Application of Problem Based Learning Model in Mathematics Learning to Improve Higher Level Thinking Skills of Class V Students of SDN Rejowinangun 1

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1. Abstract

High-level thinking skills are essential to be developed since elementary school and should be the focus in any learning activity, especially in learning mathematics. One of the teaching models that can help students develop higher order thinking skills is Problem Based Learning (PBL) which emphasizes problem solving as the center of teaching and learning activities. This study aims to explain the improvement of higher order thinking skills through the application of Problem Based Learning model in mathematics learning. The research conducted was a Classroom Action Research (PTK) which lasted for two cycles. The research includes planning activities of action implementation and observation, and reflection. Data collected in the form of learning development data, syntax implementation, and higher order thinking skills test results. The results of this study consisted of two cycles: (1) cycle I of the application of the Problem Based Learning model on higher order thinking skills with an average of 65.2%; (2) cycle II follow-up of weaknesses and shortcomings in the first cycle, at this stage the results of higher order thinking skills increased by 78.2%. Based on this review, it can be concluded that the application of the Problem Based Learning model in learning mathematics can improve students' higher order thinking skills.
Keywords: Higher Order Thinking, Problem Based Learning, Elementary School Mathematic

2.   Introduction

Education is an effort to help the souls of students both physically and mentally, from their nature towards humane and better civilization according to Sujana (2019: 29). The rapid development of science and technology in the 21st century requires students to become individuals who have critical and creative thinking in responding to all existing challenges (Mayasari et al., 2016). The output of learners that is demanded by the development of the 21st century is higher order thinking skills (HOTS) according to Larson & Miller (2011). HOTS (High Order Thinking Skills) is a high-level thinking ability that includes the ability to analyze, evaluate, and create. High-level thinking skills as problem solving are needed in the learning process, because learning designed with a high-level skills-oriented learning approach cannot be separated from a combination of thinking skills and creativity skills for problem solving (Ariyana, et al., 2018: 13).

Mathematics is a subject that is mandatory at every level of education starting at the elementary school level. Learning mathematics requires students to have several skills in problem solving, one of which is higher-level and creative thinking skills (Rochmad, Agoestanto, & Kharis, 2017). According to Mailani, dkk. (2022: 6814) the goal of geometry teaching is to develop problem-solving skills, to argue logically and seriously, to think and give the ability to develop creativity on a problem.

Mathematics lessons are closely related to higher-order thinking skills because mathematics involves problem solving and analysis that requires critical and creative thinking skills. However, in reality, the current learning process of mathematics learning has not fully trained students in honing high-level thinking skills. This is due to the lack of innovation in using learning methods, models, and strategies.

This can be seen from the results of observations that have been made at SDN Rejowinangun 1 in mathematics learning which was carried out on Monday, April 17, 2023 at SDN Rejowinangun 1 in the 2022/2023 school year in class V. The mathematics learning that is carried out has not led students to hone higher order thinking skills, the learning model applied is assignments, lectures, and practice problems, students are more

dominant in recording the material presented by the teacher and then trying practice problems, so that students' ability to analyze, evaluate, and create something new has not been carried out optimally.

The learning model that can train students' higher order thinking skills according to Arends (2008) is the PBL (Problem Based Learning) model. Researchers apply the Problem Based Learning (PBL) model, as an appropriate alternative to improve problem solving skills. With the application of PBL model learning, students will be actively involved in the problem solving process and analyze and evaluate their own thinking process. According to Sudjana (2014: 134) Problem Based Learning is learning that presents a variety of problematic situations that are authentic and useful for students, so that these problems can be used as a way to conduct investigations and research.

According to Sriyanto (2019: 18), the steps of the Problem Besed Learning model include: (1) orienting students towards problems (2) organizing students to learn (3) guiding individual and group research (4) developing and presenting work outcomes (5) analyzing and evaluating problem-solving processes.

Thus, the PBL model is thought to be able to improve the ability to think high-level mathematics in students because the source of learning in this model is a problem to be solved by analyzing, evaluating, and creating something. Based on Titin's research (2011), it is stated that the learning process using Problem Based Learning (PBL) on respiration system material shows that students' thinking skills and scientific attitudes increase. Another study conducted by Sujana (2017) on the use of PBL to improve critical thinking skills and learning outcomes. In addition to some of the above research conducted by Listiani (2017) through the application of PBL proved to be able to improve the learning outcomes of class students.

What distinguishes this research from previous research is that this research not only improves learning outcomes but also improves higher order thinking skills in fifth grade students. In addition, the previous research emphasized more on science subjects while in everyday life it is necessary to have the ability to solve problems that can be applied in

learning mathematics in elementary schools.

