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IMPLEMENTATION OF SOCIO-SCIENTIFIC ISSUES LEARNING TO IMPROVE STUDENTS CRITICAL THINKING SKILLS

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Abstract: This study aims to describe the implementation of socio-scientific issues learning, critical thinking skills, and student learning responses. This research is quantitative. This pre-experimental study used the One Group Pretest Post-test Design. The subjects in this study were 23 students of class VIII B at UNESA YDWP Laboratory Middle School. The instruments used were observation sheets of learning implementation, critical thinking skills test sheets, and response questionnaire sheets. Data analysis techniques on learning implementation sheets and response questionnaires were calculated based on the mode value, then on critical thinking skills using t-test analysis and effect size. The study results showed that learning socio-scientific issues can be carried out in very good categories. Students' critical thinking skills have increased as indicated by the acquisition of the t-test of critical thinking skills tcount > ttable or 18.852 > 2.074 with a significance level of 0.000 <0.05, so H0 is rejected, and Ha is accepted. So, it shows a significant difference in value between the pretest and post-test scores. Calculating the effect size of critical thinking skills was also carried out with a value of 3.924 in the very large category so that socio-scientific issues learning effectively influenced critical thinking skills. The results of student responses agree on learning socio-scientific issues that are interesting, easy to understand, and useful for everyday life. Thus, there is an increase in students' critical thinking skills after applying socio-scientific issues learning.

Keywords: *Critical Thinking, Socio-scientific Issues*

INTRODUCTION

In the 21st century, competition will be increasingly stringent, where technological advances and facts are developing very quickly, affecting all areas of life, education being one of them [1]. Students are not only required to prioritize cognitive skills but also to master various skills [2]. Skills can be formed when a person trains, sharpens, and develops his mind and thoughts. One of the skills that someone needs to master in the 21st century is critical thinking skills [3].

Critical thinking skills play an important role for students because they allow them to explore and solve problems in the educational process and everyday life [4]. Critical thinking skills can be grown with learning strategies that include active students directly [5]. Critical thinking skills can be obtained from students' skills in studying facts around them and making solutions to problems so that students with responsive thinking skills are only easily influenced by people's opinions if they understand the truth [6].

Socio-scientific Issues learning is learning that presents problems in everyday life in the context of science and the social environment, so applying Socio-scientific Issues learning will raise students' interest in controversial issues in everyday life [7]. Learning Socio-scientific Issues is closely related to critical thinking skills because the learning process will require students to analyze problems and make decisions [8].

Based on the results of observations and interviews with science teachers, class VIII B they were stated that students' critical thinking skills were said to be lacking. Based on the researcher's initial skills findings, the average student gets a score below 70 from the minimum completeness criteria score of 80. In addition, sometimes, students do not play an active role in learning; they only receive material from the teacher. Students need to proactively ask questions or voice their ideas. Lack of student involvement in learning causes low critical thinking skills [9]. One of the efforts that can be made to overcome these problems is to apply an appropriate approach to improve student skills, such as the Socio-scientific Issues (SSI) approach [10].

Based on the findings of the problems obtained by the researcher interested in raising the title "Implementation of Socio-scientific Issues Based Learning to Improve Critical Thinking Skills

RESEARCH METHODS

This research is quantitative. The design of this pre-experimental study was One Group Pretest – Post-test. The One Group Pretest Post-test Design scheme can be seen in Table 1. as follows:

Table 1. Scheme of One Group Pretest-Posttest

Pretest	Treatment	Post-test
O_1	X	O_2

[11]

The instruments in this study used learning implementation observation sheets, critical thinking skills test sheets, and student response questionnaire sheets.

The implementation data collection technique is carried out by observation to review how the implementation of Socio-scientific Issues learning is

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implemented. Collecting data on critical thinking skills were obtained through the results of the pretest and post-test to see students' critical thinking skills before and after being given treatment. The collection of response data was obtained through a response questionnaire after the application of learning. To collect responses from students on learning Socio-scientific Issues. The following are the data analysis techniques used in this study:

Analysis of the implementation of learning

Implementation data obtained from the observation sheet will be analyzed based on the criteria in Table 2 as follows:

Table 2. Criteria for the value of learning implementation

Value	Criteria
4	Very good
3	Good
2	Enough
1	Not good

[11]

The implementation of the Socio-scientific Issues learning will be calculated based on the value of the observation sheet acquisition mode.

