DEVELOPMENT OF *LKPD* BASED ON *METAPHORICAL THINKING* TO IMPROVE THE MATHEMATICAL *CRITICAL THINKING* SKILLS OF SDN 2 SUKOREJO STUDENTS

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Abstract

Arib Rahmawati. 2023. Development of *LKPD* Based on *Metaphorical Thinking* to Improve the Mathematical *Critical Thinking* Skills of SDN 2 Sukorejo Students.

Learning independence is one of the goals of the success of the learning process. Through independence a person is able to express his abilities such as the ability to think critically mathematically. LKPD learning based on metaphorical thinking is one of the models applied to improve students' critical thinking skills. This study aims to (1) test the effectiveness of learning through the development of LKPD based on metaphorical thinking, (2) analyze students' mathematical critical thinking skills.

This research was conducted at SD Negeri 2 Sukorejo, Jl. Raya Tunjung Tunjungan District, Blora Regency, Central Java Province. This research is a mixed method research with a sequential explanatory strategy. Quantitative research is primary research. Quantitative research using a nonrandomized control group pretest-posttest design. Qualitative research uses the Miles & Huberman model analysis.

The results showed that the development of LKPD based on metaphorical thinking to improve students' mathematical critical thinking skills at SDN 2 Sukorejo was effective through the completeness test, the average difference test, and the average difference test. The results of the analysis show that students at the stage of solving problems are better than at the stages of interpretation, analysis and evaluation. The level that students have will affect their ability to interpret, analyze, and solve problems. The results of student analysis on the pro-active aspect were better than the initiative and creativity aspects.

Keywords: *LKPD, Metaphorical Thinking, Critical Thinking Ability*

1. Introductions

Students' views of mathematics are still too far from expectations, they still view mathematics as a very difficult subject. Various studies were conducted to increase students' interest in mathematics, to update all aspects of the learning process both methods, learning strategies or

media development to assist the learning process. Various efforts to improve the learning process have been made, but still produce unsatisfactory results.

Changes in the learning process must still exist, because a teacher should not provide learning in the same (static) way. The teacher must provide changes for the progress of student learning. Choosing the right teaching method will be able to make a big difference in students. In addition to learning methods, teacher teaching techniques also play an important role in success in learning. Suherman et al. (2003) explains that teaching methods and techniques are like two different but inseparable sides of a coin. Student success in learning depends on a good learning process. One of the successes is the emergence of independence in learning.

According to Filiz & Yasemin (2013) that higher order thinking (HOT) is a person's need in the 21st century, one of which is critical thinking ability. The ability to think critically is important in learning mathematics, needs to be trained for students starting from the education level base. According to Sumarmo (2006) the goals of mathematics education have two directions of development, namely meeting current and future needs in Ratnaningsih (2013). So that the ability to think critically that a person has will help meet the needs of the present and the future.

To improve critical thinking skills, instruments such as LKPD are needed which can measure how high the level of students' thinking is. According to Prastowo (2012) LKPD is a printed teaching material in the form of sheets containing material, summaries and instructions that must be carried out by students, which refers to the basic competencies that must be achieved. Widjajanti in Apertha and Zulkardi, (2018) said LKPD is one of the learning resources that can be developed by the teacher as a facilitator in learning activities. The aim is to make it easier for teachers to carry out learning, besides that students will learn independently, understand, and carry out a task in writing. In addition to the learning process itself, it is also combined with metaphoric thinking. Through learning with a metaphorical thinking approach, efforts are made to make abstract mathematics into concrete mathematics for students, as explained by Hendriana (2012), metaphorical thinking in mathematics is used to clarify a person's way of thinking associated with his mathematical activity. The combination of station learning with metaphorical thinking becomes fun learning without forgetting the substance of the learning process. In line with the opinion of Hendriana, Carreira Sudarsono, et al, (2001) revealed that metaphorical thinking is a thinking concept that focuses on the ability of students to connect mathematical ideas and phenomena which exists.

2. Research Methods

This study uses a mixed method research method, combining quantitative and qualitative. Creswell & Plano Clark (in Creswell, 2012) defines a mixed method research design as a procedure for collecting, analyzing, and mixing both quantitative and qualitative methods in one study or series of studies to understand the research problem. The basic assumption of using both quantitative and qualitative methods in combination, provides a better understanding of the problems and research questions than either method alone Creswell (2012).

Data collection will be carried out using a sequential explanatory strategy. This strategy was implemented by collecting and analyzing quantitative data in the first stage followed by collecting and analyzing qualitative data in the second stage which builds on the preliminary quantitative results of Creswell (2009). The implementation of the strategy used in this study is as follows: (1) the researcher formulates research problems both quantitatively and qualitatively; (2) collecting quantitative data using questionnaires (learning independence) and test sheets (critical thinking skills); (3) collect qualitative data obtained from the results of interviews and analysis of student work with selected respondents; (4) quantitative data is processed with predetermined statistics and qualitative data is analyzed qualitatively; (5) the quantitative data obtained is used to conclude the research hypothesis, while the qualitative data is used to describe the findings during the treatment of respondents who have been selected based on the results of their critical thinking (high, medium, low).

