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The Effect of Numeration Literacy-Based Learning on Creative Thinking and Mathematical Communication Ability

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Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh pembelajaran berbasis literasi numerasi terhadap kemampuan berpikir kreatif dan komunikasi matematis siswa. Penelitian ini merupakan penelitian quasi eksperimen dengan desain nonequivalent control group design. Populasi penelitian terdiri atas seluruh siswa kelas IV yang berada pada wilayah gugus I Kecamatan Somba Opu, Kabupaten Gowa sebanyak 340 siswa. Melalui cluster random sampling terpilih 46 siswa dari SD Negeri Sungguminasa IV sebagai sampel penelitian. Pengumpulan data dilakukan melalui teknik angket dan tes. Data dianalisis melalui teknik analisis statistik deskriptif dan statistik inferensial yang terdiri atas independent sample t test dan multivariate test. Hasil penelitian menunjukkan pembelajaran berbasis literasi numerasi berpengaruh terhadap kemampuan berpikir kreatif dan komunikasi matematis siswa kelas IV SD Negeri Sungguminasa IV, Kabupaten Gowa.

Kata Kunci: *pembelajaran berbasis literasi, berpikir kreatif, komunikasi matematis*

Abstract

This study aims to determine the effect of numeracy literacy-based learning on students' creative thinking abilities and mathematical communication. This research is a quasi-experimental study with a nonequivalent control group design. The research population consisted of all fourth grade students in the cluster I area of Somba Opu District, Gowa Regency with a total of 340 students. Through cluster random sampling, 46 students from SD Negeri Sungguminasa IV were selected as research samples. Data collection was carried out through questionnaires and tests. Data were analyzed through descriptive statistical analysis techniques and inferential statistics consisting of independent sample t tests and multivariate tests. The results showed that numeracy literacy-based learning had an effect on the ability to think creatively and mathematically communicate in class IV students at SD Negeri Sungguminasa IV, Gowa Regency.

Keywords: *numeracy literacy-based learning, creative thinking abilities, mathematical communication abilities.*

Introduction

Nowadays, education is very dynamic. Since entering the 21st century, education in Indonesia has developed rapidly. As a result of the rapid development of technology that affects all aspects of life, not only the education system has undergone many changes, but also the goals of education to be achieved. P21 (Partership for 21st Century Learning) develops a learning framework in the 21st century that requires students to have learning and innovation skills, skills in using technology and information media (information media and technology skills), and can work and survive by using skills for life (life and career skills). In line with this statement, the Ministry of Education and Culture (in Wijaya et al, 2016) states that the 21st century learning system emphasizes the ability of students to find out from various sources, formulate problems, think analytically and collaborate and collaborate in solving problems. As one of the subjects taught at every level of education, mathematics is a learning tool that can hone 21st century skills. With mathematics, students are trained and equipped to think logically, systematically, critically, and be able to communicate ideas properly and precisely.

There are several mathematical abilities that need to be developed by students, namely problem solving, reasoning, communication, tracing patterns or relationships, understanding concepts and representations. Students' mathematical communication ability is a very important ability so that in learning there is interaction and student participation. In addition, this ability is one of the four basic skills in the 21st century, namely critical thinking, collaboration, and creative (BSNP, 2010). Mathematical communication ability is the ability to convey ideas or ideas with symbols, tables, diagrams, or other media to facilitate explanation (Hayati et al, 2018). This means that with mathematical communication teachers can better understand students' abilities to explain and interpret their understanding of the material or concepts they are learning.

According to Lestari and Mokhammad there are several indicators to identify students' mathematical abilities, namely (1) linking real objects, pictures, and diagrams to mathematical ideas; (2) explaining ideas, situations, and mathematical relations orally or in writing, with real objects, pictures, graphs, and algebra; (3) express daily events in mathematical language; (4) listening, discussing, and writing about mathematics; (5) reading with understanding a written mathematical presentation; (6) making conjectures, constructing arguments, formulating definitions and generalizations (Guntur et al, 2020).

In addition to mathematical communication skills, through learning mathematics, students are also trained to develop their creative thinking skills. Creative thinking ability are also one of the basic skills of the 21st century. Creative thinking ability are the ability to generate new ideas or ideas in solving problems. This allows the creation of alternative solutions that can be used.

The ability to think creatively can be seen from the diversity of several traits or characteristics. A person is said to have the ability to think creatively if he can fulfill the characteristics or characteristics of the ability to think creatively. According to Cotton (1991) the ability to think creatively can be characterized by 4 components, namely fluency, flexibility, originality, and elaboration. Lestari & Mokhammad explained further that this characteristic can be an indicator of the ability to think creatively mathematically, namely (1) fluency, namely having many ideas or ideas in various categories of problems or questions; (2) flexibility, namely having various ideas or ideas; (3) originality, namely having new ideas or ideas that can be problem solvers; and (4) elaboration, namely having the ability to develop ideas or ideas that are used as problem solvers in detail (Guntur et al, 2020).

