

STEAM APPROACH USING INQUIRY LEARNING MODEL ASSISTED BY LIVEWORKSHEET TO IMPROVE LITERACY MATHEMATICS FOR FOURTH GRADES ELEMENTARY SCHOOL STUDENTS

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ABSTRACT

Education is a quite important aspect for every individual, especially in elementary school. This is due to carrying out life in the future in a global era that is full of challenges. So there needs to be awareness from everyone regarding the existence developments, thus learning patterns that are oriented towards technology-based learning needed. The aim of this research was to analyze the role of the STEAM (*Science, Technology, and Mathematics*) model in learning activities in elementary schools so that students can have critical thinking skills and encourage improving mathematical literacy skills IV at SD Negeri Trosemi 02 Gatak, Sukoharjo in cycle II. The research methods used to collect data are in the form of observation, and documentation. From the research carried out, it was found that: By implementing the STEAM approach with the Inquiry Learning model assisted by Liveworksheets, it can improve mathematical literacy and learning outcomes in Fourth grades students. Average percentage of students classical learning increased from cycle I by 83.33% to 94.4% in cycle II.

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1. INTRODUCTION

Nation is large nation and is very capable of surviving and developing in the 21st century. However, Indonesia still needs cultural literacy with mutually supportive and integrated education. Education can start from the family, school and then students or students can continue it. Carrying out activities that provide encouragement so that character develops is a manifestation of the progress of a nation, especially in the current era of globalization. Reading and writing, numeracy, digital, science, culture and financial literacy are six literacies that students should master (Ministry of Education and Culture, 2018). One of the literacies that is quite important is numeracy literacy, which in basic education numeracy literacy is realized by learning Mathematics. Mathematics one of subjects that plays a very important role in education and in dealing with problems in everyday life ((Dyansih & Ali, 2015).

Mathematical literacy is that is very so that it can used as a focus for achieving learning activities in the 2013 curriculum (Wahyuni, 2020:25). A survey carried out by PISA (Program for International Student Assessment) stated that mathematical literacy is an important aspect to support the abilities students the world (Siswono, et al, 2018: 1). Mathematical literacy is ability that a person has in the formulation, application, reasoning and interpretation of mathematics in 2 contexts, namely that students will be able to carry out mathematical reasoning by using concepts, procedures and facts in providing descriptions, giving explanations

or making estimates of phenomena or incident (Kuswidi, 2015). Indicators regarding mathematical literacy abilities can be described as follows: 1) formulating mathematical situations, applying mathematical concepts, facts, procedures and reasoning, 3) interpreting, applying and evaluating mathematical results (OECD, 2017).

This mathematical literacy ability provides assistance for someone to have an understanding of the role of mathematics in daily life and at the same time use it in making various appropriate decisions regarding several phenomena or various events that occur in everyday life (Asmara, S. B., & Rochmad, 2017). In the opinion of (Masjaya & Wardoyo, 2018) those who make the statement, someone with mathematical literacy skills does not just understand mathematics but is also capable of using it to solve problems in everyday life. This also includes carrying out mathematical reasoning and using concepts, stages, facts and mathematical tools in providing explanations and making predictions about a phenomenon as well as using it in making correct decisions regarding several existing problems. (Yuberta, Nola, & Gustia, 2020)

From the interview activities carried out by researchers with class teachers regarding mathematics in Fourth grades students Trosemi 2 Gatak. Teachers have tried to carry out good teaching, such as providing guidance for students in carrying out learning activities and providing solutions when students experience learning difficulties. However, there are various obstacles faced by teachers during the learning activities, namely that some only the formula but without the concept so students find it quite difficult to apply it to several problems. Students have difficulty interpreting some questions and finding solutions if given different assignments. Then the researcher further conducted an interview with one of the fourth grade students at SD Negeri Trosemi 2 Gatak so that it was found that some students did not fully understand how to solve all mathematics problems. It is not uncommon for students still feel confused if the questions or assignments are not the same as the example questions presented by the teacher previously. Based on interviews conducted researchers with teachers and students, it is known that there are various factors that provide encouragement for low mathematical literacy skills, namely internal and external.