Based on the above background, researchers are interested in conducting collaborative classroom action research (PTKK) with the title "Application of Problem Based Learning Model in Mathematics Learning to Improve Higher Level Thinking Skills of Grade V Students of SDN Rejowinangun 1".

3. Methods

3.1 Participants and context

The study was conducted in SDN Rejowinbau 1. Location SDN Rejowinangun 1 is located in Jalan Ki Penjawi Number 62, Rejovinangun, Kotagede, Yogyakarta. The study was conducted in the full semester of the academic year 2022/2023 from April 2023 to June 2023. The subject of this research is the student of the V semester II class at SDN Rejowinangun 1 which totaled 26 students consisting of 15 male students and 11 female students.

3.2 Material

This research includes the type of class action research (PTK) using the Kemmis and Taggart research design that is carried out with 2 cycles. The stages of the model spiral, namely planning (planning), implementation of actions and observations (behavior & observation), and reflection (reflecting). The instruments used in this study are the description and non-testing tests. The test in this study is designed according to the high-level thinking ability indicators of learners that include aspects of analyzing (C4), evaluating (C5), and creating (C6). While the non-testing instrument is an angket as an observation sheet of activities on learning steps. (PBL).

3.3 Data Collection and analysis

Data analysis is carried out after the researchers obtain all the necessary data, including the results of high-level thinking skills tests and PBL syntax implementation observations. Data analysis techniques used in the research refer to the interactive analysis model of Miles and Huberman (Sugiyono, 2014). Data analysis techniques consist of three components, namely data reduction, data presentation, and conclusion drawing. Data reduction is the process of selecting research data by collecting important data and removing data that is not needed in research. The presentation of data is done by changing the data that has been reduced into the form of matrices, images, tables, or graphs. Increased number of participants at the highest level.

3.4 Ethical Considerations

Using a problem-based learning model, research access indicators are reviewed from students' high-level thinking skills test results at the end of the learning cycle. The students' high-level thinking skills test results in the pre-cycle phase were analyzed using modified Bloom Taxonomy. Further, the test results are calculated in the form of a percentage on each high-level thinking skill component to produce a based score line. The goal of the research achievement was to improve high-level thinking skills of learners by 75% of the

total percentage of each component, based on the adapted high- level thinking skills category of Heong et al. (2011).

3.5 Limitations to the Study

The hypothesis of this study is that the use of a problem-based learning model can improve high-level thinking abilities on mathematical learning students in Class V in the State SD Rejowinbuild 1 in the academic year 2022/2023.

4. Results and Discussion

The results of the research that has been done show that the ability to think at a high level in this study has increased because the learning is done using the PBL model. The condition before the action was taken showed that the ability to think at a high level was still low, this was obtained from the results of observations, among others: 1) the concentration of students was still low; 2) some students did not actively answer the teacher's questions; 3) when group discussions not all students collaborated to complete the task, 4) the results of the high-level thinking skills test in the form of analyzing (C4) were 42%, evaluating (C5) were 35%, and creating (C6) were 46%. The average percentage of achievement of higher-order thinking skills based on test results in the pre-cycle was 41%. The results of the C4-C5 concept mastery test show that the students' higher-level thinking skills are still in the poor category.

Cycle I planning activities were carried out by preparing learning instruments in the form of lesson plans and preparing research instruments in the form of higher order thinking ability tests. Implementation of cycle I through the PBL model syntax which consists of 5 stages. (1) orientation, where students are given questions to enter the problem to be solved, (2) organization, students observe videos, use concrete media, and form groups. (3) investigation, working on the problems given and finding solutions to the problems given in the LKPD, (4) developing and presenting work, students plan and prepare

work in the form of diagrams creatively, (5) analyzing and evaluating, students reflect and investigate.

Students' higher order thinking skills are measured through the results of the higher order thinking skills test. The results of the observation of the learning process in the form of data on high-level questions asked by students during learning. The higher-order thinking skills test included 10 description questions. The percentage score of each aspect of higher order thinking skills in cycle I is presented in Table 1 below.

Table 1. Percentage Score of Each Aspect of Higher Level Thinking Skills in Cycle I

Aspect	Achievement (%)	Category
Analyzing	61.5%	Good
Evaluate	65%	Good
Create	69%	Good
Average	65.2%	Good

Table 1 shows the score of each aspect of higher order thinking skills of grade V students of SDN Rejowinangun 1 in cycle I. The average score of analyzing aspects of students is 61.5% in the good category. The average score of the aspect of evaluating students is 65% with a good category. The average score of the aspect of creating students is 69% with a good category. The average score of higher order thinking skills of grade 5 students is 65.2% with a good category.

