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The Influence of Student Worksheet Based on Problem Centered Learning to Increase Students Mathematics Creative Thinking Ability

*Yasmi Adillah Adnan[1]

[1] *Mathematics Education Master's Program, Universitas Negeri Makassar, Makassar, Indonesia*
[*] *yasmiadillah@gmail.com*

ABSTRACT

This study used Student Worksheets based on Problem Centered Learning (PCL) to increase the students' mathematics creative thinking ability by solving non-routine problems due to a lack of critical and creative thinking abilities. The research method used experimental research to determine the quality of the Student Worksheets by taking only one experimental class based on Problem Centered Learning. The instruments used were in the form of learning implementation observation sheets, student activity observation sheets, and students mathematics creative thinking ability tests, with the following research results; 1) learning implementation using the Student Worksheets based on Problem Centered Learning (PCL) was doing admirably, with an average score of 3.88 which means it was in the very good category, 2) student activities were in the very active category with the overall average percentage was 88.75% which means it was in the very active category, 3) After being taught with Problem Centered Learning, the average score of students' mathematics creative thinking ability was 71.49, exceeding the minimum score of 65, with 28 of 37 students declaring to qualified the criteria. Based on the results of the study, the results show that there is an increase of students' mathematics creative thinking ability in the medium category, with the average normalized gain index of students after being taught using student worksheets based on the Problem Centered Learning (PCL) models is 0.47 which is in the medium category.

Keywords: *mathematics creative thinking ability, student worksheets, and Problem Centered Learning.*

1. INTRODUCTION

For most people, education guides children to resemble adults; yet, according to Jean Piaget [1], education entails generating and creating, even if in small amounts of contrast to other creations. According to Jean Piaget, education is a bridge between two worlds: on the one hand, a developing individual, and on the other, the social. It is the role of educators to encourage these folks' intellectual and moral values. Individuals grow and develop from the moment they are born, and this growth is causal. However, because educators demand values, there is a normative component. This value is a guideline for determining what is answered, permitted, and banned. As a result, education is a normative interaction between people and their ideals.

Education is a content, direction, and choice that has been determined as a vehicle for the future development of students who cannot be separated from education, as seen from the perspective of giving instructions that education is a content, direction, and choice that has been determined as a vehicle for the future development of students who cannot be separated from education, as seen from the perspective of giving instructions that education is a content, direction, and choice that has been determined as a vehicle for the future development of students who cannot be separated from education human control is required. The concept of education relates to the idea that education, like the nature of its intended audience, namely humans, has many facets and is highly complicated. There is no adequate limit to adequately define the meaning of education due to its complexity.

National education serves to develop capabilities and create the character and culture of a dignified nation in the context of the nation's intellectual life, according to UUSPN No. 20 of 2003. Finally, education must be promoted to establish a society distinguished by individual nobility, state justice, and a happier and more religious life than any individual.

Mathematics is one of the subjects that play a significant role in science. Mathematics leads to a systematic logic of thought in humans, and it is a rather effective tool in the advancement of science and technology. As a result, mathematics plays a significant part in today's period of science and technology. The essential pattern and starting point for discovering and developing practical and pure sciences, including exact and social sciences, is logically based on mathematics.

Because mathematics is so directly tied to everyday life, the value of mathematics is emphasized. Students are expected to apply mathematical concepts and mindsets to problems they encounter in everyday life after learning mathematics. This is undoubtedly a collaborative effort between teachers and students as subjects in the teaching and learning process, particularly in mathematics. Mathematical concepts and attitudes meant to be entrenched in students cannot be achieved without the correct technique. Students will not be able to attain the goals of learning mathematics.

Several foreign institutes have undertaken studies that show that Indonesian pupils are significantly behind their peers in terms of mathematical competence, as evidenced by the Trend in International Mathematics and Science Study (TIMSS) [2]. TIMSS is a worldwide examination of junior high school students' math and science achievement. Indonesia was ranked 38th out of 45 countries in 2011. This score is not an improvement over prior years; instead, it is a decrease, as Indonesia was rated 35th in 2003 and 36th in 2007. This result was obtained because Indonesian students were unable to solve TIMSS questions well and had a low level of mathematical creative thinking ability, even though if their level of creative mathematical thinking was adequate and basic concepts were mastered, Indonesian students would be able to solve any question, including TIMSS, well. Despite the fact that they are rarely confronted with such inquiries. Whereas a future with insecure or ever-changing conditions, as well as increasingly tough competition, necessitates educational goods that are not only talented in a creative field but also in developing it [3].