The low ability literacy of students is generally due to the lack of attention paid by students to each teaching and learning activity. So that do not understand what being taught the teacher in learning activities as part of internal activities. Therefore, the thing that should be considered is how to provide various new innovations that are used as learning media so that students' motivation in learning activities increases and they are able to provide literacy support for students' mathematical abilities. In providing support abilities, there needs to be appropriate learning media so that students can understand the material provided by the teacher.

Inaccuracy in using methods in mathematics learning activities can have an impact on students' interest and achievement in learning activities as stated by (Danielson, 2002) students who get higher achievements generally show a positive attitude and it is much better to carry out learning activities using the methods referred to based on the established curriculum. Using inappropriate learning methods can have an impact on students' lack of interest in mathematics learning activities. This can make students' achievement in mathematics learning quite low. The learning method that is attempted can encourage students' interest in carrying out mathematics learning activities, namely inquiry based learning which can be understood as a learning method that involves full student activity in learning activities (Danielson, 2002; Kuhlthau, Maniotes, & Caspari, 2007). Inquiry can be understood as a learning method in which students can obtain and use various sources of information and various ideas in increasing students' knowledge regarding certain issues, problems and topics. In the inquiry learning method, there needs to be investigation, exploration, search, research, as well as learning stages in solving problems. In this method, students' interests are prioritized and provide challenges for students in connecting their world with what is being studied.

The success or failure of a learning activity does not depend the learning media but also on the methods and approaches used (Ramalisa & Pasaribu, 2015). One approach to learning activities that can encourage students' mathematical literacy skills to develop is Science, Technology, Engineering, and Mathematics (STEAM) approach. STEAM is a development of the STEAM approach and provides additional "ART" which aims to encourage the development of students' abilities to investigate, communicate and have critical thinking skills in learning activities (Sari & Setiawan, 2020). STEAM is an approach to learning activities that accommodates science, technology, engineering arts and mathematics abilities (Nasrah, Amir, & Purwanti, 2021). The STEAM approach is a contextual learning approach that can provide encouragement for students to have an understanding of various phenomena in life (Hadinugrahaningsih, 2017). By implementing the STEAM approach, it is hoped that students can have a deep understanding of mathematics easily because it is related to everyday life (Tabi'in, 2020:39)

Based on the background description that has been explained in the previous section. So the researcher wants to carry out research with the title "STEAM Approach with Liveworksheet Assisted Inquiry Learning Model to Improve Mathematical Literacy of Fourth grades Students at SD Negeri Trosemi 2" .

2. RESEARCH METHODS

In this research, a classroom action research design or Classroom based action research was used, the aim of which was to encourage mathematical literacy in Fourth grades students at SD Negeri Trosemi 2 Gatak Sukoharjo. The research implementation time is divided into 2 cycles, each cycle consisting of 3 stages, including planning, implementation and reflection. Various experts state that the action research model according to Arikunto (2010:137) can be described as follows:

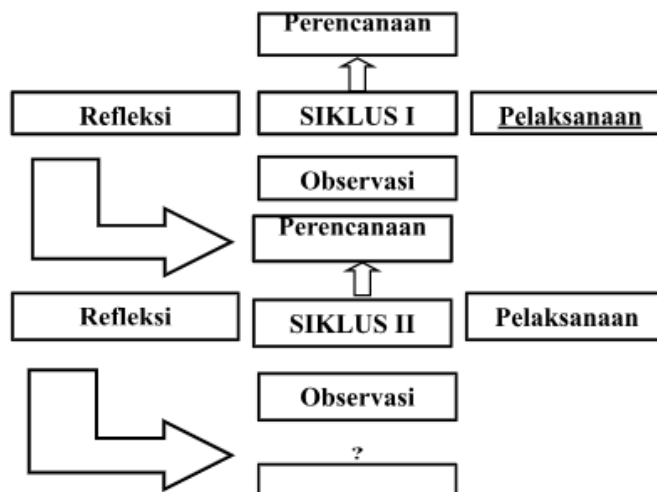


Figure 1. Action research flow (Arikunto, 2010:137)

