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STEM MODEL TO IMPROVE ELEMENTARY SCHOOL STUDENT NUMERATION LITERACY

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ABSTRACT

This study aims to determine the STEM learning model to improve the numeracy literacy of elementary school students in the 3T area. This study uses classroom action research. The research participants consisted of (10) elementary school students in the 3T areas (frontier, remote, and disadvantaged) in Madiun. The research method uses classroom action research. In this study, there were two data, namely verbal data and nonverbal data. The verbal data in this study are the results of recording the activities of applying the stem learning model to improve the numeracy literacy of elementary school students. Nonverbal data, namely the value of the evaluation results of students' numeracy literacy. The subjects in this study were grade 5 teachers and grade 5 elementary school students in 3T. The instrument in this study used questionnaires, interviews, and tests. The results showed an increase in the activeness of students' learning, namely in the first cycle of 62.78% (good category), then in the second cycle, it increased to 71.85. % (very good category) so it can be said that students' writing scores were good.

Keywords: Learning methods; STEM; numeration literacy

1. INTRODUCTION

Problems related to mathematical literacy, in general, can be seen in the PISA test results. Since 2000, the average junior high school student achievement, especially in mathematics, is always below the total average and outside the standard deviation. The achievements of Indonesian students have always been at the bottom from 2000 to 2015, (Sulistiawati et al., 2021; Nugroho et al., 2018). To overcome the low literacy of students, Indonesia created a government program in 2016 to discuss the National

Literacy Movement in schools. One of the School Literacy Movements is in the form of numeracy literacy. Numerical literacy is the knowledge and skills to use various numbers and symbols related to basic mathematics to solve practical problems in everyday life, analyze the information presented in various forms, and interpret the results of the analysis to predict and make decisions (Beng et al., 2022;). Numerical literacy consists of three aspects: arithmetic, numeracy relations, and arithmetic operations. Counting is the ability to count an object verbally and identify the number of objects. Numerical relations relate to the ability to distinguish the quantity of an object, such as more, less, higher or shorter. Meanwhile, arithmetic operations are the ability to carry out basic mathematical operations in addition and subtraction (Perdana & Suswandari, 2021).

Based on the observations carried out in fifth grade at SDN Selosari 3, numeracy literacy activities are still poorly implemented in the mathematics learning process. So that it raises several problems in the field, namely the ability to count as a basic concept of mathematics may have been mastered by students. However, students' skills in using these concepts in real conditions or when solving unstructured problems are even ignored. The low numeracy literacy ability is thought to occur because learning activities are not maximized to support the development of students' numeracy literacy. Students are not familiar with mathematical applications in learning other fields. Learning using conventional methods is still often used by teachers in the process of learning mathematics. In mathematics learning activities, many students are less skilled in arithmetic, less skilled in conveying and writing their own ideas, less able to understand information, and passive during learning. The results of interviews with teachers about students' numeracy literacy also stated that students were still lacking in learning mathematics and had low interest in reading.

From some of the problems above, an innovative learning method or model is needed to improve students' numeracy literacy activities in the mathematics learning process in 3T area schools (disadvantaged areas). Efforts to bring up mathematical literacy in children (learners) require relevant learning strategies. One of them is STEM learning because this learning requires students to be familiar, literate, and proficient with knowledge related to science, technology, engineering, and mathematics. It is hoped that students will be familiar with mathematical problems that are useful in various disciplines, especially science, technology, engineering, and mathematics itself. The STEM learning model is learning that focuses on innovations that students provide as well as applied processes to design a solution to today's complex contextual problems using sophisticated tools and technology and the application of mathematics to the process, (Hallström & Schönborn, 2023; Ahmad et al., 2021).

