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IMPROVING UNDERSTANDING OF THE CONCEPT OF ADDITION AND SUBTRACTION THROUGH THE APPLICATION OF PANJURANG MEDIA IN GRADE II STUDENTS

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Abstract

This research is motivated by the low understanding of mathematics concepts of grade II students in addition and subtraction of integers, as well as the lack of student involvement in the learning process. This research aims to improve the understanding of mathematical concepts through the application of Panjurang (Addition and Subtraction Board) media. The type of research used is Class Action Research (CAR) which is carried out in two cycles, each consisting of the planning, action implementation, observation, and reflection stages. The subjects of the study were 20 students of grade II UPT SPF SD Inpres Ikip Campus. Measurement of concept comprehension refers to the classic Bloom Taxonomy of Comprehension (C2) level, which includes translation, interpretation, and extrapolation abilities because all three aspects are relevant to assessing students' understanding of symbols, meanings, and patterns in computational operations. In Cycle I, the results of observations showed that the learning process from both the teacher and student side and the learning outcomes were still in the category of adequate. After improvements were made in Cycle II, there was a significant improvement in all aspects, namely the learning process from the teacher's side, the learning process from the student side, and learning outcomes, increasing to the good category. This increase is characterized by more active student involvement, more optimal use of Panjurang media, and increased student learning completeness. Thus, it can be concluded that the use of Panjurang media is effective in improving the understanding of mathematics concepts of grade II students in addition and subtraction materials.

Keywords: Media Barriers, Conceptual Understanding, Classroom Action Research, Bloom's Taxonomy, Mathematic In Primary School

INTRODUCTION

Mathematics is a basic subject that has an important role in daily life and the development of science. Good math skills provide a solid foundation for students to understand more complex concepts at the next level of education (Sengkey et al., 2023). One of the basic concepts that must be mastered from an early age is addition and subtraction (Suartini et al., 2022).

A good understanding of these basic operations makes it easier for students to master other math materials, such as multiplication, division, and problem solving (Sofiyah et al., 2025). In addition, a strong understanding of these concepts also contributes to logical thinking and problem-solving skills in everyday life.

Government Regulation Number 57 of 2021 concerning National Education Standards emphasizes the development of students' potential to become individuals of faith, piety, noble character, health, knowledge, creativity, and responsibility. In relation to learning, mathematics plays an important role in equipping students to face life challenges and scientific development (Subandi, 2021). Therefore, understanding basic concepts such as addition and subtraction is a priority in elementary school, as it is the foundation for mastering more complex

mathematics.

Mathematics at the elementary education level is a subject that requires the ability to think critically in understanding every concept taught. In line with the mandate of the Minister of Education and Culture Research and Technology No. 16 of 2022, the learning process is interactive, inspiring, fun, and challenging. Such a learning atmosphere is expected to facilitate students' understanding of the concepts taught in depth.

Concept understanding is the ability of students to master subject matter, not just remembering or recognizing, but also being able to represent it in a simpler form, interpret information, and apply it according to their cognitive structure (Nurhayati et al., 2023). In mathematics learning, understanding concepts is a very important aspect because students are not only required to memorize formulas or calculation procedures, but also need to understand the meaning behind each operation carried out and be able to use it in various contexts of problems (Meidianti et al., 2022).

Good mastery of concepts will make it easier for students to learn mathematics thoroughly. In addition to supporting numeracy skills, understanding concepts is also the foundation for developing reasoning skills, communicating, connecting between materials, and solving problems mathematically. In the case of integer operations such as addition and subtraction, mastery of these basic concepts is essential (Rahayu & Soleha, 2023), as it is a prerequisite for understanding more complex materials such as algebra and geometry at the next level. On the other hand, a weak understanding of basic concepts often leads to errors in solving problems and limitations in using effective problem-solving strategies.

The results of initial observations in class II UPT SPF SD Inpres IKIP Campus, it is known that students are less interested and less enthusiastic in learning mathematics. Students find math difficult because the material is abstract and uses symbols (+, –, =) that are often not conceptually understood. The + sign is supposed to mean combining two groups of objects, – indicates reduction, and = indicates equality, but students tend to just memorize the procedure without understanding its meaning. This condition can be seen from the results of daily tests, where only 5 out of 20 students (25%) reached KKTP 75, while the other 75% did not meet the standards. This low understanding is partly due to the lack of use of concrete and contextual learning media, even though media can help students understand concepts visually, really, and interestingly.

According to Piaget, students aged 7–12 years are in the concrete operational stage, which is the phase of cognitive development where they can more easily understand concepts through real experience than abstract symbols (Ningsih et al., 2022). This shows that mathematics learning in elementary school will be more effective if it is supported by concrete media, which can help students connect direct experiences with the concepts learned (Hadi et al., 2023). The application of concrete media is expected to increase students' understanding of addition and subtraction operations, as well as foster interest and enthusiasm for learning.