The evaluation results show that the high-level thinking skills of students in cycle I have increased compared to the pre-cycle even though it has not reached the research target of 75%. The following are problems and solutions for planning cycle II as a form of reflection of cycle I learning activities. First, students have not been actively involved in question and answer activities, the solution is that the teacher provides motivation and makes quiz games more interactive. Second, students have difficulty in analyzing problems, the solution is that teachers guide and train students in formulating problems. Third, learning evaluation activities lack time so that the results of the work are not

maximized, the solution is that the teacher makes the right time allocation and always reminds the remaining time to complete the task.

Improvements made in cycle II have increased, which previously some students were not active in answering activities to be more enthusiastic and active in answering questions related to high-level category questions. The impact of improving the quality of the process in learning activities has led to good progress in the acquisition of data on the ability to think at a high level in cycle II can be seen in table 2 below.

Table 2. Percentage Score of Each Aspect of Higher Level Thinking Skills in Cycle II

Aspect	Achievement (%)	Category
Analyzing	73%	Good
Evaluate	76.9%	Good
Create	84.6%	Good
Average	78.2%	Good

Table 2 shows the score of each aspect of higher order thinking skills of grade V students of SDN Rejowinangun 1 in cycle II. The average score of analyzing aspects of students is 73% in the good category. The average score of the evaluation aspect of students is 76.9% with a good category. The average score of the aspect of creating students is 84.6% with a good category. The average score of higher-order thinking skills of grade 5 students was 78.2% in the good category. The class higher order thinking skills score is built by the accumulation of the higher order thinking skills scores of 26 learners as presented in Figure 1.
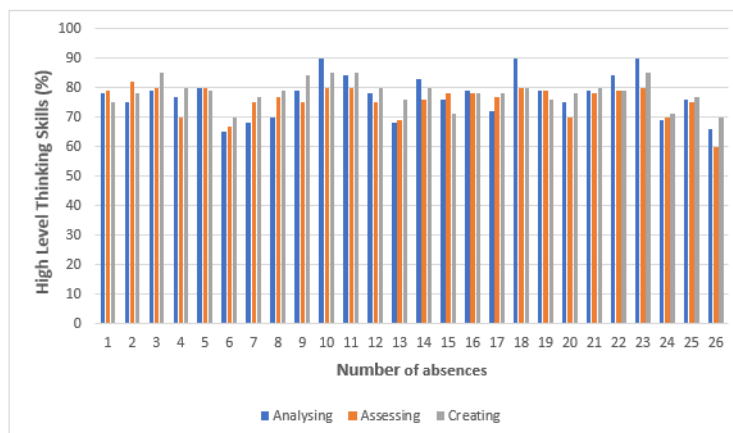
Figure 1. Percentage of Achievement of Analyzing, Evaluating, and Creating
of Learners in Cycle II

Figure 1 shows that the highest analyzing score in cycle II of 90% was obtained by students with attendance numbers 10, 18, and 23 while the lowest score of 65% was obtained by students with attendance number 6. The highest evaluating score of 80% was obtained by students with attendance numbers 3, 5, 11, 18, and 23 while students with attendance number 26 obtained the lowest score of 60%. The highest creation score of 85% was obtained by absentee learners 3, 10, 11, and 23, while absentee learners 6, 13, and 26 obtained the lowest score of 70%.

Comparison of the percentage achievement of students' higher-level thinking skills in Pre-Cycle, Cycle I, and Cycle II. Shows that the application of the problem-based learning model on data presentation material in the form of diagrams is able to improve the higher-level thinking skills of students from 41% in the Pre-Cycle to 65.2% in Cycle I and 78.2% in Cycle II. Based on the results of the analysis, it is known that the thinking process of students has met the target, which is to increase to a percentage of 75% in all aspects of higher order thinking skills according to Bloom's Taxonomy Revision.

In line with research on students' higher-level thinking skills conducted by Chasanah (2017) on biotechnology material in Class XII SMA, students' thinking skills are still relatively poor in the pre-cycle which uses a combination of Inquiry methods only, but in the first and second cycles using the Problem Based Learning (PBL) model shows that students' higher-level thinking skills increase.

5. Conclusion

Based on the results of research and discussions on the application of problem-based learning models in mathematics learning to improve high-level thinking skills of students of grade V SDN Rejowinangun 1 can be drawn the conclusion that the implementation of Problem Based Learning (PBL) learning models on students of class V S DN Rejowini 1 can improve high level thinking skills. Seeing from the average outcomes of high-level thinking skills students on the Pre-Cycle 41% category less to 65.2% on Cycle I with a good category, and Cycle II reached 78.2% of the good category. Based on the results of the research, it is obtained that problem-based learning can be used as an alternative in the learning process where its implementation requires solutions to the problem presented. This model can also help improve the learners' ability to think at a high level, so they can complete the test or problem well.

6. Acknowledgement

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