The research subjects were all Fourth grades students in the 2023/2024 academic year who used the independent curriculum. This research was conducted in the odd semester 2023/2024, to be precise in November 2023, for 2 cycles. The number of research subjects was 18 *students*, with details of 9 male *students* and 9 female *students*. The research object is the STEAM approach with the Inquiry Learning Model assisted by *Liveworksheets*. In this research, the methods used to collect *n* data are as follows:

1) Observation

Observation can be stated as an activity in collecting data by carrying out direct observations regarding the existence of symptoms, phenomena and empirical facts that are closely related to the research problem (Musfiqon, 2012). In this research, an observation sheet was used which the researcher used to look at how the implementation of the STEAM approach was used in the experiment. In implementing this STEAM-based approach, it is presented by providing conclusions from the research results expressed in several sentences (Belbase & Mainali, 2022)

2) Test

Tests are generally used to provide grades and carry out measurements regarding student learning outcomes, especially cognitive learning outcomes related to mastery of teaching materials that are in line with the learning objectives (Sudjana, Nana, & Ibrahim, 2009). giving tests to students to find out how far students have developed or understood students after implementing a STEAM-based approach. Measurements are carried out by giving mathematical questions related to multiples and factors. Questions are given via *Liveworksheet (WORKSHEET)* where students are given a web link or barcode code that can be scanned using a smartphone. The type of question given is a mathematical literacy essay

3) Documentation

Sugiyono (2013), defines documents as records of *events* that have passed. The document can be in the form of a picture, tool, or monumental work *from someone*. The document used in this research can be in the form of a list of student groups and a list of student grades. Documentation can be in the form of photos and videos which are used to provide a realistic depiction of student group activities and the classroom atmosphere when learning activities are carried out.

3. RESULTS AND DISCUSSION

Of the students' ability to think critically in cycle one, it was obtained from the *ability test* to think critically which was carried out at the third *meeting* in cycle 1. The distribution of the results of *n* *ability* in critical thinking is presented in table 1.

Table 1. Value Critical Thinking ability of Students Cycle I

No.	Intervals	Category	Frequency	Percentage (%)
1	85-100	Very good	6	33.3 %
2	75-84	OK	9	50 %
3	55-69	Enough	2	11.1 %
4	40-54	Less	1	5.5 %
5	0-39	Very less	-	-

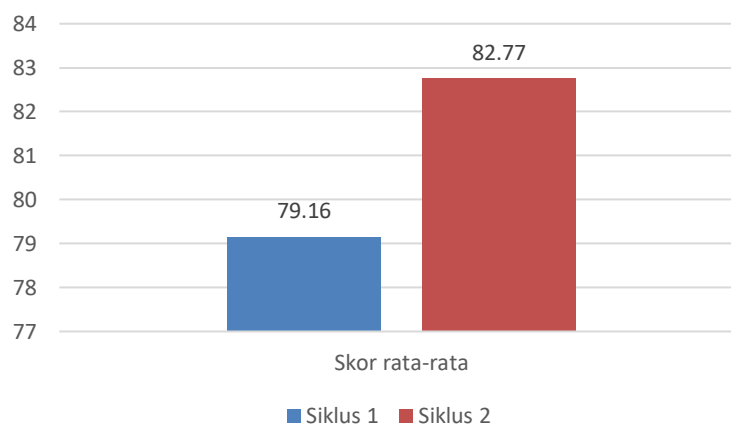
From Table 3 it can be seen that the test results regarding the critical thinking abilities of students in Fourth grades of SD Negeri Troseme 02 Gatak, Sukoharjo are classified as being in the good category. These findings are quite satisfying for researchers because the findings regarding the critical thinking abilities of fourth grade students at SD Negeri Troseme 02 Gatak, Sukoharjo are good but still need improvement. The results of the critical thinking ability test cycle I were able to reach an average score of 79.16

In cycle 2, this was obtained by carrying out critical thinking ability tests which were carried out at the sixth meeting in cycle 2. The following findings are presented in table 2.