The Panjurang Media (Addition and Subtraction Board) is present as a solution to improve students' understanding of addition and subtraction operations. This media is designed to resemble a congklak game, where students enter and take counting beans according to the question card instructions, so as to understand the meaning of the (+), (–), and (=) symbols in real life (Aprilianto, 2023). In this way, students not only memorize the procedure, but also understand the concepts concretely (Nazhifah, 2023). The characteristics of Panjurang that are interactive, concrete, and fun encourage direct student involvement (hands-on activity) and are in accordance with the concrete operational stage according to

Piaget (Putri et al., 2024). Its shape that resembles traditional games increases learning motivation and supports various learning styles of students (Melati et al., 2023).

The effectiveness of the use of concrete media in mathematics learning is also strengthened by research (Bahtiar et al., 2024) regarding the use of concrete object media in mathematics learning, which has been proven to significantly improve student understanding and learning outcomes. The results showed a sharp increase in learning completeness, from 7.4% in the pre-cycle stage to 48.1% in the first cycle, and reached 88.9% in the second cycle. The average student score also increased from 55.19 to 72.78 and then 81.30. Concrete media used in learning help students understand abstract mathematical concepts more realistically, as they can see, touch, and manipulate concrete objects directly in the learning process. This makes learning more interesting, active, and meaningful for students, so that they are able to build a better understanding of the concepts of the material being taught.

Referring to the previous description, the purpose of this study is to investigate the impact of the application of addition and subtraction board learning media (Panjurang) on students' understanding of mathematical concepts, especially related to addition and subtraction materials in grade II UPT SPF SD Presidential Instruction IKIP Campus.

METHOD

This research uses a qualitative approach, which is research that aims to understand the learning process in a natural context without using statistical analysis. Researchers act as key instruments that observe, record, and describe changes in students' behavior and activity patterns during learning (Sugiyono, 2019). The qualitative approach in this study was used to describe in depth how the Panjurang (Addition and Subtraction Board) media is applied and how the media affects the understanding of the concept of addition and subtraction in grade II students.

The type of research used is the Kemmis & McTaggart model Class Action Research (CAR). CAR is carried out in two cycles, and each cycle consists of four stages: (1) planning, (2) implementation of actions, (3) observation, and (4) reflection. The focus of action in each cycle is the application of Panjurang media as a concrete tool to help students understand the meaning of counting operations in real terms, not just procedural. The use of Panjurang media is centered on students' manipulative activities, such as moving the calculation seeds to represent plus and minus operations.

The research population was all grade II students totaling 20 students, consisting of 10 males and 10 females. The researcher acts as a teacher who carries out learning while the classroom teacher acts as an observer.

Data was collected through teacher and student observation sheets, as well as concept comprehension tests in the form of filler questions and story questions at the end of each cycle. Data analysis was carried out quantitatively by calculating the average score of students' concept understanding per cycle, and qualitatively to assess students' participation and interest during learning.

The preparation of questions in this study refers to three subcategories of C2 comprehension in Bloom's Taxonomy, namely translation, interpretation, and extrapolation (Sari et al., 2022).

1. Translation is the ability to transform abstract concepts into other forms of representation, for example changing symbols into meanings. Its operational indicators include translating, changing, illustrating, defining, and reexplaining.
2. Interpretation is the ability to understand the main idea of information, such as interpreting diagrams, tables, graphs, or figures. Its operational indicators include interpreting, distinguishing, explaining, and describing.

3. Extrapolation is the ability to draw conclusions or make predictions based on known information. Its operational indicators include calculating, assuming, inferring, forecasting, distinguishing, determining, and filling.

The data analysis techniques in this study include qualitative and quantitative analysis. Qualitative analysis is used to interpret the learning process through observation sheet instruments for teacher activities and student activities. The observation sheet contains indicators of learning implementation, such as the clarity of the delivery of objectives, the accuracy of the use of Panjurang media, the steps of presenting the material, the provision of examples, the accuracy of guidance, class management, and the involvement of students in participating in activities. Each indicator is assessed using the Good, Sufficient, and Less categories, then the percentage is calculated using the formula:

$$\text{Final Value} = \frac{\text{Acquisition Score}}{\text{Maximum Score}} \times 100\%$$

Meanwhile, quantitative analysis is used to process data on student learning outcomes through concept comprehension tests at the end of each cycle. Quantitative data was analyzed by calculating the average score and the percentage of classical completeness, where completeness was stated to be achieved if at least 80% of students obtained a score of ≥ 75 according to the KKTP.

