

Application of Games in Problem Based Learning in Mathematics Learning to Increase HOTS of Class II-A Students of SD Negeri Ngebel

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1. Abstract

The background of this research is the low critical thinking skills or HOTS, students' activeness is not facilitated, classes are not conducive in class IIa SDN Ngebel especially in learning mathematics. The purpose of this study is to make improvements in learning and as an effort to improve critical thinking skills in class IIa students at SDN Ngebel by learning with game wrappers in the problem-based learning model. This research is a classroom action research (CAR) using the Kemmis and MC Taggart models, with planning steps, action implementation and observation, and reflection. Data collection techniques using test techniques. The test instrument is in the form of description questions to measure the level of HOTS critical thinking skills. Based on the results of research in cycle I and cycle II, there was an increase in the average pretest and posttest and in the posttest comparison of cycle I and cycle II there was also a significant increase. The increase in the mean pretest to posttest in cycle I was 49.96 to 74.12. The increase in the mean pretest to posttest in cycle II was 62 to 84.04. The average posttest increase in the two cycles was 74.12 to 84.04.

Keywords: *game, pbl, mathematics.*

2. Introduction

High order thinking skill is an ability that needs to be developed for students. Students in the 21 education era are required to master several abilities, one of which is the HOTS ability. HOTS is considered as a high-level or critical problem-solving ability (Saraswati & Agustika, 2020). As a student, of course this demand becomes a frightening

specter, especially since this demand is aligned and intersects with subjects that are disliked. Therefore, it is important to make preparations for the younger generation with mature provisions such as critical thinking skills (Sani, 2019). Critical thinking skills are needed to develop creativity and also develop problem solving skills (Faridah, 2019). Through the application of HOTS to learning media it helps improve cognitive skills through educational games (Anggraini et al., 2021).

Educational games are not only in the form of learning media, but the implementation of games can also be integrated with the PBL model. The game was chosen as an application in the PBL model because children at the age of 8 know learning cognitively at the concrete stage in interpreting the lessons learned. Based on cognitive learning theory according to Piaget's theory, children aged 7-11 years are at the concrete operational stage. At the concrete operational stage students must see and experience what they are learning for themselves, this is because students are not yet able to think abstractly (Piaget, 2002). The application of games to critical thinking in children has its own role. The game as an intermediary in the process of delivering material through real direct activities in accordance with the concept of cognitive learning theory.

The role of games in the teaching and learning process through the PBL learning model has a positive impact on the development of HOTS abilities in mathematics. This is because the benefits of using the PBL learning model can improve students' critical thinking skills. The PBL learning model provides a basic explanation to conclude (Herzon et al., 2018). Learning success is assessed by the extent to which students learn meaningfully (Aini et al., 2016). Therefore, the learning model needs to be inserted with games (Hurloc, 1997).

The use of games in second grade learning is appropriate for attracting students' attention to mathematics. This is due to the lack of enthusiasm of students in learning. Based on the results of observations made in class IIa SDN Ngebel, it was seen that 15 out of 25 students could not focus on learning. seen in the observation, 15% of students like to walk to and fro, 10% play with their friends, 5% annoy friends, and are nosy. Based on interviews with class teachers, class IIa students are known to be active, happy with activities but are not facilitated in learning, the teacher stated that students felt they had enough to play during recess. The causes of these problems were identified based on teacher and student interviews due to the teacher's lack of habituation towards the use of game-based learning models, especially in mathematics. Whereas the mastery of mathematical abilities in life needs to be developed. The abilities acquired on the basis of the development of mathematics are needed to be able to face life, so that these abilities are very important for elementary school students to have (Sanderayanti, 2015; Ulya, 2016).

Stages or syntax in the problem based learning model are (1) student orientation towards problems; (2) organizing students to study; (3) guiding students individually/groups; (4) developing and presenting works; and (5) analyze and evaluate the problem solving process (Rahayu et al., 2019; Wijayanti et al., 2022). The research aims to improve students' HOTS thinking skills in mathematics through games in the problem-based learning model at SDN Ngebel class II-A in the 2022/2023 academic year.