Table 2. Values Abilities Critical Thinking Cycle II Students

No.	Intervals	Category	Frequency	Percentage (%)
1	85-100	Very good	7	38.8 %
2	75-84	OK	10	55.5 %
3	55-69	Enough	1	5.5 %
4	40-54	Less	-	-
5	0-39	Very less	-	-

The table shows that the test results indicate the critical thinking ability of Fourth grades students at SD Negeri Troseme 02 Gatak, Sukoharjo relatively good. In cycle II students were able to achieve an average score of 82.77. The distribution of average learning scores in cycles 1 and II occurs in the following graph,

**Figure 2. Average Score for Learning Activities**

Based on the guidelines for classifying student responses, the average score of student responses when implementing the guided inquiry learning model using the existing STEAM base is in the positive category. This means that students can accept the implementation of the learning model that has been used. Findings regarding students' critical thinking abilities by implementing a guided inquiry model based on STEAM. The ability to think is in the low category with an average score n of 66.94 with learning completeness of 44.44% while in cycle I the ability to think students is in the good category with an average score n of 79.16 with completeness of 83.33% and increasing in the II cycle to n of 82.77 with classical completeness of 94.4% but still in the same category, namely "good"

These results strengthen the results of previous research carried out by (Iman, Ibnu, & Nasrullah, 2017) and (Nisa, Koestiari, Habibullah, & Jatmiko, 2018) with the result that the guided inquiry learning model can encourage increased students' critical thinking abilities. Apart from that, the results from (Lai, 2018),

(Mutakinati, Anwari, & Yoshisuke, 2018), and (Soros, Ponkham, & Ekkapin, 2017) obtained similar results that the implementation of the STEAM model was able to improve students' thinking abilities.

A research is declared successful if the STEAM model has been established and is then able to encourage student learning activities to increase to at least the high category. Based on the results of the analysis carried out, the implementation of the STEAM model can encourage student learning activities in class. As the results (Taringan, Juliani, & Limbong, 2018) state that this model can encourage students' learning abilities.

Referring to the results of the questionnaire regarding student responses, it was found that student responses to the STEAM-based guided inquiry learning model had a score of 80.96 and were in the very positive category. This means that students can implement the learning model implemented.

Based on the activities carried out at the end of each cycle, it is known that there were various obstacles that occurred during the implementation of the guided inquiry learning model with a STEAM basis in Fourth grades of SD Negeri Trosemi 2 Gatak Sukoharjo. Various obstacles that occurred included: 1) learning activities in cycle I had not proceeded optimally. This can happen because students are still not used to the new learning system; 2) students experiencing quite a lot difficulty in formulating problems and proposing hypotheses on the problems stated in the worksheet, 3) students' lack of ability in practicum; 4) there are fluctuations in students' motivation, enthusiasm, concentration and readiness to receive learning. From these obstacles, a solution was found, namely: 1) teachers can repeat the stages of the STEAM-based learning model with students periodically; 2) the teacher tries to understand the students again by formulating problems, proposing hypotheses properly and correctly. 3) the teacher provides practicum information several days before the practicum is carried out by students; 4) carrying out additional ice breaking when learning is deemed less conducive, such as light sports, games, sharing and various other activities can restore students' focus in class.

Meanwhile, the results of *observation* activities and evaluations of actions in cycle II can be presented as follows: 1) the learning stages in cycle II show learning conditions that are quite conducive compared to before, 2) in carrying out problem formulation and proposing hypotheses on the problems obtained. On the WORKSHEET it can be stated as good, 3) in carrying out the practicum students are able to use practicum tools that are in harmony with the *n* procedures. 4) during the learning stage there is an increase in concentration, *motivation* and readiness for learning.

4. CONCLUSION

Based on research results class actions in learning Mathematics on Multiples and Factors material by applying the STEAM approach with the Inquiry Learning model assisted by *Liveworksheet* to Improve the Mathematical Literacy of Fourth grades Students at SD Negeri Trosemi 2, it can be concluded that the application of the STEAM approach with the Inquiry Learning model assisted by *Liveworksheet* increase interest in reading or mathematical literacy. " This can be seen from the students' critical thinking ability before implementing the STEAM - based guided inquiry learning model and is in the low category with an average score of 66.94 with classical completeness of 44.44%. whereas in first cycle's ability to think critically was in good category with an average score of 79.16 with classical completeness of 83.33% and experienced an increase again in cycle II to of 82.77 with classical completeness of 94.4% but is still in the same category, namely good category.

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