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IMPROVING FRACTIONS LEARNING OUTCOMES THROUGH PBL-BASED MATH GAMES AND POWTOON VIDEOS AT SDN 37 LUBUKLINGGAU

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Abstract: Problem-Based Learning (PBL) is a student-centered instructional approach that emphasizes the use of real-life problems to develop students' higher-order thinking skills and active involvement in the learning process. This study aimed to examine the effectiveness of the Problem-Based Learning model in improving students' academic achievement and learning engagement, particularly in the cognitive domain. The research employed a classroom action research design involving 17 fifth-grade students of MIN 26 Hulu Sungai Utara during the odd semester of the 2022/2023 academic year. Data were collected through observation sheets to measure student participation and written tests to assess learning outcomes. The results revealed that in the pre-cycle stage, the students' average score was 68.12, with a classical mastery level of 47%, where only 8 out of 17 students achieved the minimum passing grade of 65. After the implementation of PBL, students' learning outcomes improved progressively. In Cycle 1, the average score increased to 75.29 with a classical mastery of 70.59%, while in Cycle 2, the average score further rose to 78.82, and classical mastery reached 82.5%, with 14 students achieving the minimum passing grade. These findings indicate that the Problem-Based Learning model is effective in enhancing students' academic achievement and engagement in learning.
Keyword: Problem-Based Learning (PBL), Math Games, Powtoon Videos, Fractions Learning Outcomes, Elementary School Students

INTRODUCTION

Mathematics is a subject that plays a crucial role in developing students' logical, analytical, and critical thinking skills. Fractions are a subject often considered difficult by students. Fractions require a strong conceptual understanding because they relate to number operations, comparisons, and their application in everyday life. Based on initial observations at SDN 37 Lubuklinggau, most fifth-grade students experienced difficulties in understanding the concept of fractions, particularly in comparing, adding, and subtracting fractions. This difficulty resulted in low student learning outcomes, as evidenced by the class average score, which was still below the Minimum Completion Criteria (KKM) set by the school.

Improving student learning outcomes in fractions requires an innovative, engaging learning approach that is tailored to student characteristics. One strategy that can be used is Problem-Based Learning (PBL). PBL is a learning approach that emphasizes contextual problem-solving, enabling students to actively seek solutions and construct knowledge independently. In practice, PBL can be combined with interactive learning media, such as Math Games and Powtoon videos. Math Games offer a fun learning experience through educational games, thereby increasing student motivation and engagement. Meanwhile, Powtoon videos allow for visual and animated presentations of fractions, making abstract concepts easier for students to understand..

Several previous studies have shown that the use of technology-based interactive media in mathematics learning can improve conceptual understanding, learning motivation, and student learning outcomes. For example, research conducted by Lestari & Haryanto (2022) showed that the use of Powtoon media in mathematics learning can significantly improve students' achievement of basic competencies. Similarly, research by Santoso (2021) confirmed that Math Games are effective in improving fraction learning outcomes because students are actively involved and motivated to complete the game's challenges..

Based on this background, this study aims to improve the learning outcomes of fifth-grade students at SDN 37 Lubuklinggau in fractions through the implementation of Math Games and Powtoon videos based on Problem-Based Learning (PBL). This research is expected to not only improve student learning outcomes but also serve as an alternative learning strategy that is engaging, creative, and in line with technological developments in the digital era..

METODOLOGI

Research Design

This study employed Classroom Action Research (CAR) with a quasi-experimental approach. CAR was chosen because the study aimed to improve student learning outcomes through direct classroom learning interventions. The quasi-experimental approach was used because the researchers did not use complete randomization but instead selected experimental classes based on equal academic ability.

Research Subjects

The subjects of this study were fifth-grade students of SDN 37 Lubuklinggau in the 2025/2026 academic year. Subjects were selected using purposive sampling, selecting classes with equivalent academic abilities based on their mathematics report card scores from the previous semester. One class was selected as the experimental group, receiving fraction learning using Math Games and Powtoon Videos based on Problem-Based Learning (PBL). The study was conducted at SDN 37 Lubuklinggau, which has computer facilities and projectors to support the use of digital learning media.

