

EFFECTIVENESS OF SOCIO-SCIENTIFIC ISSUES WITH MIND MAPPING STRATEGY ON STUDENTS LEARNING OUTCOMES ON HEAT TOPIC

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Abstract: This study aims to describe student learning outcomes in the knowledge aspect by implementing the socio-scientific issues method with a mind mapping strategy. The type of research uses a pre-experimental design with a one-group pretest-posttest design. The studied samples consisted of 32 students of grade eight junior high school SMP Negeri 14 Gresik, Indonesia. Data was collected using instruments in the form of learning implementation observation sheets, student response questionnaire sheets, and test assessments. The results of this study, namely: (1) the implementation of learning with the socio-scientific issues method with a mind mapping strategy at each stage got a very good category; (2) the application of the socio-scientific issues method with the mind mapping strategy received a very good response; (3) learning outcomes in the knowledge aspect showing an increase as evidenced by the N-gain average value in the high category.

Keywords: *Socio-Scientific Issues, Mind Mapping, Learning Outcomes*

INTRODUCTION

In Indonesia, four aspects of assessment are emphasized in the main principles of the 2013 curriculum, namely aspects of knowledge, skills, attitudes, and behaviors that are expected to provide comparable qualities between hard and soft skills [1]. The learning process from the 2013 curriculum is expected that students can play a more active role by providing challenging, inspirational, fun, and interactive learning and motivating students, especially in the aspect of knowledge that is very important for students to know [2].

Cognitive knowledge is student knowledge related to students' ability to think. Cognitive knowledge is very important in learning [3]. Learning is an activity in helping students get the knowledge that has been designed as well as possible to support the student's learning process [4].

The learning used in the 2013 curriculum should be learning that can be student-centered so that students can be actively involved in learning. However, in reality, many schools still have not been optimal in implementing the 2013 curriculum [5]. It can be seen from the number of teachers who use the lecture or other teacher-centered methods, especially with the current situation, namely the Covid-19 pandemic. The COVID-19 pandemic has brought major changes to the world of education. The education system that changed from offline to online caused students to lack understanding of learning concepts, so student learning outcomes decreased [6].

In 2022, along with the decline in the Covid-19 rate in Indonesia, the government, in this case, the Education Office, began implementing a limited face-to-face meeting policy. There is a difference between limited face-to-face learning and learning in the pre-Covid-19 pandemic, which lies in the

classroom and the number of students who enter the classroom. At the time of limited face-to-face meetings, limited class hours only lasted for 30 minutes, and the number of incoming students was only 50% of the number of students [7].

Innovative learning methods and interesting learning strategies are needed to improve student activities and learning outcomes, one of the learning methods for socio-scientific issues [8]. The socio-scientific issues method is a method with a learning process that requires students to be more active in learning in the classroom. This method is similar to the problem-based method, where the learning process is carried out through contextual problem recognition. The difference lies in the development of the problem [9].

Socio-scientific issues can be implemented with several learning strategies [10]. Several learning strategies and tools have been designed to improve student learning outcomes, such as case-based teaching, role-playing, problem-based learning, discussion groups, didactic learning, concept maps, and mind maps. The mind mapping strategy is one way that can be used to improve student learning outcomes [11]. Mind mapping is an easy learning strategy to help students remember details and key points, understand the main concepts and see the relationship [12].

From the results of observations made with science teachers at SMP Negeri 14 Gresik school, socio-scientific issues have never been used before during learning. Socio-scientific issues with mind mapping strategies in science learners at SMP Negeri 14 Gresik have never been studied. The current study focus on finding the effectiveness of Socio Scientific Issues With Mind Mapping Strategy on Student's Learning Outcomes on Heat topic.

RESEARCH METHODS

This study uses a type of pre-experimental design research with a design of one-group pretest-posttest design to describe the effectiveness of the socio-scientific issues method with a mind mapping strategy toward improving learning outcomes in heat material. The study subjects used one class, namely VII-F, with 32 students. This research was conducted in the even semester of the 2021/2022 school year in May 2022 at SMP Negeri 14 Gresik.

Procedure

The data collected uses several methods, namely the observation method, the questionnaire filling method, and the test method. The observation method is used to obtain data on the implementation of learning by the lesson plans. The implementation sheet is filled out as the learning activities occur. Science students carry out observers of the implementation of learning. The questionnaire method aims to obtain student response data after participating in learning using the socio-scientific issues method with a mind mapping strategy. The test method is carried out by giving students multiple choice questions, as many as ten. The questions used are obtained from existing questions which are then developed and modified by socio-scientific issues. Questions are given to students before students get learning using socio-scientific issues (pretests) to describe students' initial knowledge. Then students are given the same questions after getting socio-scientific issues (post-test) learning to describe the students' final knowledge.

