implementation of the learning model can be enhanced through the use of instructional media, which serves to capture the attention of students during group learning sessions. Thus, a combination of technology-based learning resources, specifically Quizizz, a

web application for creating interactive quiz games, can be employed as a valuable learning tool. Students can access this program from any location they are situated. As Citra and Rosy (Citra & Rosy, 2020), Quizizz is an educational application that gamifies learning by incorporating multiplayer activities in the classroom, rendering the learning experience more enjoyable and engaging. Additionally, Wibawa, et al. (Wibawa et al., 2019) noted that Quizizz offers features that generally facilitate the learning process for both educators and students, suggesting its potential for innovative learning. In conclusion, it can be deduced that utilizing the Problem-Based Learning model with the assistance of Quizizz has the potential to improve the mathematics learning outcomes of 1st-grade students at SD Negeri 12 in Bengkulu City.

The research conducted by Datreni (Datreni, 2022) found the results that support the present research. The result showed that the PBL (Problem Based Learning) Model can improve Mathematics learning outcomes for class III elementary school students. This also appropriate to the study conducted by Najoan, et al. (Najoan et al., 2023) that found the result that the application of the problem based learning model can improve mathematics learning outcomes for class III at SD GMIM IV Tomohon.

Other research that discuss the problem based learning model is conducted by Jenah, et al. (Jenah et al., 2022), even though it focused on the online problem-based learning, it also in line with the present research. The result discovered that the average value of the N-Gain score using the online problem-based learning model was 0.6985, putting it in the moderate category for improving student learning outcomes.

Specifically in the result of research done in the issue of Quizizz application, Based on the results obtained, the implementation of Quizizz as an Education Game-based learning media was carried out through the stages of analysis, design, development, implementation and evaluation. Thus, it is found that the application of Quizizz in learning activities can improve and have a positive influence on mathematics learning activities (Hafiyah & Hadi, 2023).

Next, (Amsul et al., 2022) had found that the results of the research show that the use of quizizz learning media is effective on the interest and mathematics learning outcomes of class XI IPA MAN 2 Sinjai students. In the same tone, Lestari (Lestari, 2022) found that Quizizz has interesting features that can increase student concentration, motivation and learning outcomes so that it can be used as an alternative mathematics learning media.

It can be summarized that in conclusion, the paragraphs suggest that employing the Problem-Based Learning model with the support of Quizizz has the potential to improve

mathematics learning outcomes in different educational settings. This is in line with the findings of Nisa (2023) that reveals the use of the Quizizz application media can enhance numeracy skills in third-grade students in the subject of Mathematics.

D. CONCLUSION

The research findings and discussions at SD N 12 Bengkulu city indicate that first-grade students can enhance their mathematical learning outcomes by utilizing the Problem-Based Learning model with Quizizz application support. The evidence from this study reveals a notable improvement in learning mastery between two cycles. Initially, 70% of students achieved mastery in Cycle I, but this increased to 90% in Cycle II. Moreover, the average score increased from 69.44% in Cycle I to 86.44% in Cycle II. These results demonstrate that the implementation of Problem-Based Learning with Quizizz assistance effectively increases the number of students who attain learning mastery.

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