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DEVELOPMENT OF PROBLEM BASED LEARNING MODEL TO IMPROVE STUDENT'S CRITICAL THINKING SKILLS IN FLAT BUILDING MATERIALS IN CLASS IV DUMINANGA STATE SCHOOL

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Abstract:
This study aims to see the improvement of students' critical thinking skills in the fourth grade flat building material at Duminanga State Elementary School through the Problem-Based Learning development model. This learning model development research refers to the stages of the Borg and Gall development model which was modified from 7 steps into four stages, namely (1) problem identification and needs analysis, (2) planning, (3) expert trial and revision, (4) trial field and revision. The instruments in this study consisted of; (1) model and device validation sheets, (2) teacher and student activity implementation sheets and student response questionnaire sheets; (3) Learning Outcomes Test Sheets for learning using a problem based learning model. Based on the results, the learning model and supporting devices are suitable for use with very valid categories. The results of the trial show the level of practicality of the assessment of teacher activities in the limited trial with an average value of 94.3% and the wide-scale test reaching 97.65%. The results of the assessment of students in the limited trial with an average value of 92.3%. The results of the assessment of students on a large-scale trial with an average value of 98% and based on student response questionnaires on a limited scale with an average of 85.7% and on a wide-scale trial with an average of 87.9%. This shows that the problem based learning model has met the practical criteria and received a positive response. The effectiveness of the classical learning model on a limited scale was achieved at 83.3% and then normalized to N-Gain with a value of 0.42 in the medium category. In the wide-scale test, 85% was achieved and then the N-Gain was normalized with a value of 0.5 in the medium category. This shows that the test of learning outcomes obtained through teacher and student activities using Problem Based Learning in achieving learning objectives has been achieved and student skills have increased.

Keywords: Learning Model, Problem Based Learning, critical thinking and Borg and Gall Model

INTRODUCTION

The educational process is a long process of activities that must be based on the development and needs of students. Therefore, every process that is passed must be designed in accordance with the development and needs of students, so that what is expected as a function of education is to develop abilities and shape the character and civilization of a dignified nation in order to educate the life of the nation and state can be achieved.

One of the efforts to develop creativity in learning mathematics is by integrating a model of developing creativity in the teaching and learning process of mathematics. The learning model has a function as an instrument that helps or facilitates students in obtaining a number of learning experiences. The development of learning models in the context of improving the quality of student learning outcomes needs to be pursued continuously and comprehensively. Thus the learning model carried out in the classroom must be arranged based on the needs and characteristics of students who are learning and the characteristics of the material to be taught. (Alan and Afriansyah 2017)

The teacher's lack of creativity in using a more student-oriented learning model that emphasizes higher-order thinking skills or critical thinking skills. Regarding critical thinking skills, Walker (2005:19) states that critical thinking skills are a process that allows students to acquire new knowledge through problem solving and collaboration processes. Critical thinking skills focus on the learning process rather than just acquiring knowledge. Critical thinking skills involve activities, such as analyzing, synthesizing, making judgments, creating, and applying new knowledge to real-world situations (Redhana 2013).

Problem Based Learning (PBL) learning model is a learning approach that makes confrontations with students with practical problems or learning that starts with giving problems and has a context to the real world. This learning model can train students in solving a problem with the knowledge they have.

The Problem Based Learning (PBL) learning model is very suitable to be applied to all subjects, including Mathematics. If we look at the characteristics of Mathematics and Problem Based Learning (PBL), both have a common thread with each other. Viewed from the aspect of Mathematics, Mathematics is a science that develops dynamically. Which means, with rapid developments and wide contributions in various aspects of human life, it has caused a shift in view from Mathematics as a static science to Mathematics as a generative dynamic science. If we relate it to the Problem Based Learning (PBL) learning model, this change in view has implications for changing the pedagogical aspect of learning which emphasizes more on Mathematics as problem solving and developing mathematical thinking skills in students. Thus, students can be more active, creative, and innovative in the learning process. Based on this, the application of Problem Based Learning (PBL) in learning is very helpful in improving the quality of learning and the quality of students. (Yuliani, Destiniar, and Jayanti 2020).