Research Variables

The independent variable in this study was the implementation of Problem-Based Learning (PBL) combined with math games and Powtoon animated videos. This intervention was designed to create active, contextual, and student-centered fraction learning through real-world problem solving and the use of engaging digital media. The dependent variable was student learning outcomes in fractions, measured through formative and summative tests. These learning outcomes reflected improved conceptual understanding, problem-solving accuracy, and students' ability to apply fraction concepts after participating in PBL-based learning supported by Math Games and Powtoon.

Research Instrument

This study employed several research instruments to collect comprehensive data. The learning outcome test consisted of multiple-choice and short-answer items designed to measure students' understanding of fractions, including addition, subtraction, and comparison. Student activity observation was conducted using an observation sheet to record learners' participation, enthusiasm, and engagement during Math Game– and Powtoon-based learning activities. In addition, a learning motivation questionnaire was administered to identify changes in students' motivation after the implementation of interactive learning media. Finally, documentation in the form of photographs and video recordings of classroom activities was collected to support qualitative analysis and strengthen the interpretation of the findings.

Research Procedures

The research was conducted in two cycles with the following steps:

Cycle 1

1. Planning: Developing a PBL-based lesson plan using math games and Powtoon videos.
2. Implementation: Teaching fractions using these media.
3. Observation: Recording student activity, enthusiasm, and engagement.
4. Reflection: Analyzing learning outcomes and student responses for improvement in the next cycle..

Cycle 2

1. Planning: Improve methods and media based on the results of the reflection on cycle 1.
2. Implementation: Repeat the lesson using the refined strategy.
3. Observation: Monitor student engagement and assess the effectiveness of the improvements.
4. Evaluation: Use a final test to measure improvements in students' fraction learning outcomes.

Data was collected through:

- Written tests for learning outcomes.
- Observation sheets for student activities.
- Questionnaires for learning motivation.
- Photo/video documentation to support research evidence..

Data Analysis Techniques

Data were analyzed quantitatively and qualitatively:

Quantitative Analysis:

Test results were analyzed using descriptive statistics (mean score, percentage of learning completion) and inferential statistics, if necessary (e.g., t-test).

The percentage of learning completion was determined based on the school's Minimum Competency Criteria (KKM), for example, 75 or above is considered complete.

2. Qualitative Analysis:

o Observations of student activities, teacher notes, and documentation were analyzed using qualitative descriptive analysis to assess student engagement and motivation in learning.

RESEARCH RESULT

1. Cycle 2 Results

In the second cycle, learning was improved based on reflections from cycle 1, including: Powtoon animation presentations were made more interactive and concise, tailored to students' concentration levels. Math games were given additional challenges to further motivate students. PBL discussions were guided by trigger questions to maximize student engagement.

Tabel 1. Hasil Belajar Siswa Siklus 2

No	Aspek penilaian	Pre-tes siklus 2	Post – siklus 1	Penigkatan
1	Penjumalahan pecahan	70	85	15
2	Pengurangan pecahan	68	82	14
3	Perbandingan pecahan	68	83	15
4	Rata rata nilai	68,7	83,3	14,6
5	Persentase ketuntuntasan	60%	90%	30%

The results of cycle 2 showed an increase in average scores of 14.6 points and a learning completion percentage increase to 90%, meaning that most students had achieved the Minimum Completion Criteria (KKM). Observations showed that students were more active, motivated, and confident in solving fraction problems, both through Math Games and PBL discussions based on Powtoon animation..

Based on both quantitative and qualitative data, the findings indicate a significant improvement in students' fraction learning outcomes from Cycle 1 to Cycle 2. Quantitatively, students achieved higher scores and greater mastery of fraction concepts after the implementation of the learning intervention. Qualitatively, classroom observations showed that the use of Math Games increased student engagement by creating a more enjoyable and motivating learning atmosphere. Students were more enthusiastic, actively participated in activities, and showed greater interest in completing learning tasks. In addition, Powtoon videos effectively facilitated students' visual understanding of abstract fraction concepts by presenting material in an animated and concrete form. The Problem-Based Learning (PBL) approach further encouraged students to think critically, engage in discussions, and independently discover mathematical concepts through problem-solving activities. Overall, the integration of interactive media and PBL strategies proved to be an effective approach for improving elementary school students' understanding and learning outcomes in fraction material.

