THE INFLUENCE OF STEM LEARNING MODELS ON SCIENCE LITERATION ABILITY OF ELEMENTARY SCHOOL STUDENTS

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ABSTRAK

Penelitian ini bertujuan untuk mengetahui pengaruh pembelajaran STEM terhadap kemampuan literasi sains pada siswa kelas V SDN Cipinang Besar Utara 03. Penelitian ini menggunakan metode eksperimen dengan desain *one group pretest postest*. Sampel yang digunakan dalam penelitian ini adalah siswa kelas V yang berjumlah 21 orang. Instrumen yang digunakan dalam penelitian ini adalah tes tulis berupa soal pilihan ganda. Berdasarkan hasil pengolahan data secara statistik dengan menggunakan Uji Wilcoxon diperoleh hasil Ha diterima karena Thitung (0) < TTable (59) yang artinya terdapat pengaruh yang signifikan terhadap peningkatan literasi sains siswa dengan menggunakan model pembelajaran STEM. Hasil penelitian ini menunjukkan bahwa terdapat peningkatan literasi sains siswa yang menggunakan model pembelajaran STEM.

Kata kunci : pembelajaran STEM, literasi sains, siswa SD

ABSTRACT

This study aims to determine the effect of STEM learning on scientific literacy skills in fifth grade students at SDN Cipinang Besar Utara 03. This study used an experimental method with a one group pretest posttest design. The sample used in this study was fifth grade students, totaling 21 people. The instrument used in this study was a written test in the form of multiple choice questions. Based on the results of statistical data processing using the Wilcoxon Test, the results of Ha are accepted because Tcount (0) < Ttable (59) which means that there is a significant influence on increasing students' scientific literacy using the STEM learning model. The results of this study indicate that there is an increase in students' scientific literacy using the STEM learning model.

Keywords: STEM learning, scientific literacy, elementary student

1. INTRODUCTION

The rapid development of technology and science is certainly a challenge in itself, both in the educational environment and in the world of work. So that it is necessary to have a generation that has adequate skills in the form of hard skills and soft skills for both elementary school and tertiary students. This causes the teacher to be able to adjust to the changes that are taking place. In this era, educators are demanded not only to be able to grow students' cognitive abilities, but also other abilities, especially abilities that exist in everyday life such as the ability to solve problems.

According to the World Economic Forum (2015) 21st century skills consist of 16 skills and three categories, namely character quality, competence and basic literacy. Basic literacy describes the process of students carrying out core skills in everyday life. These skills are indispensable as the foundation needed by students to build more advanced character qualities and competencies. There are six basic literacy, namely numeracy literacy, literacy literacy, scientific literacy, ICT literacy (communication information technology, financial literacy, and civic and cultural literacy.

Scientific Literacy is an individual skill to know, communicate and implement scientific knowledge in coping making decisions based on several

considerations (Niswatuzzahro et al., 2018). In the 21st century the keys to the success of a nation are technology and science so that scientific literacy is considered the key in education line with Betari (2020). Students must be literate in technology and science so that science teachers must be able to prepare parts of scientific literacy in students. revealed that in the 21st century the keys to the success of a nation are technology and science so that scientific literacy is considered the key in education. There are four parts in scientific literacy as a body of knowledge, a way of investigating a way of investigating, a way of thinking and an interaction between science, technology, and society. (interaction between science, technology and society) (Dewantaria & Singgihb, 2020).

In fact, in Indonesia, students' scientific literacy is still low. This was proven from the results of the Program for International Student Assessment (PISA) study in 2015, namely a study that emphasized mathematical literacy, science and reading proving that Indonesia's scientific literacy (IPA) entered the rank of 64 out of 72 (OECD: 2015). Trends study results in International Mathematics and Science Study (TIMSS) in 2015, namely a study centered on science and mathematics which was attended by grade 4 students from 47 countries showing that scientific literacy (IPA) of Indonesian students for grade 4 was ranked 44th out of 47 countries contestants (TIMSS: 2015).