METHOD

This research was conducted at Public Alementary School Duminanga which is located at Jl. Trans Sulawesi Lintas Selatan, Duminanga Village, Helumo District, South Bolaang Mongondow Regency, North Sulawesi Province. This research was conducted in the even semester of the 2021/2022 academic year.

The instruments used in this study were: format validation instrument to determine the validity of the instrument to be used in the study, validity assessment instrument consisting of a validation sheet for Problem Based Learning learning model books, lesson plans, LKPD and THB. Student response questionnaires and Teacher and student activity sheets on the implementation of learning to assess the practicality of the product. For the effectiveness assessment instrument using the Learning Outcome Test instrument.

This development research used descriptive qualitative analysis. Furthermore, the data from the validation results were analyzed. Referring to the data analysis technique using descriptive analysis and then qualitative. The descriptive analysis used is the percentage. Descriptive and qualitative analysis is used to interpret all inputs from validators on the development of learning tools and research instruments.

The data from the validation results are calculated and analyzed based on the following formula:

$$Validation\ percentage = \frac{total\ validation\ score}{max\ score} \times 100\%$$

Analysis of practicality quality was obtained from teacher assessment data on products, data on student responses to the learning process and utilization of LKPD and data on the implementation of Problem Based Learning learning models.

Table 1. Conversion of Learning Implementation Percentage

No.	Persentase (%)	Category
1	> 80	Very good
2	> 60 – 80	Well
3	> 40 – 60	Enough
4	> 20 – 40	Not enough
5	≤ 20	Very less

(Hidayati, Nofiah, and Setiawati 2021)

The effectiveness of this learning is measured from learning outcomes tests by conducting pretest and posttest, to determine the improvement of students' critical thinking skills then the effectiveness of learning outcomes is determined using the normalized gain (N-gain) equation according to Hake (1998).

$$N - Gain = \frac{Skor\ Postes - skor\ Pretes}{Skor\ Maks - Skor\ pretes}$$

Table 2. Criteria for learning effectiveness

No	Score	criteria
1	<g> ≥ 0,7	Tall
2	0,3 <g> < 0,7	Currently
3	<g> < 0,3	Low

(Mahyuddin, Wati, and Mangkurat 2017)

FINDINGS

Based on the data results from the implementation of the trial activities carried out in developing the learning model of problem based learning are as follows:

1. Analysis of the Validation Results of the Prolem Based Learning Model to Improve Critical Thinking Skills for Fourth Grade Students of Public Alementary School Duminanga

Table 3. Results of the Validation of Problem Based Learning Model Books

No.	Validator	Score	Criteria
1.	Validator 1	93,48 %	Very Valid
2.	Validator 2	96,74 %	Very Valid
Average		95,11%	Very Valid

Based on the validation assessment category, the Problem Based Learning Learning Model Book that was made included in the score range of 86% - 100% with Very Valid criteria.

Table 4. Results of RPP Validation by Expert Validators

No.	Validator	Score	Criteria
1	Validator 1	95,73 %	Very Valid
2.	Validator 2	88,03 %	Very Valid
Average		91,88%	Very Valid

Based on the category of validation assessment, the Lesson Plan made is in the score range of 86% - 100% with Very Valid criteria.

Table 5. Results of LKPD Validation by Expert Validators

No.	Validator	Score	Criteria
1	Validator 1	100 %	Very Valid
2.	Validator 2	100 %	Very Valid
Average		100 %	Very Valid

Based on the validation assessment category, the Student Activity Sheet that was made was in the score range of 86% - 100% with the Very Valid criteria, the category was eligible to be used.

Table 6. Results of THB Validation by Expert Validators

No.	Validator	Score	Criteria
1	Validator 1	97,44 %	Very Valid
2.	Validator 2	94,87 %	Very Valid
Average		96,16 %	Very Valid

Based on the validation assessment category, the Learning Outcomes Test that is made is in the score range of 86% - 100% with the Very Valid criteria, the category is feasible to use.