Instruments

This study used to pretest and pons-test tests, observations and questionnaires. Pretest and pons-test tests are used to measure students' cognitive abilities, which will later determine student learning outcomes. Pretest and pons-test questions are ten questions prepared by five critical thinking indicators. Observation instrument sheets are used in research to determine student learning outcomes in learning activities. Questionnaires are given to students to find their responses regarding their learning outcomes. Observation, the implementation of learning, is seen when students do questions from the teacher.

Data Analysis

The analysis process is carried out when the entire data obtained by the researcher has been obtained completely. The analysis of the implementation data that has been obtained is calculated by calculating the percentage of the score obtained using the following equation:

$$P = \frac{\text{number of observation scores}}{\text{smax score}} \times 100\%$$

The percentage of the assessment results is then converted into the categories contained in the table:

Table 1. Category of Lesson Plan Implementation Observation

Percentage (%)	Information
P<25%	Not Good
25%≤P<50%	Less Good
50%≤P<75%	Good
P≥75%	Very Good

Data from student response questionnaires converted into quantitative form based on the Likert scale, namely a score of 1 category "Promising", a score of 2 categories of "Disagree", a score of 3 categories of "Agree", a score of 4 categories of "Strongly Agree" that has been converted in quantitative form, calculated the percentage of each question item using the formula:

$$\%NRS = \frac{\sum_{i=1}^n NRS}{NRS \text{ maksimal}} \times 100\%$$

The percentage obtained on each statement is interpreted according to the following categories:

Table 2. Student Response Percentage Category

%NRDS	Category
25% ≤ %NRS < 43%	Not Good
44% ≤ %NRS < 62%	Less Good
63% ≤ %NRS < 81%	Good
82% ≤ %NRS < 100%	Very Good

The completeness of learning is measured if each student's post-test score can reach the Minimum Completion Criteria (MCC) score [13]. The Minimum Completion Criteria (MCC) score at SMP Negeri 14 Gresik is 75, so if the student's post-test score ≥ 75, then the student can be said to be complete in learning. In knowledge, the magnitude of an increase in learning outcomes is known based on the results of the N-Gain calculation.

RESULTS AND DISCUSSION

This research was carried out at SMP Negeri 14 Gresik for two meetings. After conducting research in the form of "The Effectiveness of Socio Scientific Issues with Mind Mapping Strategy on Student's Learning Outcomes on Heat Material," several data were obtained as follows:

Implementation of Learning

Observation of learning implementation aims to describe the teaching and learning process carried out by the Learning Implementation Plan (LIP) that has been made. Science students carry out observers of the implementation of learning. A recapitulation of the data from the observation of the

implementation of the learning process at 2 meetings is shown in Table 3.

Table 3. Percentage of Learning Implementation of Each Stage

No	Fase	Meeting	
		I	II
1	Introduction	100%	87.5%
2	Present goal and set	87.5%	75%
3	Present information	100%	100%
4	Organize students into learning teams	100%	100%
5	Assist teamwork and study	87.5%	100%
6	Test on the materials	100%	100%
7	Provide recognition	75%	100%
8	Penutup	87.5%	100%

Table 3 shows the percentage of implementation of each stage of learning using the socio-scientific issues method with a mind mapping strategy during 2 meetings. In the preliminary stage, the percentage at meeting 1 and 2 were obtained by 100% and 87.5%, respectively. In the Present goal and set stage, the percentage at meeting 1 and 2 were

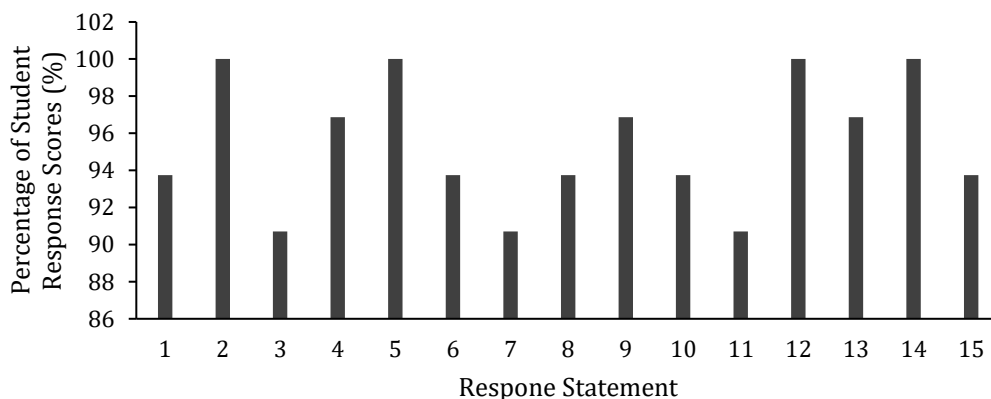


Figure 1. Percentage Diagram of Student Responses to Learning

Figure 1. is a diagram of the student's response percentage. The picture shows that the percentage of each item of the student's response statement is from 90.7% to 100%. Based on the student response percentage category, where if the percentage of student responses has a score of $82\% \leq \% \text{NRS} \leq 100\%$, then the response is classified as a very strong category [14].