DISCUSSION

Based on the research results, the implementation of Math Games and Powtoon videos integrated with the Problem-Based Learning (PBL) approach on fraction material in Grade V of SDN 37 Lubuklinggau demonstrated a significant improvement in students' learning outcomes from Cycle 1 to Cycle 2. This improvement is clearly reflected in the increase in the average student score, which rose from 70 in Cycle 1 to 83.3 in Cycle 2, as well as in the percentage of learning mastery, which increased substantially from 60% to 90%. These findings indicate that the learning intervention was effective in enhancing students' understanding of fractions and in achieving the expected learning targets. The improvement in learning outcomes suggests that combining interactive digital media with a student-centered learning strategy can create a more meaningful and effective learning experience, particularly for abstract mathematical concepts such as fractions.

The increase in students' achievement shows that the use of Math Games and Powtoon videos based on the PBL model helped students better understand fraction concepts, including addition, subtraction, and comparison of fractions. Through interactive and contextual problem-solving activities, students were able to connect mathematical concepts with real-life situations, making learning more relevant and easier to comprehend. This finding is consistent with the study conducted by Lestari and Haryanto (2022), which reported that Powtoon-based

learning media are effective in improving students' understanding of mathematical concepts by presenting abstract material in a more concrete and visual form. Visual and animated explanations allowed students to process information more effectively, especially those who tend to be visual learners.

The role of Math Games in this study was particularly important in creating a fun and challenging learning environment. Role-playing and game-based activities encouraged students to actively participate in learning while reducing anxiety often associated with mathematics. Learning through play increased students' engagement, strengthened memory retention, and facilitated a deeper understanding of fraction concepts. This result supports Santoso's (2021) research, which found that educational games can significantly improve students' motivation and learning outcomes in mathematics, especially in fraction topics.

In addition, Powtoon videos played a crucial role in supporting students' conceptual understanding. The use of animated visuals and clear narration helped students grasp fraction concepts more easily and reduced boredom during learning activities. Presenting material through animation made lessons more interesting and maintained students' attention throughout the learning process. This finding aligns with Arikunto's (2013) statement that visual media can strengthen students' understanding of abstract concepts by providing concrete representations.

Furthermore, the effectiveness of the PBL approach was evident in students' active involvement in problem-solving, discussion, and idea expression. PBL encouraged students to think critically, collaborate with peers, and communicate their mathematical reasoning. By guiding students to independently discover fraction concepts, learning became more meaningful and student-centered. The successful integration of Math Games, Powtoon videos, and the PBL strategy demonstrates a strong synergy between media and pedagogy, where interactive media enhanced motivation and engagement, while PBL ensured active thinking and discussion. As a result, students not only memorized fraction concepts but also understood and applied them in real-world contexts.

Despite the significant improvement, some limitations were identified. A few students still required additional guidance when dealing with more complex fraction problems. Therefore, it

is recommended that teachers provide reinforcement sessions for students who have not yet achieved mastery, develop more challenging Math Games to enhance critical thinking skills, and increase the use of short animated videos to reinforce key concepts. These efforts are expected to further improve learning outcomes and ensure that all students achieve optimal understanding of fractions.

CONCLUSION

Through the implementation of Math Games and Powtoon Videos based on the Problem-Based Learning (PBL) approach at SDN 37 Lubuklinggau, several important conclusions can be drawn. The application of PBL-supported interactive media significantly improved the fraction learning outcomes of Grade V students. This improvement is clearly shown by the increase in the average student score from 57.7 in the pre-test to 83.3 in the post-test of Cycle 2. In addition, the percentage of learning mastery rose substantially from 35% in Cycle 1 to 90% in Cycle 2, indicating that most students successfully achieved the Minimum Completion Criteria (KKM). These results demonstrate that the learning intervention was effective in enhancing both achievement and mastery.

Moreover, the use of interactive media such as Math Games and Powtoon Videos increased students' motivation, enthusiasm, and engagement during fraction learning activities. Students became more active in classroom discussions, were motivated to complete game-based challenges, and showed greater interest in learning mathematics. The visual and interactive nature of the media also helped students understand abstract fraction concepts more easily. Furthermore, the PBL approach effectively encouraged students to think critically, independently, and creatively when solving fraction problems. Learning became more student-centered, allowing students not only to memorize fraction concepts but also to understand and apply them in real-life contexts. Overall, the strong synergy between interactive media and PBL strategies proved to be an effective approach for improving elementary school students' fraction learning outcomes and overall mathematical competence.

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