2. Results of Data Analysis Practicality of Prolem Based Learning Models to Improve Critical Thinking Skills for Fourth Grade Students of Public Alementary School Duminanga

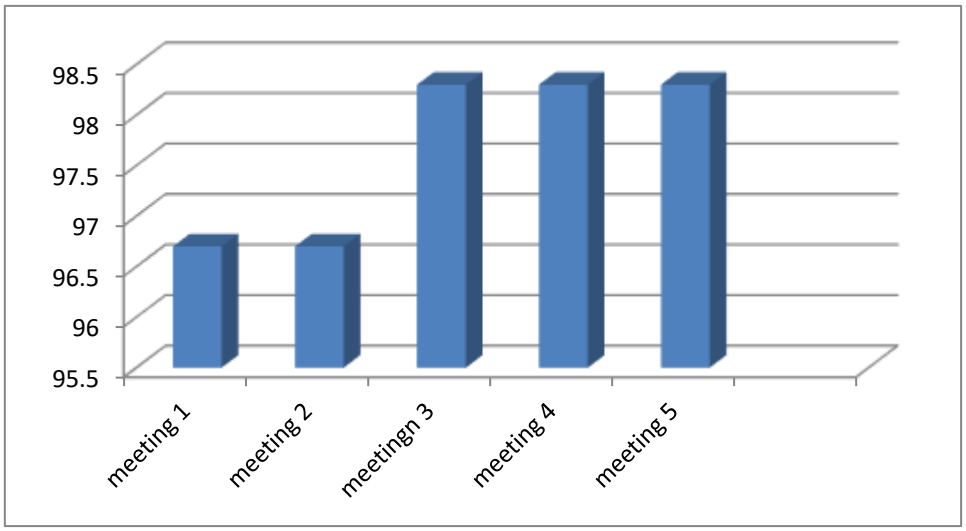

Figure 1. Implementation of Learning (Teacher Activities) by Observers in Limited Scale Trials.

Based on the results of the observer's assessment of the implementation of learning (teacher activities) using learning model products and supporting devices in a limited-scale trial, they were in the very good category. This shows that the learning process by the teacher is going very well by following the appropriate steps even though there are some things that have not been implemented perfectly.