Analysis of critical thinking skills

The results of the pretest and post-test of critical thinking skills will be analyzed using the t-test. Before calculating the t-test, a prerequisite test, namely the normality test, will be carried out to determine the normality of the pretest and post-test data. After the data is declared to be normally distributed, the t-test is calculated using SPSS 26 with a significance level of (a) = 5% if the significance value (sig) <0.05 means that Ha is accepted and H0 is rejected [12]. There is a significant difference between pretest and post-test critical thinking skills.

Critical thinking skills data is also calculated as effect size. This effect size is used to determine the effectiveness of learning Socio-scientific Issues on students' critical thinking skills. The effect size formula for one class is as follows:

$$ES = \frac{\bar{x}\ \text{post-test} - \bar{x}\ \text{pretest}}{\text{Population standard deviation}}$$

The calculation results are then interpreted according to Table 3 as follows:

Table 3. Effect Size Interpretation

Effect size	Interpretation
$0 \leq ES \leq 0.20$	Kecil
$0.20 \leq ES \leq 0.50$	Sedang
$0.5 \leq ES \leq 1.00$	Besar
$ES > 1.00$	Sangat besar

[13]

Analysis of student responses

Student response data obtained will be analyzed based on the criteria in Table 4 as follows.

Table 4. Learning Response Value Criteria

Value	Criteria
4	Strongly Agree
3	Agree
2	Little Bit Agree
1	Disagree

[14]

Student responses to learning Socio-scientific Issues will be calculated based on the questionnaire acquisition mode.

RESULTS AND DISCUSSION

Implementation of learning

The implementation of learning during the two meetings was observed by three observers using observation sheets on the implementation of learning that had been adapted to the syntax of the problem-based learning model with the socio-scientific issues approach. Observation of the implementation of learning aims to assess the quality between the teacher's stages of teacher learning and the learning stages in the lesson plans. The learning implementation mode is presented in Figure 1 as follows.

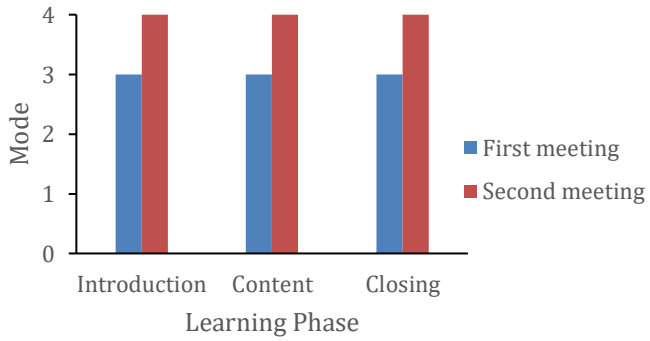

Figure 1. Learning Implementation Mode

Information: 1 = Not good
2 = Enough
3 = Good
4 = Very good

In the preliminary activities, the researcher started the lesson by greeting, praying together, giving apperceptions, and conveying learning motivation. In the preliminary activities, there was an increase at each meeting from good to very good category. It is because, in the first meeting on aspects of delivering apperception and student motivation, they still needed help to answer spontaneously when the researcher asked questions. Then in the second meeting, there was an increase because students could provide answers when the researcher gave a question related to a

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problem, so apperception and motivation at the second meeting increased and went well.

The core activity starts with dividing student study groups then students are distributed student worksheets. Students in groups were asked to identify the problems in the articles presented in the student worksheets. Students discuss with their groups to analyze the problem and then are asked to find out the impact of the problem to make a solution to the problem presented. The core activities have increased at each meeting from good to very good category. The aspect of stating the problem and making solutions has increased. It is because, at the first meeting, students still need more confidence in expressing opinions and ideas. Then in the second meeting, students are used to expressing opinions and ideas with their group mates.

In closing activities, students can ask questions, give appreciation, and pray together. This closing activity obtains the mode in the very good category. While carrying out learning activities, students can complete learning well, starting from stating problems, identifying problems, presenting impacts, to making solutions to problems. So that the mode of obtaining the implementation of learning by applying the socio-scientific issues approach from the first meeting to the second meeting has improved very well.

Critical Thinking Skills

Critical thinking skills are high-level cognitive skills; critical thinking skills can help students to analyze information and problems more critically [15]. The student's critical thinking skills test given in this study contained five indicators of students' critical thinking skills, namely: 1) giving simple explanations, 2) building basic skills, 3) concluding, 4) providing further explanations, and 5) developing strategies and tactics. The average critical thinking skills test is presented in Figure 2. as follows.