3. Methods

3.1. Participants and context

This research is a classroom action research developed by Stephen Kemis and Robim Mc. Teggrat. Finding the best strategy so that there is an increase in the abilities or skills of students is the goal of this classroom action research (Kemmis & Mc. Teggart, 1988). The classroom action research conducted consisted of two cycles consisting of stages that had to be passed, namely planning, implementing, observing, and reflecting. The research location is located at Ngebel Tamantirto Elementary School, Kasihan District, Bantul Regency, Yogyakarta Province. The subjects in this study consisted of 25 students including 14 male students and 11 female students in class II-A for the 2022/2023 academic year.

3.2. Material

Based on the research objective, which is to improve students' HOTS abilities in mathematics which focuses on the three indicators of hots, it is measured using a test. The instrument used in this research is a description test that must be answered by students (Sriyati et al., 2019). The description test is given after and before the completion of learning in each cycle as a learning result of 3 questions. The instrument questions in this study are listed in the table. 1 below..

Tabel 1. Instrumen Soal Pretest dan Posttest

KKO (Taksonomi Anderson)	Indikator	Pertanyaan
C4	Analyze	<ol style="list-style-type: none"> 1. Beni has ten marbles. half of the marbles will be given to Susi. How many marbles will be given to Susie? 2. Radit was fishing, he caught 3 fish. one third of the fish will be given to Roro. how many fish does roro receive?
C5	Evaluate	<ol style="list-style-type: none"> 1. If the apples that you give are still 6, will both of your children get each divided equally into two equally? 2. If it matches the clock on the side, is it true that it is currently 13.00 WIB?
C6	Create	<ol style="list-style-type: none"> 1. if described how the shape of $\frac{1}{3}$? 2. The shape of the clock showing nine o'clock in the box provided below !

3.3. Data Collection and analysis

The research data is in the form of the results of students' scores on HOTS abilities in the implementation of learning in applying the problem-based learning model with the help of games. Data validation uses expert validation methods, namely class teachers and tutor teachers. Data analysis used a quantitative descriptive technique which consisted of the mean difference between the pretest and posttest whether there was an increase or not.

The research data contains description questions obtained from the results of student answers. Each student gave answers twice, namely before carrying out learning

and after learning. The results will be analyzed and a percentage of conclusions will be drawn as follows.

$$X = \frac{\text{correct answer} \times 5}{15} \times 100\% \quad (1)$$

3.4. Ethical Considerations

The ethical consideration in this study is not clearly stating the research subjects studied. This is one of the ethical codes in writing scientific papers. The researcher only describes the results in the form of an average percentage without mentioning the real results of student work.

3.5. Limitations to the Study

The limitation of this study is that there is no class observation related to the measurement of students' critical thinking abilities. There is also no study on HOTS conducted by teachers in learning, studies are still on cognitive abilities. While the ability to cooperate can also be seen from the point of view of the development of students' cognitive abilities. Thus, there will be completeness of supporting data to measure and describe the ability of collaboration between students.

4. Results and Discussion

The results of this study are in the form of students' HOTS abilities related to three indicators which are the focus of the research including (1) analyzing; (2) evaluating; (3) creating. The HOTS ability in this study was reviewed during the mathematics learning process which took place using the problem based learning model in class II-A.

4.1. Siklus 1

The results of the research in cycle 1 were in the form of the achievement of the

three indicators on fractional material by students which were obtained from the results of the scores done by students before learning and after learning related to the assessment of initial abilities. The results of the comparison of scores after using the problem based learning model with the application of students' ability games in cycle 1 are presented in Figure 1.