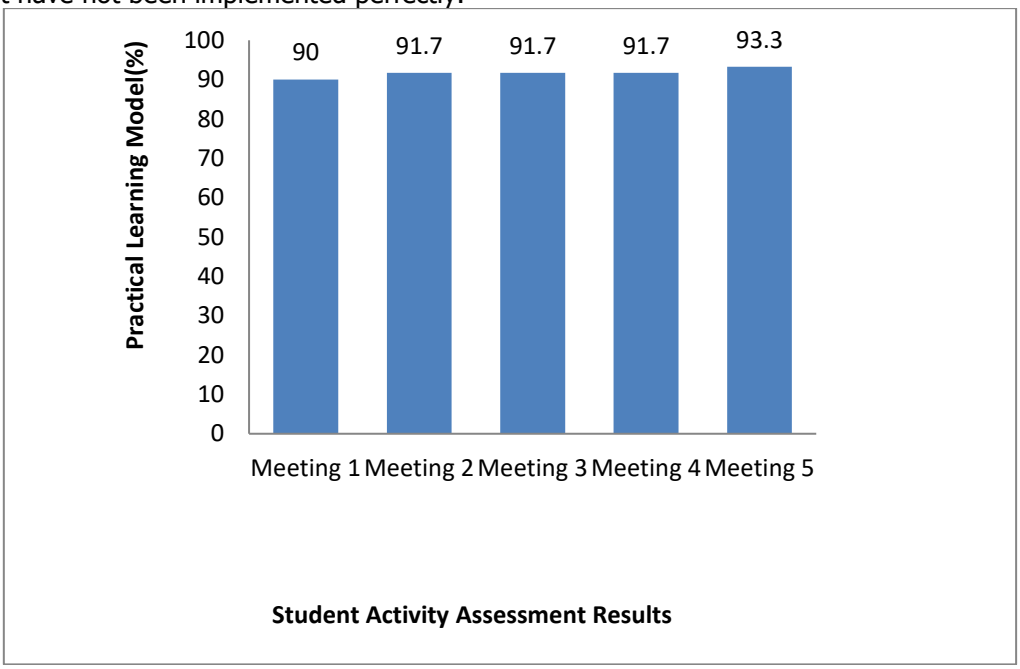

Figure 2. Implementation of Learning (Student Activities) by Observers in Limited-Scale Trials.

Based on the results of the observer's assessment of the implementation of learning (student activities) using learning model products and supporting devices in a limited-scale trial, they are in the Practical category. This shows that the learning process using the problem based learning model is in accordance with the steps and has been successfully carried out by students, although there are still some shortcomings.

Based on the results of the assessments of the two observers on the implementation of learning (teacher activities) using the learning model product and supporting devices in the large-scale trial, it was in the very good category. This shows that the learning process by the teacher is going very well by following the appropriate steps even though there are some things that have not been implemented perfectly.

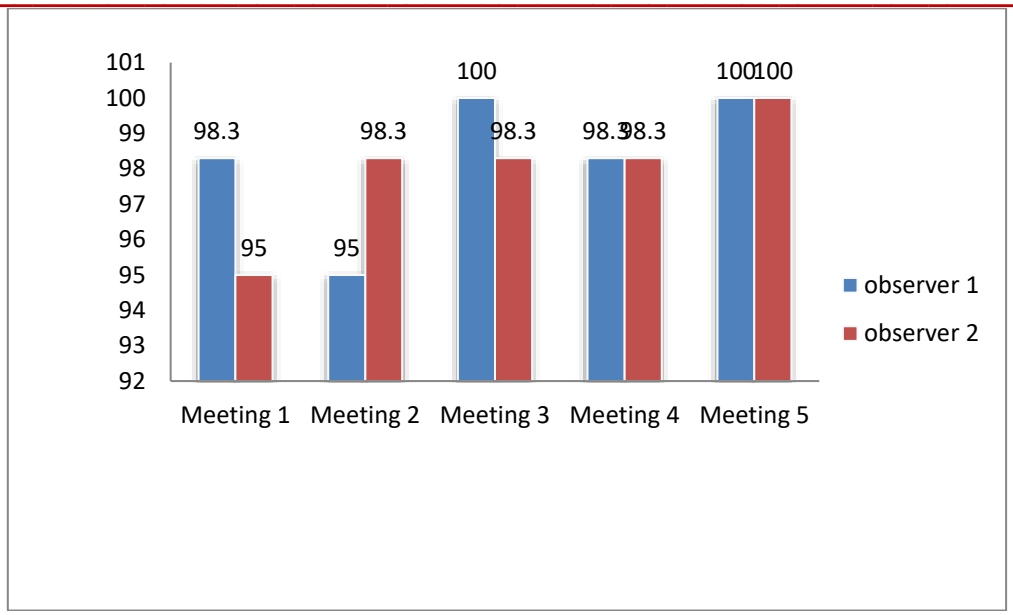

Figure 3. Implementation of Student Activities Learning

Based on the results of the assessment from the two observers on the implementation of learning (student activities) using the learning model product and supporting devices on a limited scale trial, it was in the Practical category.