3. Result and Analysis

a. Research result

In this section the research results will be described into 2 (two) research stages, namely quantitative and qualitative research. The two stages of the research were carried out to answer the problems that had been formulated in Chapter I. The description of the results of this study was based on data obtained from the results of tests of students' mathematical critical thinking skills, student learning independence questionnaires, the results of interviews which were converted into sheets of scripts, and notes field, as well as supporting documentation. The purpose of this research is to test the effectiveness of metaphorical thinking-based LKPD development to improve students' critical thinking skills at SDN 2 Sukorejo.

b. The Effectiveness of *Metaphorical Thinking*-Based *LKPD* Development

The results of testing the effectiveness criteria for the development of *metaphorical thinking*-based *LKPD* on the material for flat sides of prisms and pyramids are explained as follows:

Preliminary Data Analysis

This study took two classes to be subjected to two treatments, namely one experimental class and one control class. The treatment for students in the experimental class used the development of *LKPD* based on metaphorical thinking, while students in the control class applied conventional learning in this case applying expository learning. The population of students in class IV SDN 2 Sukorejo, and students in class V SDN 2 Sukorejo. Then two classes were taken as sample classes based on the input and considerations of the subject teachers. Students in the experimental class in this study were students in class IV which consisted of 30 students, while students in the control class were students in class V which also consisted of 30 students. Students from the experimental and control classes must have the same initial abilities, therefore tests for normality and homogeneity of the initial data are carried out. The initial data in this study were obtained from the pretest of students' *critical thinking* skills before learning.

Initial Data Normality Test

The normality test aims to determine whether the initial abilities of the selected experimental and control class students come from populations that are normally distributed or not. Normality testing uses the Kolmogorov-Smirnov test with the help of SPSS 16.0 for windows. The hypothesis is formulated as follows.

H0: The initial data on student scores is normally distributed.

H1: Initial data on student scores is not normally distributed.

Tabel Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
KBKM	.095	74	.098	.969	74	.066

Lilliefors Significance Correction

Based on the results of the table with a significant level of 5%, the value of Sig. = 0.098> 0.05, so H0 is accepted. Thus it can be concluded that the initial data of the experimental class students

and the initial data of the control class students were normally distributed. The test results are strengthened by showing the histogram and normal curve shown in the following figure.
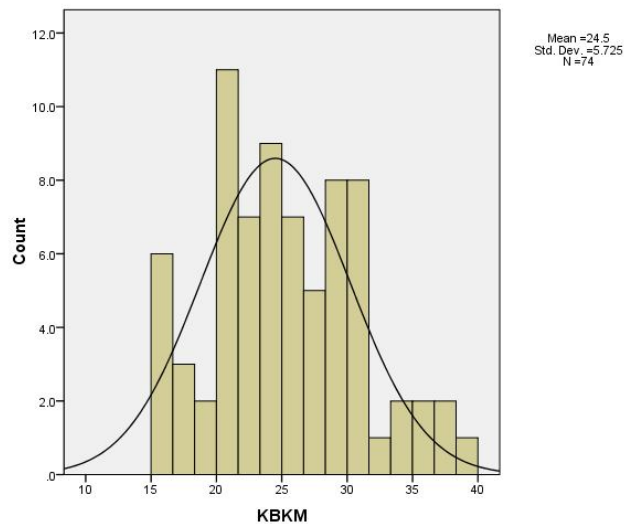
Histogram and Initial Normal Curve

Final Data Analysis

In the final data analysis, the data used is the result data tested at the end of the lesson. The analysis was carried out to test the effectiveness of developing metaphorical-based worksheets implemented in experimental class students.

Final Data Normality Test

The final data normality test was carried out with the same test steps as the initial data normality test. The final data used is the results of tests of students' mathematical critical thinking skills which are tested after learning (posttest). The hypothesis is formulated as follows.

H0: Data on student scores in the control and experimental classes are normally distributed.

H1: Data on the scores of control and experimental class students are not normally distributed.

The test steps can be seen in the output results shown in the following table.

Final Data Normality Test Table

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
KBKM	.091	74	.200[*]	.978	74	.210

Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Based on the results of Table, with a significant level of 5%, the value of Sig. = 0.200'> 0.05, so H0 is accepted. Thus it can be concluded that the value data of experimental and control class students is normally distributed.

4. Closing

Based on the analysis of *LKPD* with its *metaphorical thinking,* it improves the *ability* to *think critically* mathematically as a whole, students are able to solve problems in questions through the stages of interpretation, analysis, evaluation, and problem solving.

At the analysis stage, students who have high *critical thinking* skills will write down the information provided by the questions in sufficient detail according to the questions given, such as writing down the unit size of the side length. Students are also able to determine important information from the problem. Students who have moderate and low critical thinking skills write down the information provided by the problem in a less thorough manner, the length of the side is the right size in the list. At the problem solving stage, students who have high *critical thinking* skills begin by understanding the problem, writing down what is known and what is being asked. Students with high critical thinking skills understand the problem in more detail. While students with moderate and low critical thinking skills understand the problem less thoroughly.

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