Mathematical communication ability and creative thinking ability are basic skills of the 21st century and have an important role in the intellectual development and daily life of students as an effort to improve the quality of human resources. But in reality, students' mathematical communication skills and creative thinking are still low. This is proven through the results of pre-research observations, namely that students' mathematics learning outcomes are still low, especially related to word problems. In addition, student-teacher interaction is still lacking, there are some students who are still wrong in describing tables and graphs, there are still many students who are unable to express their ideas and opinions during learning. To overcome this problem, an appropriate learning approach is needed. Based on a literature review, numeracy literacy-based learning is one of the lessons that can improve students' creative thinking skills and mathematical communication abilities (Perdana, Suswandari, 2021; Ruslam et al, 2023; Marjuki, 2020).

Numerical literacy-based learning is learning that integrates numeracy literacy in its process. Numerical literacy is the ability to use reasoning. The focus of this numeracy literacy ability is that students can formulate, apply, and interpret mathematics into various contexts that include mathematical reasoning and use mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena in everyday life (Ekowati et al, 2019). Based on this statement, numeracy literacy is closely related to students' creative thinking skills and mathematical communication. Therefore, through this research, researchers want to prove whether numeracy literacy-based learning affects students' creative thinking skills and mathematical communication abilities.

Method

This research is a quasi-experimental study with a nonequivalent control group design. The population of this study included all fourth grade students in Region I Cluster I, Somba Opu District, Gowa Regency, which consisted of 6 schools with a total of 340 students. Through the cluster random sampling technique, two classes were selected as research samples, namely IV A and IV B, which were located in SD Negeri Sungguminasa IV as many as 46 students. Data collection is done through observation and test techniques. Data were analyzed descriptively and inferentially. The inferential statistical analysis includes prerequisite tests and hypothesis tests consisting of independent sample t tests and multivariate tests.

Result and Discussion

Creative Thinking

Measuring the ability to think creatively is done through questionnaire techniques that was carried out twice in each class, namely pretest and posttest. The results of the pretest analysis can be seen in table 1 below.

Tabel 1. Categorization of Creative Thinking Ability (Pretest)

Score Range	Category	Experiment		Control	
		F	(%)	F	(%)
81 – 100	Very High	0	0	2	8,7
61 – 80	High	11	47,8	6	26,1
41 – 60	Moderate	11	47,8	11	47,8
21– 40	Low	1	4,3	4	17,4
0 - 20	Very Low	0	0	0	0
Jumlah		**23**	**100**	**23**	**100**

Based on the table 1, students' creative thinking ability at the pretest stage, experiment and control classes are relatively the same. In the experimental class, none of the students or 0% had very high creative thinking abilities, and in the control class there were 2 students or 8,7%. In the high category, in the experimental class there were 11 students or 47.8% and in the control class there were 6 students or 26,1%. In the

moderate category, there were 11 students or 47,8% each in the experimental and control class. Next, in the low category, there is 1 student or 4,3% in the experimental class and there were 4 students or 17,4% in the control class. There were no students who were in the very low category, both in the experimental and control classes.

Table 2. Categorization of Creative Thinking Ability (Posttest)

Score Range	Category	Experiment		Control	
		F	(%)	F	(%)
81 – 100	Very High	6	26,1	1	4,3
61 – 80	High	10	43,5	10	43,5
41 – 60	Moderate	7	30,4	12	52,2
21– 40	Low	0	0	0	0
0 - 20	Very Low	0	0	0	0
Jumlah		**23**	**10**		

Based on the results of the posttest analysis in table 2, there is a significant difference between the experimental class and the control class. This is because in the experimental class there was an increase after treatment in the form of numeracy literacy-based learning. The increase can be seen in the very high category in the experimental class to 6 students or 26.1% while in the control class it fell to 1 student or 4.3%. In the high category in the experimental and control classes each 10 students or 43.5%. In the sufficient category, there were 7 students or 30.4% in the experimental class while in the control class there were 12 students or 52.2%. There are no students in the low and very low category.

Mathematical Communication

The collection of data on students' mathematical communication abilities was carried out through a test technique. This test was carried out twice in the experimental class and the control class. Following are the results of the pretest and posttest analysis presented in Tables 3 and 4 below.

Table 3. Categorization of Mathematical Communication Ability (Pretest)

Score Range	Category	Experiment		Control	
		F	(%)	F	(%)
93 – 100	Very High	0	0	0	0
84 – 92	High	0	0	0	0
75 – 83	Moderate	0	0	0	0
0 – 74	Low	23	100	23	100
Jumlah		**23**	**100**	**23**	**100**

Based on the analysis of table 3, at the pretest stage students' mathematical communication abilities in both the experimental and control classes were 100% in the low category.