The success indicators in this study can be seen from two aspects, namely the process aspect and the result aspect. The process is said to be successful if the activities shown by the teacher's activities and the students' activities have mostly met the good assessment scale. This can be seen from the learning results that have been contained and compiled in the activity observation sheet. The success of each action can be determined by comparing the results of the activities of each cycle carried out in the learning activities.

Table 1. Indicators of process success Learning

Indicators of Learning Process Success	Qualification
68%-100%	Good (B)
34%-67%	Sufficient (C)
0%-33%	Less (K)

As for the success criteria in the aspect of learning outcomes, it is seen from the achievement of the test scores of understanding mathematical concepts. Learning is declared successful if classically at least 80% of the total students obtain a score of ≥ 75 according to the KKTP that has been set. This classical completeness is a reference to determine whether the actions given are able to significantly improve students' understanding of concepts.

RESULTS OF RESEARCH AND DISCUSSION

Based on the implementation of classroom action research carried out in two cycles, data was obtained on teacher activities, student activities, completeness of learning outcomes, and indicators of understanding of mathematical concepts. Data was collected through observation and concept comprehension tests, then analyzed to see the development from cycle I to cycle II. In general, the results of the study show that there is an increase in both the implementation of learning and the achievement of students' concept understanding.

Table 2 Teacher and Student Activities

Cycle	Teacher Activities	Student Activities
I	63% (Sufficient)	54-60% (Sufficient)
II	85% (Good)	80-85% (Good)

In the first cycle, teachers' activities are still quite sufficient because the guidance is not even and time management is not effective. Student activity is still low, especially in focus and independence in doing assignments. However, after improvements were made in cycle II, teachers' activities increased to a good category with more equitable guidance, while students were more active, focused, and enthusiastic in learning

Table 3 Concept Comprehension Indicators based on Blooom taxonomy

Indicators	Cycle I	Cycle II
Translation	76,67%	100%
Interpretation	75%	78,33%
Extrapolation	39,17	80%

Translation and interpretation indicators are relatively easy to achieve because they are related to basic skills of counting and understanding operating symbols. On the other hand, the extrapolation indicator is still low even though it has increased quite sharply from cycle I to II. This shows that students still have difficulties when they have to apply concepts to contextual story problems.

Table 4 Concept Comprehension Test Results

Cycle	Number of Students Completed	Percentage	Category
I	8 of 20	40%	Incomplete
II	17 of 20	85%	Conclusion

In the first cycle, only 40% of students achieved completeness, far below the minimum criterion of 80%. After reflection and learning improvement, the number of students who completed increased to 85% in cycle II, so that learning was declared successful.

The results of the study show that the use of Panjurang media is effective in

improving the understanding of the concept of addition and subtraction in grade II elementary school students. This media facilitates students in understanding computational operations concretely through the manipulation of number boards and counting seeds, in accordance with the enactive and iconic stages in Bruner's theory (Arsyad, 2021)

In the first cycle, the involvement of teachers and students is still limited. Teachers tend to give general direction, while students are passive and have difficulty using media. This low engagement is in line with Piaget's theory which emphasizes that students at the concrete operational stage need repetitive hands-on experience to connect mathematical concepts to real-world situations (Putri et al,. 2024).

Improvements in cycle II, in the form of simplification of instruction, gradual exercises, and more intensive teacher guidance, increase student participation and learning effectiveness. Students begin to actively ask, answer, and conclude material, in accordance with Bruner's principles of active learning, which allow for the development of knowledge through meaningful experiences.

In terms of learning outcomes, improvements were seen in the indicators of translation, interpretation, and extrapolation, which showed the ability of students not only to recognize mathematical symbols, but also to relate them to contextual problems. This is according to the C2 subcategory of comprehension in Bloom's Taxonomy, which states that conceptual comprehension includes all three abilities. These findings are in line with the research of Bahtiar et al. (2024), which shows that concrete media significantly improves students' understanding and learning outcomes from pre-cycle to cycle II.

Overall, Panjurang media has been shown to support more effective mathematics learning, in accordance with students' cognitive development. However, some students still need assistance to complete the completion steps, so the role of teachers remains crucial. This media can be used as a practical alternative in learning counting operations in grade II elementary school.

CONCLUSION

Based on the results of the two-cycle grade action research, the use of the Addition and Subtraction Board (Panjurang) media has been proven to improve the understanding of mathematics concepts of grade II students in addition and subtraction materials. Teacher activity increased from the sufficient category in Cycle I to good in Cycle II, characterized by more effective learning management. Student activities also increased significantly, from 54.17% in Cycle I to 95% in Cycle II, showing that students are more focused, active, and responsible. The results of the concept comprehension test reached an average of 85, with 85% of students complete. All indicators of concept understanding (translation, interpretation, extrapolation) are well achieved. Thus, Panjurang media is effective in helping students understand concepts concretely, funly, and in accordance with Bruner and Piaget's learning theories.

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