This is still a long way from the national education vision's objectives and aspirations. The absence of student participation in the teaching and learning process is one of the reasons for this. This is something that students at high school in Gowa have noticed, where teachers are more engaged than students. Furthermore, because the learning strategy is still teacher-centered, the option for students to be more involved in their learning is limited.

Teachers should explain mathematical concepts to students during the teaching and learning process to meet learning objectives. On the other hand, student activity should not be overlooked because energetic pupils are more likely to remember the mathematical concepts presented. Forming student study groups is one strategy to engage students in their studying.

Problem-Centered Math is a type of mathematics instruction that allows students to engage in learning tasks that can engage them in the process. According to Walber [4], Problem-Centered Math is a problem-solving-based approach to mathematics education, also known as a student-centered approach.

The learning process is constructed to emphasize the value of communication and meaningful learning through the Problem Centered Learning method. Communication in this learning can take place between the teacher and the students, between the students and the teacher, or between the students and the teacher. Learning occurs when students develop their knowledge, according to the Problem Centered Learning method to learning.

The Problem-Centered Learning approach allows students to participate in prospective learning activities by solving problems to identify solutions that are not immediately apparent. Students will be challenged to create their own mathematical understanding by solving problems, presenting solutions through presentations in front of the class, and seeing the approaches used by other students since problem-centered instruction will increase student learning efforts.

According to Kadel [4], one of the benefits of the Problem Centered Learning approach that sets it apart from traditional learning or even problem-solving learning, which focuses solely on problem-solving procedures, is that the ultimate goal achieved through the Problem Centered Learning approach is for students to think creatively when solving mathematical problems.

Mathematical creative thinking is the ability to solve problems and/or build thinking on structures by following deductive reasoning principles and the relationships between concepts generated to integrate essential aspects in mathematics [5].

Others have linked concepts from fluency, flexibility, and originality to the concept of mathematical creativity, as described by Russian psychologist Krutetskii in the context of formal issues, discovery, freedom, and originality [6,7] adds that the creation or refinement of techniques) and sensitivity builds on conventional methods as a supplement to these notions.

The ability to locate and solve mathematical problems, which contains the following components: fluency, flexibility, creativity, and elaboration, can be concluded based on the many understandings presented by the experts above. It is critical to assess pupils' mathematical creative thinking abilities. Researchers use students' activities to enhance their understanding of solving problems and their answers to identify creative people.

When it comes to learning mathematics, the Problem Centered Learning technique is beneficial. This is because students can better understand mathematical concepts that they find difficult. After all, the knowledge is investigated and discovered by them. With the Problem Centered Learning approach, students are expected to think creatively while learning mathematics in the classroom.

The authors plan to research the title of the student worksheet based on problem-centered learning toward increasing students' mathematics creative thinking ability based on the above description.

2. METHOD

This research is called experimental research because it is an activity that is planned and carried out by researchers to collect evidence related to the hypothesis. Using student worksheets based on Problem Centered Learning, this study explores students' mathematical creative thinking abilities.

This research was conducted at one of the high schools in Gowa. Sampling in this study using a random sampling technique. As for the many samples in this study, there were 37 students. The instrument used in this study is students' mathematical creative thinking ability tests, learning implementation observation sheets, and student activity observation sheets.

This research was conducted in three stages of activity. These are the preparation stage, the implementation stage, and the data analysis stage.

The data analysis technique used in this research is descriptive analysis and inferential statistical analysis.

2.1. Research Design

The research design used mainly as follows:

Table 1. Research design model one group pretest-posttest design

O_1	X	O_2

Information:
O_1 : Pretest before treatment is given

O_2: Posttest after the treatment is given

X : Treatment of experimental class by using the learning approach Problem Centered Learning (PCL)

The pretest and posttest were completed by one class in this study. The pretest question is a test administered before therapy or learning PCL. Then a posttest is administered to measure the students' creative thinking ability as it relates to problem-centered learning in class.

2.2. Hypothesis

2.2.1. Major Hypothesis

The hypothesis of this research is student worksheet based on problem-centered learning has a significant effect on increasing students' mathematics creative thinking ability.

2.2.2. Minor Hypothesis

1. Post-test students' average score significantly achieves a minimum score (65) after being taught by learning approach Problem Centered Learning.
2. The average score of the normalized gain significant mathematics learning outcomes in the middle category (average gain ≥0.3) after being taught by learning approach Problem Centered Learning.