Table 4. Categorization of Mathematical Communication Ability (Posttest)

Score Range	Category	Experiment		Control	
		F	(%)	F	(%)
93 – 100	Very High	0	0	0	0
84 – 92	High	13	56,5	0	0
75 – 83	Moderate	10	43,5	14	60,9
0 – 74	Low	0	100	9	39,1
Jumlah		**23**	**100**	**23**	**100**

Based on table 4, after treatment there was an increase in students' mathematical communication abilities, especially in the experimental class. In the experimental class, 13 students or 56.5% were in the high category and 10 students or 43.4% were in the moderate category. There are no more students who are in the low category. Whereas in the control class, the increase in students' reading comprehension abilities was not as great as in the experimental class. There were no students who were in the high category, 14 students or 60.9% in the moderate category, and there were still 9 students or 39.1% in the low category.

Normality Test

Based on the data normality test for students' creative thinking abilities in the pretest stage experimental class obtained a significant value of 0.58 and 0.16 in the posttest stage. The two significant values are greater than 0.05 so that the data on the ability to think creatively in the pretest and posttest experimental class is normally distributed. As for the data on the ability to

think creatively in the control class at the pretest and posttest stages, it obtained a significance value of 0.200 > 0.05 so that the data was declared normally distributed.

The data on the mathematical communication ability of the experimental class students at the pretest stage was 0.180 and the posttest stage was 0.177. Both of these significance values are greater than 0.05 so that the data is declared normally distributed. Furthermore, data on the mathematical communication ability of control class students at the pretest stage was 0.51 and the posttest stage was 0.54. Both of these significance values are greater than 0.05 so that the data is declared normally distributed.

Homogenity Test

The homogeneity test of students' creative thinking abilities in the experimental and control classes obtained a significant value of 0.981 > 0.05 so that the data was declared homogeneous. The data on students' mathematical thinking abilities in the experimental and control classes obtained a significance value of 0.601 > 0.05 so that the data was declared homogeneous.

After going through the normality and homogeneity tests, the data is stated to have been normally distributed and homogeneous, then it is continued with hypothesis testing. The hypothesis test in this study consisted of two independent t tests and multivariate tests.

Independent t Test

Based on the independent t test data on students' creative thinking abilities, a significance value of 0.006 <0.05 was concluded, so it was concluded that there was an influence of literacy-based learning on students' creative thinking abilities. The mathematical communication ability data obtained a significance value of 0.000 <0.05 and it was stated that there was an effect of literacy-based learning on students' mathematical communication abilities.

Multivariate Test

This test was conducted to prove whether literacy-based learning affects students' creative thinking skills and mathematical communication simultaneously. The results of the multivariate test show a significance value of 0.000 <0.05 so it can be concluded that there is an effect of literacy-based learning on students' creative thinking skills and mathematical communication simultaneously.

Based on the results of the study, literacy-based learning affects students' creative thinking skills and mathematical communication. The results of this study are in line with several previous studies that literacy-based learning can improve students' creative thinking skills and mathematical communication (Muzaki & Masjudin, 2019; Alfiah, 2020; Perdana, Suswandari, 2021). The application of numeracy literacy-based learning has an impact on students' creative thinking skills and mathematical communication. It can be seen that the creative thinking skills and mathematical communication skills of the experimental class greatly improved compared to the control class which only used conventional learning.

Through the use of numeracy literacy-based learning in mathematics learning it can improve creative thinking skills and higher mathematical communication, so that students can learn more and be able to solve the problems they face and are able to think creatively and mathematically. Numerical literacy-based learning has a positive impact on Class IV students at SD Negeri Sungguminasa IV, Gowa district, namely:

a) Students are able to solve problems by processing numbers correctly.
b) Can broaden or deepen numeracy understanding through activities within the school environment, to provide opportunities for students to practice numeracy literacy skills.

c) Can improve the quality of human resources and improve human life standards.
d) Can realize students in solving problems in everyday life and the scope of numeracy literacy is very broad to apply.
e) The ability to think creatively aims to:
f) The ability of students to recognize and understand and respond to a statement, situation and problem.
g) The ability of students to generate many ideas.
h) The ability of students to express a variety of problem solving.
i) The ability of students to add situations or problems so that they become complete and detailed, which can be in the form of tables, graphs, pictures, models, and words.
j) Mathematical communication aims to:
k) Students' ability to connect real objects, pictures or equations into mathematical forms
l) Students' ability to explain mathematical situations and relations orally or in writing using algebraic forms, pictures or equations,
m) The ability of students to change real events into language or mathematical symbols,
n) Students' ability to formulate definitions and generalizations as well as construct arguments.

Conclusion

Based on the results of the study, it can be concluded that numeracy literacy-based learning has an effect on students' creative thinking abilities and students' mathematical communication. Numerical literacy-based learning is very good to develop because it has a significant effect on some very fundamental students' thinking skills.

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