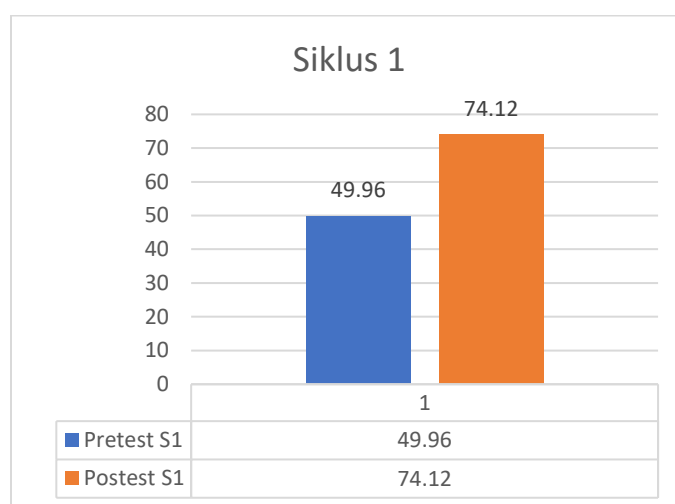


Figure 1. Average HOTS Ability Cycle 1

Figure 1 shows that the results of the achievement analysis on pretest and posttest scores on students' HOTS abilities with the results of the pretest average of 49.96 and posttest average of 74.12.

4.2. Siklus 2

After obtaining the results of the acquisition of scores based on a comparison of the average pretest and posttest scores in cycle 1, the next cycle was carried out, namely cycle 2. The actions of cycle 2 were carried out because students' HOTS abilities still needed to be improved and developed further. The results of the actions in cycle 2 on the hourly time

unit material in mathematics. The results of the analysis of students' HOTS abilities in cycle 2 are presented in Figure 2.

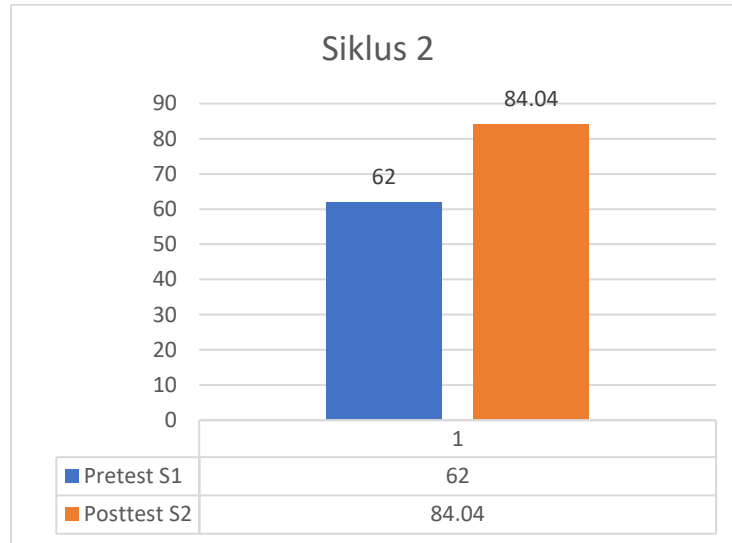


Figure 2 Average HOTS Ability Cycle 2

Figure 2 shows that the results of the achievement analysis on pretest and posttest scores on students' HOTS abilities with the results of the pretest mean results of 62 and posttest mean of 84.04.

4.3. Perbandingan semua siklus

Comparison of the results of the posttest average analysis of students' HOTS abilities from the pre-cycle stage, cycle 1 and cycle 2 experienced different increases. The improvement achieved from the three stages is summarized and presented in Figure 3.