3. Results of Data Analysis on the Effectiveness of the Prolem Based Learning Model to Improve Critical Thinking Skills for Fourth Grade Students of Public Alementary School Duminanga

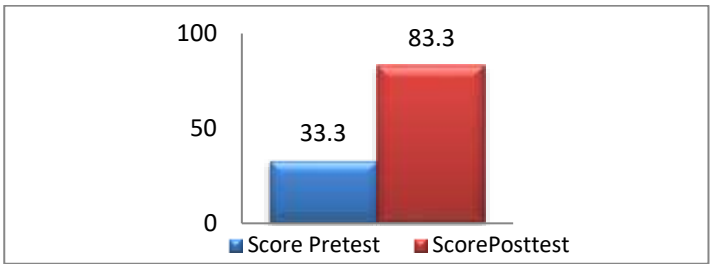

Figure 4. Results of Assessment of Learning Outcomes on Limited Scale Trial

Based on the data from the pretest and posttest results of the Learning Outcome Test in the Limited Scale Trial, there was an increase in the completeness score obtained, calculated from the difference of 50%. The scores obtained are then normalized using the N-Gain formula with a value of 0.42 which is then converted to the N-gain criteria and the learning outcomes test to measure students' critical thinking skills is in the medium category.

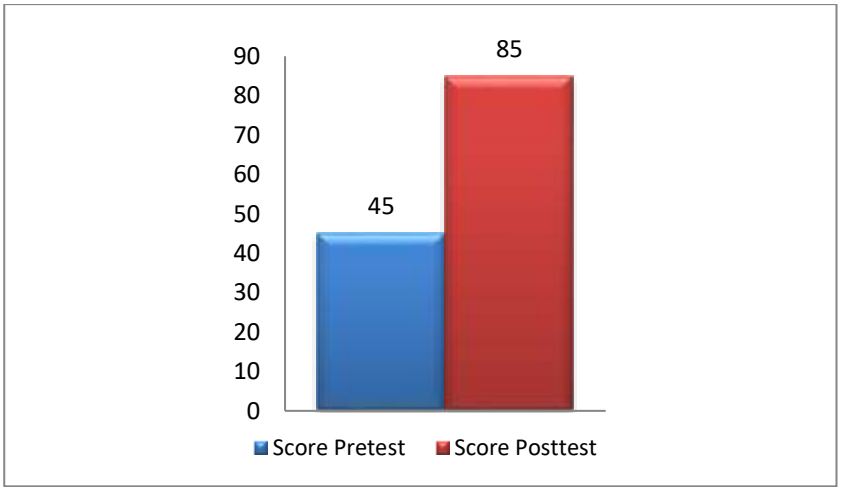

Figure 5. Results of Assessment of Learning Outcomes Test on a Wide Scale

Based on the data from the pretest and posttest results, there is an increase in the completeness value which is calculated from the difference of 40%. The score obtained is then normalized using the N-Gain formula with a value of 0.5 which is then converted to the N-gain criteria and the critical thinking test results are in the medium category.

DISCUSSION

1. Validity of Problem Based Learning Learning Model to Improve Critical Thinking Skills for Fourth Grade Students of SD Negeri Duminanga

Based on the results of the research in the preliminary study and seeing the shortcomings of the learning model, Draft I of the problem based learning learning model was produced at the needs analysis stage. then, the draft I was reviewed by experts in this case 2 validators to determine the validity criteria. Based on the results of data analysis on the validity of research instruments from validators/experts, it is known that the components of the learning model in the form of a problem-based learning model book, and the supporting tools for RPP, LKS and THB I developed have met the valid criteria.

A learning model is said to be valid if it shows a need, novelty (state of the art), has a strong foundation, and there is consistency between model components (Nieveen, 1999). This is in line with the opinion (Makhrus, 2018) who argues that a valid learning model can be used as a guide and reference for teachers in planning learning in the classroom to assist students in making conceptual changes to misconceptions that are wrong into scientific conceptions.

The following presents the syntax/steps of the problem-based learning model that has been developed in this study.

a. Student orientation on problem situations.