STEM is an effective learning approach to improve students' ability to think creatively, (Nirmalasari, 2021). STEM is a combination of four scientific disciplines namely

science, technology, engineering, and mathematics in an interdisciplinary approach and is applied based on real-life contexts, (Syaifuddin et al., 2022; Ahmad et al., 2021). Based on the problems described, this study examines the effect of STEM learning on numeracy abilities, which can provide a choice of learning strategies in the classroom in making efforts to improve students' numeracy skills. Based on the explanation above, the problem in this study is formulated: How can the STEM learning model improve the numeracy literacy of elementary school students in 3T areas (disadvantaged areas)?

2. METHODS

The approach used in this study is a qualitative approach and this type of research is Classroom Action Research (CAR). Classroom action research was carried out in class IV UPT Elementary School in Madiun. The subjects in this study were 13 fifth-grade elementary school students consisting of 8 male students and 5 female students. This research design uses a design from Kemmis & Mc Taggart. The design stages consist of (a) planning, (b) implementation, (c) observation, and (d) reflection. The actions were carried out in 2 cycles, namely cycle I and II. The data collection techniques used were observation, questionnaires, and tests, which included a numeracy literacy test. This observation activity includes observing the activities of students and teachers during learning. There are three stages of data analysis. The first stage is data condensation, the second is presenting data, and the third is data verification. Then the indicators of success in this study consist of process indicators and outcome indicators in implementing the STEM models.

Table 1. Indicators of Learning Success

Level of Success	Qualification
76% - 100%	Good (G)
60% - 75%	Sufficient (S)
90% - 59%	Less(L)

There are two indicators of success in this Classroom Action Research, namely:

1. The learning process is successful if all the learning steps apply the STEM learning model. Implemented with good qualifications (B) with a value range of 76% - 100%.
2. The indicator of student learning outcomes in this action research is "If 76% or more of the number of students who take part in the learning process succeed in obtaining an SKBM score of ≥75 then the research has been successful so there is no need to proceed to the next cycle.

Processing of the collected data is then carried out qualitatively and quantitatively. Processing of the collected data is then carried out qualitatively and quantitatively.

3. RESULTS AND DISCUSSION

Based on the research on increasing students' numeracy literacy in learning mathematics, the research conducted a research technique with 2 cycles. Then the data obtained from this study with the number of students 14 students. In the first cycle has not achieved a maximum increase in learning outcomes with the acquisition of an average value of 55.25%. So, the researcher decided to continue the research again in cycle II. In the research process of cycle II, this has achieved an increase in numeracy literacy obtaining an average value of 70.79%.

1. Final Cycle I Test Results

Cycle 1 tests were carried out to know student literacy in learning mathematics using the STEM learning model in cycle 1 learning. It results from observations of teacher activities applying the STEM learning model. Observation and test results can be seen in the following table:

Results of teacher activity

Table 2. Teacher Activity Result

	Cycle I Rating Score		
	I		**II**
Presentation value	72,4%		76,3%
Average percentage value		74,35%	

Table 2 shows that the teacher's activity in the learning process of Mathematics lessons using the STEM model in cycle 1 is already good. The value of teacher activity in the first cycle of the first meeting was 72.4% and in the second meeting was 76.3% so the average percentage in the first cycle was 74.35%. However, there are still deficiencies so the researcher continues to the next cycle.

2. Student activity results in cycle 1

Cycle 1 tests were carried out to determine student literacy in mathematics using the STEM learning model in cycle 1 learning. The results of observations of student activities applying the STEM learning model follow. Observation and test results can be seen in the following table:

Table 3. Student Activity Result

	Cycle I Rating Score	
	I	II
Presentation value	60,14%	65,42%
Average percentage value	62,78%	

Table 3 shows that student activity in the learning process of Mathematics lessons using the STEM model in cycle I was quite good. The value of student activity in the first cycle of the first meeting was 60.14% and in the second meeting was 65.42% so the average percentage in the first cycle was 62.78%. However, there are still deficiencies so the researcher continues to the next cycle.