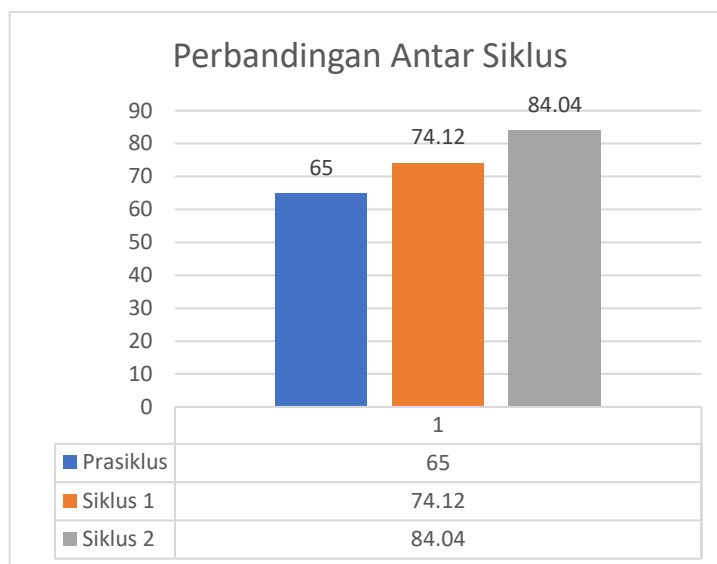


Figure 3 Post-test Cycle Comparison

Each stage of this research experienced various and significant improvements leading to better results. This can be influenced by various things and factors. The use of problem based learning learning models seems to be able to influence the increase in students' HOTS skill, such as critical thinking in mathematics (Sujatmika et al., 2019).

Based on the results of the comparison of the averages of the two cycles, it appears that there is an increase between cycle one and cycle two. The increase in the number of cycles means that conceptually students prefer to use problem-based learning models with playful applications. In accordance with cognitive learning theory, children's ability to solve problems in games that have been played can improve their cognitive abilities (Lestari, 2019). The use of problem-based learning models provides problems in the form of puzzles that children must solve through games that make children learn more challenged. In accordance with learning theory, Gange said that a student is faced with a problem, in the end they are not just problem solvers, but children also learn something new (Utami, 2017).

Games for children as a learning stimulus that runs flexibly and aims to make it easier for children to understand concepts by solving problems.

The role of games in learning is in line with Sulistiyawati's research (2021) where there is an increase in learning outcomes after using the kahoot game application in learning mathematics. It can be realized that games both as media and approaches or applicators have a role to improve learning abilities. In line with the results of using games as a basis for solving problems in the problem-based learning model, games in learning can be said to be fun learning because students always ask to play accompanied by learning. Fun learning can affect student learning outcomes (Sulistiyawati et al., 2021). Children as individuals who experience a process of development cannot be separated from personal and social problems. Playing activities can be applied in children's learning (Halifah, 2020).

Incorporating game elements into the learning process, especially problem-based learning, improves students' ability to process results and their learning processes more critically. Research that incorporates elements of games into learning is I Wayan Sutama's research (2020). Increasing critical thinking skills occurs when students do learning using playing techniques (Sutama et al., 2020).

Problem based learning proves that problem solving can improve critical thinking skills or HOTS abilities. The average increase in student scores was followed by students' critical thinking skills. This is in accordance with research conducted by Dina Ayuningsih (2019) the application of the problem-based learning model is considered suitable to be used to improve students' critical thinking skills, this is evidenced by the occurrence of an average critical thinking ability in students and a significant decrease in the percentage of students' remedial (Ayuningsih et al., 2019). Improving effectively the ability to think

critically or HOTS in the process of learning mathematics using problem-based learning models (Azizah et al., 2019; Noer & Gunawibowo, 2018; Yanti & Prahmana, 2017).

The problem-based learning learning model is packaged in a game carried out by giving problems to games that are carried out in groups. The application of the problem-based learning model gives students the power to train their cognitive level so that they can solve problems critically. With the habit of honing these thoughts students can improve critical thinking skills.

5. Conclusion

Based on the results of this study it can be concluded that the application of games in the problem-based learning model can improve the ability of collaboration between students in class IIa mathematics at SD Negeri Ngebek in the 2022/2023 academic year. This can be seen from the increase in the average between the pretest and posttest in cycle 1 and cycle 2 as well as in the results of the posttest cycles 1 and 2. The use of the PBL model allows students to carry out problem analysis in groups and critically wrapped in games. Interaction through fun games has a significant impact on students' critical thinking skills or HOTS.

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