At this stage, we as teachers play an important role in learning to present a problem and guide students to be able to explore what information is known about the problem, generate a list of questions and see students' initial abilities and hypotheses about the problem. During the trial activities of the learning model at school, namely for five meetings, at the problem orientation stage in learning this is more focused on giving problems in the form of story questions or in the form of HOTS so that students are trained to find ideas from these problems. And learning activities can implemented throughout the meeting.

b. Student organization for learning

At this stage, the teacher's activities are focused on conditioning students to learn and forming students into several groups, where the student learning groups have been determined by the teacher heterogeneously. At this stage students are also required to be able to determine learning resources that can be used to solve problems.

c. Guiding Individual and Group Research

At this stage, students are given a problem that is contained in the LKPD. where each group in the group collects information from various sources to solve existing problems. Furthermore, each group discusses and conducts an investigation of the results obtained with the help of the teacher so that they can obtain solutions / problem solving.

d. Develop and present the work

At the development stage and the stage of presenting the work, several representatives of the student groups will present the results of their investigations to the teacher and all students in front of the class. Next, the teacher gives the opportunity for other groups to respond to the results of the group's presentation. In addition, the teacher's job is to provide feedback and rewards for student results and presentations.

e. Analyze and evaluate

At this stage the teacher together with students reflect or evaluate the problem solving process that has been done by students. In this stage the teacher helps students to reflect on the knowledge and skills they have acquired, the learning strategies that students use, and the contribution of students in group learning.

2. The Practicality of Problem Based Learning Models to Improve Critical Thinking Skills for Fourth Grade Students of SD Negeri Duminanga

A learning model is said to be practical if three indicators are achieved, namely the implementation of learning teacher activities, student activities and student responses in the minimally good category. To find out the practicality of a learning model that has been validated and meets the valid criteria, it is necessary to conduct a field trial. Where the field trial was carried out with two activities, namely a limited-scale trial and a wide-scale trial. In trial activities, both on a limited and broad scale, trials are carried out by implementing a problem based learning model in learning in schools. Field trials were carried out at SD Negeri Duminanga for fourth grade students. In the limited-scale trial consisting of 6 students and the wide-scale trial consisting of one class. According to (Setiawan, 2020) the results of the practicality test of the model show the implementation of the syntax in learning is classified as high (mostly achieved) and meets the practicality of the model.

3. The Effectiveness of Problem Based Learning Model for Improving Critical Thinking Skills for Fourth Grade Students of SD Negeri Duminanga

The effectiveness of a problem-based learning model in this development research is indicated by the completeness of learning outcomes achieved by students. Based on the results of the competency achievement test using THB.

Based on the data obtained by the pretest score, in the limited scale test only two people completed based on the KKM from a total of 6 students. This explains that the percentage of completeness is 33.3% while the posttest on a limited scale trial there are five who have completed based on the KKM of 6 students with a completeness presentation of 83.3%. When viewed from these activities there is an increase in the value of completeness obtained calculated from the difference of 50%. The scores obtained are then normalized using the N-Gain formula with a value of 0.42 which is

then converted to the N-gain criteria and the learning outcomes test to measure students' critical thinking skills is in the medium category.

Furthermore, the large-scale trial obtained pretest data there were 9 students completed based on the KKM from 20 students with a completeness percentage of 45% while in the posttest there were 17 students completed based on the KKM from 20 students with a completeness percentage of 85%. When viewed from these activities there is an increase in the value of completeness obtained calculated from the difference of 40%. The scores obtained were then normalized using the N-Gain formula with a value of 0.5 which was then converted to the N-gain criteria and obtained a learning outcome test to measure students' critical thinking skills in the medium category. Based on the pretest and posttest analysis, both on a limited scale and on a wide scale, it can be seen that the increase in the percentage of students' completeness is because students have followed the learning process using problem based learning learning model development products so that their critical thinking skills increase. Overall, the development of description questions on critical thinking indicators is said to be effective because it can represent all indicators in measuring students' critical thinking skills.

CONCLUSION

Based on the results of data analysis, the factors that cause students' learning difficulties in SD Negeri Duminanga and the deficiencies contained in the Problem Based Learning learning model can be concluded that the resulting product development experiences an increase in students' critical thinking skills in Class IV Elementary School Class IV Duminanga. evidenced by the results of the analysis of validity, practicality and effectiveness to reach the very good criteria and deserve to be used.

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