Learning Outcomes

Learning outcomes are abilities humans have obtained after the learning process [16]. Learning outcomes can be observed in many aspects: skills, knowledge, and attitudes [17]. Learning results in the aspect of knowledge are obtained from the value of pretest and post-test work. The pretest is a question before learning with the socio-scientific

obtained by 87.5% and 75%, respectively. In the present information stage, the percentage at meeting 1 and 2 were obtained by 100%. In the stage, organizing students into learning teams obtained percentage at meeting 1 by 100% and meeting 2 by 100%. In the assist teamwork and study stage, the percentage at meeting 1 was obtained by 87.5% and meeting 2 by 100%. In the Test on the materials stage, the percentage at meeting 1 was obtained by 100% and meeting 2 by 100%. In the Provide stage, recognition was obtained percentage at meeting 1 by 100% and meeting 2 by 75%. In the Closing stage, the percentage at meeting 1 was obtained by 87.5% and meeting 2 by 100%. Based on the data obtained, the learning carried out at each stage in each meeting with socio-scientific issues with mind mapping strategies has been carried out in a very good category.

Student Responses to Learning

Students' responses to learning were obtained by filling out the questionnaire with 15 statements. Students then fill in by putting a checkmark in the column with scores between 1 and 4. The percentage of response results is converted into a diagram shape as follows:

issues method with the mind mapping strategy applied. The post-test is a question after learning the socio-scientific issues method with the mind mapping strategy applied. The results obtained were analyzed by descriptive analysis of N-Gain, which can be seen in the following table:

Table 4. Recapitulation of Pretest Value Results, Post-test Value, and N-Gain

Component	Number of Students	Lowest Value	Highest Value	Average
Pretest	32	10	65	35.63
Post-test	32	65	100	81.94
N-Gain	32	0.61	1.00	0.72

Table 4. is a table and analysis of pretest, post-test, and N-Gain results obtained from class VII-F students of SMP Negeri 14 Gresik. This table shows that the learning outcomes of 32 students improved to various criteria.

The average student pretest score tends to be low at 35.63 because the questions are given as a reference to see the initial knowledge when students have not studied the material and before the socio-scientific issues learning method is applied. After students had studied the material and applied the socio-scientific issues method with mind mapping strategies, the average post-test score of students increased to 81.94. It indicates that the student's average post-test score has increased from the average pretest score. It can be seen an increase in learning outcomes from normalized N-Gain.

The average n-Gain score of students in Table 6 is 0.72, which is included in the high category. It shows that the socio-scientific issues method with the mind mapping strategy applied to classes VII-F influences learning. It can be seen that the results of the post-test scores are better than the results of the students' pretest scores. It is by research from Marpuang shows that students are said to have an increase in learning outcomes with a high category if they have an average score with a gain score of $\langle g \rangle \geq 0$ [18].

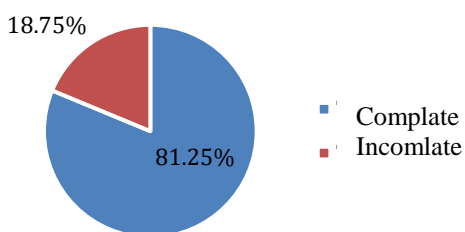


Figure 2. Completeness Diagram of Student Knowledge Learning Outcomes

Figure 2 shows that 81.25% of students have a post-test score with a complete category, and 18.75% of students have a post-test score with an incomplete category. The incompleteness in the students is caused because the scores obtained have not reached the minimum completion criteria. Students are declared complete in learning if they get a score of ≥ 75 , the minimum completion criteria score for science learning. The data obtained show that the learning carried out is effective and successfully used to improve learning outcomes. If the number of students who complete the minimum completion criteria $> 75\%$, then learning is said to be effective and successful [7].

CONCLUSION

There is an increase in learning outcomes through applying socio-scientific issues with mind

mapping strategies. The learning results that occur at each stage in each meeting occur very well. The data analysis on the response questionnaire shows that the student response is very good. The average percentage of student responses from the fifteen statements was 95.43%, with a very strong category. The use of socio-scientific issues with mind mapping strategies is effectively used to improve student learning outcomes. Student learning outcomes have increased, as evidenced by the average n-Gain score of all students of 0.72 in the High category.

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