The results of the PISA study (OECD: 2015) and TIMSS (2015) illustrate that the literacy skills of Indonesian students are still lacking. This moved researchers to carry out research to improve the scientific literacy abilities of Indonesian students. Researchers held identification of the problem first by conducting interviews and observation in elementary school. The elementary school that the

researchers chose was SDN Cipinang Besar Utara 03. These observations and interviews aimed to see the level of scientific literacy and the learning process of the fifth grade students. The results of the observation at the elementary school indicated that students had not been able to concretize learning material. Students only read and have not been able to implement what they read in everyday life. Students also cannot think scientifically, so they cannot solve problems and do not have critical thinking

Given the importance of scientific literacy for students, it should be implemented from an early age in elementary schools. One effort that can be implemented to increase students' scientific literacy is through the Science, Technology, Engineering and Math (STEM) learning model. STEM learning helps students learn academic concepts correctly using four scientific disciplines (science, technology, engineering skills and mathematics). Students can be trained to directly integrate each aspect through learning that uses a STEM approach (Priyani & Nawawi, 2020)

Mastery of Science, Technology, Engineering and Mathematics with STEM learning can be carried out by teachers by combining problems in everyday life with scientific concepts taught in class. Students are expected to be able to implement their knowledge in the environment and through STEM students can become logical thinkers and able to solve problems. The purpose of STEM learning is for students to have scientific literacy skills that can be seen from writing, reading, observing, and doing science so that if they later participate in society, they can already develop the competencies they already have in dealing with problems in everyday life. days related to the field of STEM science (Subekt et al., 2018). This is also supported by research Rahmi et al. (2022) which states that through the

STEM-based Project Based Learning model, students' natural science learning outcomes on the properties of light have increased.

Solutions that can be done to improve scientific literacy skills, one of which is by conducting STEM learning that is student-centered. In line with research conducted by (Abdi et al., 2021) "learning using the STEM approach requires students to have the knowledge and skills simultaneously to solve a problem and train students to apply their knowledge as a form of solving environmental-related problems by utilizing technology."

Based on the background, the researchers attempts to examine more deeply the STEM-based learning model which is thought to have an influence on students' scientific literacy in science learning. However, the magnitude of this influence cannot be known with certainty. Therefore, research is needed on the STEM Learning Model in science learning. The aim is to find out whether there is an influence in the application of the STEM learning model on scientific literacy skills in Class V of Cipinang Besar Utara 03 Public Elementary School.

Based on the search and various kinds of literacy studies, researchers have not found a solution to the problem of scientific literacy using the STEM learning model. So that researchers carry this as a novelty that distinguishes it from previous studies. This research update includes components of scientific literacy in aspects of thinking and interactions between science, technology and society. The scientific literacy component is associated with STEM learning which includes aspects of science and technology.

2. RESEARCH METHOD

The method used in this research is quantitative research using experimental methods. Experimental research is research that distributes treatment to something to be studied. The experimental research design used was the Pre-Experimental Design in the form of One Group Pretest-Posttest Design (Table 1). In this research design previously given a pretest in advance of the class that will be given treatment. Then the class will be given a posttest treatment. This design can be described as follows:

Table 1. Design of research

Pre test	Treatment	Post test
O1	X	O2

Information:
O1 = Pretest value before treatment
X = Treatment (given treatment)
O2 = Posttest value after being given treatment

Pre Experimental Design does not use control variables and the samples are not randomly selected random, According to (Nuryanti, 2019). Furthermore, to see the effect of the treatment on the experiment with the One-Group Pretest-Posttest Design, can be seen from the comparison or difference of O1 and O2 (Fatmala et al., 2017).

3. RESULTS AND DISCUSSION

The following presents the results of the pre-test and post-test results of scientific literacy learning during the learning process using the STEM (Science, Technology, Engineering and Math) learning model.

The initial score data (pre test) on the basic IPA learning of the water cycle before being given the treatment was processed. And then data on increasing students' scientific literacy before learning (pre test) is presented in the Table 2.