3. Cycle II Final Test Results

Cycle II tests were carried out aiming to determine student literacy in learning mathematics using the STEM learning models. The results of observations of teacher activities applying the STEM learning model follow. Observation and test results can be seen in the following table:

Results of teacher activity

Table 4. Teacher Activity Result

	Cycle I Rating Score	
	I	II
Presentation value	78,4%	80.3%
Average percentage value	79,35%	

The value of teacher activity in the learning process of cycle II experienced a very good increase compared to cycle I. It can be proven that the value at the first meeting of the second cycle, the teacher activity value was 78.4%, and at the second meeting, the teacher activity value reached 80.3% so the average percentage of teacher activity was 79.35%. This shows that the teacher's activity is very good and the teacher can be seen that the teacher's role in using the learning model greatly influences the learning process both from student activity and also student numeracy literacy.

4. Results of student activity cycle II

The second cycle test was carried out to determine student literacy in learning mathematics using the STEM learning model in cycle II learning. The following are the

results of observations of student activities applying the STEM learning model. Observation and test results can be seen in the following table:

Table 5. Student Activity Result

	Cycle I Rating Score	
	I	**II**
Presentation value	68,50%	75,21%
Average percentage value	71,85%	

The results of student observations in cycle II experienced an increase in cycle I. It can be seen in Table 5, in cycle II the average percentage was 71.85%. It can be proven that the value at the first meeting of the second cycle, the activity value of students was 68.50% and at the second meeting, the activity value of students reached 75.21% so the average percentage of activity was 71.85%. It can be seen that in cycle II it has increased compared to cycle I. So that with these results the researcher is sufficient to take action or the cycle stops here.

The study results show that applying the STEM model increases numeracy literacy in elementary schools in the 3T area in learning mathematics. This increase can be seen by comparing the average student learning outcomes and the percentage of student learning completeness in each of the following cycles:

Table 6. Results of Increasing Students' Numeracy Literacy

No		**Cycle I**	**Cycle II**	**Enhancement**
1	Average percentage	62,78%	71,85	9,07

Based on the presentation of these data, there are several deficiencies or weaknesses in the learning process including: students are less active in learning, in doing evaluations there are still some students who have not been able to solve problems regarding fractions using concrete objects.

The research was carried out in 2 cycles by applying the STEM learning model. The learning process applying the STEM approach which consists of four stages, namely a) planning b) implementation c) observation, and d) reflection proves that there is an increase in student activity as students become active during the learning process. This is in line with the opinion which states that STEM shows that STEM learning makes students able to solve problems better, are innovators, inventors, independent, logical thinkers, and technologically literate, (Permanasari, 2016).

In addition, in line with previous research (Tati et al., 2017) Development of the STEM model, while the update of this research is the STEM model of mathematical literacy and multiple intelligences. The pattern of learning mathematics with the STEM approach emphasizes practical principles, where in every, lesson students are always facilitated to practice so that students get an unforgettable learning experience during the learning process, (Ulfa et al., 2019).

The STEM model STEM is a learning approach that connects four fields, namely science, technology, engineering, and mathematics into a holistic whole, (Capraro et al., 2013). The STEM approach is also an approach that is in accordance with the 2013 curriculum. Through the STEM approach students are expected to have learning and innovation skills, one of which is creative thinking skills, (Fitriyah & Ramadani, 2021). This is in line with the opinion which states that in the STEM learning process in schools, information is formed through collaborative risk-taking and creativity, meaning that students can use science, technology, engineering, and mathematics skills in the learning process to think and solve problems., (SUWARDI, 2021). So, it can be concluded that the STEM model also impacts increasing scientific attitudes and conceptual understanding of students.

CONCLUSION

From the results of the research and discussion, it can be concluded that the application of the STEM learning model can increase students' numeracy literacy. The average percentage value indicates this in the first cycle of 62.78% and in the second cycle of 71.85%. There was an increase in student numeracy literacy obtained by students.

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