3. RESULT

3.1. Classical Assumption Test

3.1.1. Normality Test

Table 2. Normality test result

	Statistic	Df	Sig.
Posttest	0.140	37	0.063
Gain Normalized	0.105	37	0.200

Based on Table 2, it can be seen the data posttest is 0.063 greater than $\alpha = 0.05$. It can be concluded that the data were usually distributed to student posttest. As for the data, the normalized gain is 0.200 greater than $\alpha = 0.05$. In accordance with the acceptance criteria Ho of the preceding, it can be concluded that the data were normally distributed students gain normalized.

3.2. Hypothesis Test

3.2.1 Hypothesis Testing 1

Table 3. Statistical sampling the posttest

	N	Average	Standard Deviation
Posttest	37	71.49	15.45

Table 4. One sample t-test results *in posttest*

	Test Value = 64.9		
	T	Df	Sig. (2-tailed)
Posttest	2.593	36	0.014

Based on tables 3 and 4, it can be seen that Sig. (2-tailed) for data, the posttest is 0.015, or it can be said that for the data posttest is 0.015, the average post-test is 71.49. If used, it can be inferred from the above table Sig. (2-tailed) < 0.05. It can be concluded that the average posttest scores of high school students in Gowa are no different from 65 (minimum score) after being taught using the approach of problem-centered learning.

3.2.2. Hypothesis Testing 2

Table 5. Statistical sampling the normalized gain

	N	Average	Standard Deviation
Gain Normalized	37	0.47	0.17

Table 6. Result one sample t-test gain normalized

	Test Value = 0.29		
	T	Df	Sig. (2-tailed)
Gain Normalized	6.491	36	0,000

Based on tables 5 and 6, it can be seen that Sig. (2-tailed) for data normalization gain is 0.000, or it can be said that for data normalization gain is the average gain is normalized 0.47. If used $\alpha = 0,05$, it can be inferred from the table above that because of Sig. (2-tailed)) < 0.05 and Ho is rejected, then the average value of the gain is normalized Students are different from 0.3. It can be concluded that the scoring average increases students' mathematics creative thinking abilities math is significantly different than 0.3 after being taught using the approach of problem-centered learning.

4. DISCUSSION

This research was conducted at a high school in Gowa, where the experimental group would then be taught using the problem-centered learning approach. The experimental class consisted of 37 students. This research was conducted in 5 meetings. Two meetings were used to give tests (pretest and posttest) to students, and 3 meetings were conducted with the learning process using student worksheets.

Mathematics learning in this study applies the problem-centered learning approach, namely dynamic learning, for students to interact and collect as much information as possible from their interactions with other students or their teachers to solve a problem. The learning steps for Problem Centered Learning (PCL), namely:

a. Carry out a task
b. Group Activities
c. Share (Sharing)

This study aims to increase students' mathematics creative thinking ability by using student worksheets based on problem-centered learning. Based on the Kolmogorov-Smirnov test for normality, the normal distribution of data posttest that is 0.015 qualified to do the t-test samples (one-sample t-test). Based on the analysis result can be seen that Sig. (2-tailed) for data, the post-test is 0.015, or it can be said that the post-test is $\alpha = 0.05$ the average post-test is 71.49. If used, it can be concluded from the table above Sig. (2-tailed)) < 0.05, and Ho rejected. From the hypothesis that has been concluded with rejected, it can be concluded that there is an average increase in student math proficiency test results with an average of 71.49 after being taught by the provision of approach problem-centered learning.

For student activity, it can be seen that from three meetings, the average percentage of total student activity during classroom learning was 88.75%, with a very active category.

From the description above, it can be concluded that inferentially, the problem-centered learning approach can increase students' mathematics creative thinking ability.

5. CONCLUSION

Based on the study results, the conclusions in the study of the influence of students' worksheets based on problem-centered learning at high school in Gowa during three meetings were students mathematics creative thinking abilities increased.

Based on the inferential analysis, the posttest average score (creative thinking ability) of students mathematics significantly is 71.49 or more than 65 (minimum score), and the score of increasing students mathematics creative thinking ability is significantly 0.47 or more than 0.3 (based on the score). Normalized gain after being taught using the Problem Centered Learning (PCL) approach.

AUTHORS' CONTRIBUTIONS

Yasmi Adillah Adnan compiles questionnaires, carry out research and compiles articles.

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