Table 2. Students' mastery of concepts
before learning (pre test)

Num	Computed factors	Pre test score data
1	Average (x)	44,76
2	Standard Deviation	8,44
3	Maximum Score	60
4	Minimum Score	30

Final score data after being given treatment (post test) on science learning the subject of the water cycle was processed. And tehan Table 3 shows descriptive data of concepts after learning (post test).

Table 3. Students' mastery of concepts after
learning (post test)

Num	Computed factors	Post test score data
1	Average (x)	71,20
2	Standard Deviation	6.70
3	Maximum Score	85
4	Minimum Score	60

Based on the calculation of the Wilcoxon test, the scientific literacy score shows an increase, with the highest score being 85 and the lowest being 60. The pretest and posttest scores for all children show no negative ranking score (-), so all rankings are given a positive sign (+). Next, the positive and negative ranking signs are added up then the result of the smallest sum is taken to be Tcount. Based on the calculation, the value of Tcount = 0 is obtained, namely the amount with the smallest absolute price. The critical value for the Wilcoxon test is 0.5 and N = 21 (number of samples) and from the Wilcoxon test list, Ttable = 59

The hypothesis put forward in this study is that there is an increase in scientific literacy results after applying the STEM (Science, Technology, Engineering and Math) learning model to science learning with water cycle material in class V students at SDN Cipinang Besar Utara 03. To test the hypothesis results there are criteria for taking decision by testing H1, namely:

(Ha) Accepted if (Thitung) < TTable

Based on calculations through the Wilcoxon test with n = 21 at a significant level of 0.05, Ttable = 59, then Ha is accepted because Tcount (0) < Ttable (59) means that the proposed hypothesis is accepted. This shows that STEM learning has a significant influence on the scientific literacy of fifth grade students.

Improvement in student learning outcomes can be seen from the results of the pre-test and post-test where there are significant changes in learning outcomes before being given treatment and after being given treatment. The highest score obtained by SN with a value of 85 and the lowest score obtained by F, GH and M with a value of 60. The value of the learning outcomes of 21 students using STEM learning has achieved a KKM score of 70 and the average score of the 21 students experienced an increase from the pre-test average of 44.76 to the post-test average of 71.20.

Based on the results of research using the STEM learning model can improve students' scientific literacy skills. Increasing students' scientific literacy skills can also shape students into citizens who have scientific ideas, creativity, intellectual abilities, reasoning and concern for the community environment (Fa'idah & Mahanal, 2019). Anticipate in response to the negative impact of the development of technology and science. With a strong understanding of science, students can understand the interactions of science, technology and society well (Abidin et al., 2021).

Integration of science, technology, engineering, and mathematics in STEM learning has an impact positive on the development of students' scientific literacy skills. On every step of science

learning directs students to reasoning and making discoveries, so that students do not only limited to an understanding of scientific concepts, but also can use his knowledge to solve various problem. (Yuliati & Saputra, 2019). Phenomena related to low scientific literacy in Indonesia shows that the world of education in Indonesia still needs to improve self. One of them is by implementing oriented learning in active students, learning using the STEM approach requires students to have the knowledge and skills together to solve a problem related to the environment by utilizing technology. (Rohmah et al., 2019)

4. CONCLUSION

Based on the results of work on and analysis of data on discussion data and research results regarding STEM learning methods as an effort to improve students' scientific literacy skills, it can be concluded that there is a significant increase in science learning on the water cycle material. The increase in students' scientific literacy skills can be seen from the difference in pretest scores with an average of 44.76 which are spread between scores of 30 to 60 and post-test scores with an average of 71.20 which is spread between scores of 60 to 85. The test results also reinforce the statement that there is an increase in learning outcomes obtained using the Wilcoxon Test with the results Ha = Tcount (0) < Ttable (59). Thus the hypothesis in this study is accepted, namely that there is an increase in students' scientific literacy skills by applying the STEM learning model.

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