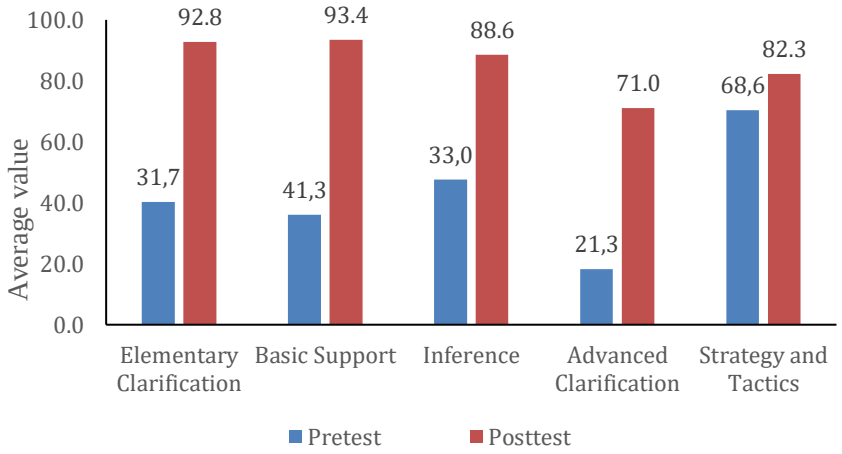

Figure 2. Average indicators of critical thinking skills

There was an increase in the five indicators, as seen from each indicator's pretest and post-test averages. The indicator elementary clarification experienced the highest increase, with an average pretest score of 31.7 and a post-test of 92.8. This increase occurred because socio-scientific issues learning required students to discuss and convey ideas in identifying problems so as to improve students' skills in elementary clarification. The increase in indicators is elementary clarification because students can identify problems through their learning activities [16].

The indicator of basic support increased from the average pretest score of 41.3 and post-test of 93.4. There is an increase in this indicator because, during the learning process, students are asked to observe a social problem in life and look for solutions to the problems given to build students' basic support [17].

The indicator inference that it has increased from the average pretest score of 33 and post-test of 88.6. There is an increase in this indicator because when students are able to observe and relate the problems presented, students can process information obtained globally into shorter, more concise, and clear inferences [18].

The indicator advanced clarification, increasing from the pretest average score of 21.3 and the post-test of 71. In this indicator, there is an increase because, in group learning activities, students can convey ideas and obtain feedback from their group mates so that they can increase student understanding. So students are accustomed to further explaining the problems presented [19].

As for the strategy and tactics indicators, there was a slight increase from the average pretest score of 68.6 and post-test of 82.3. The percentage obtained by students on this indicator was previously quite high in the pretest, and there was an increase again in the post-test, although only slightly. It is because students have previously been interested in learning activities that present problems requiring them to provide solutions related to everyday life. In applying learning with the socio-scientific issues approach, students together in groups will discuss strategies and choose the right strategy to solve problems. So that students can solve problems well. The indicators for developing strategies

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and tactics increase because students can try to analyze and solve a problem [16].

There is an increase in students' critical thinking skills after implementing socio-scientific issues learning. It is evidenced by the results of the paired t-test on the pretest and post-test scores of students' critical thinking skills. Prior to that, a normality test was carried out as a determinant if the data obtained was normally distributed, as shown in Table 5. as follows.

The results obtained a significant level at the pretest of 0.100 and the post-test of 0.077. Where the pretest and post-test results > 0.05, the pretest and post-test data are normally distributed. Then a paired t-test was carried out using SPSS, which is written in Table 6. as follows.

Table 5. Shapiro-Wilk Normality Test Results

Tests of Normality			
	Shapiro-Wilk		
	Statistic	df	Sig.
Pretest	.928	23	.100
Post-test	.923	23	.077

Table 6. Paired t-test results

	Mean	Std deviation	t	Df	Sig.(p)
Pretest-Posttest critical thinking skill	46.478	1.823	-18.852	22	0.000

Based on Table 6. the t-test that has been carried out, resulting in tcount > ttable or 18,852 > 2,074 through SPSS 26, also obtained a significance level (a) = 5%, which is 0.000 <0.05 so that H0 is rejected and Ha is accepted. It proves a significant difference in scores between pretest and post-test scores. As for effect size calculations, the results obtained were 3,376 in the very large category. It proves that learning Socio-scientific Issues effectively influences students' critical thinking skills.

The results of improving students' critical thinking skills are inseparable from learning activities that present Socio-scientific Issues. Socio-scientific Issues (SSI) learning is closely related to critical thinking skills because, during the learning process, students are expected to play an active role in everything from identifying societal problems and making solutions to concluding [20].

In learning Socio-scientific Issues (SSI), critical thinking plays an important role in describing and identifying aspects of science. Critical thinking skills will help critically examine information based on various sources used in explaining Socio-scientific Issues (SSI), including information on Socio-scientific Issues (SSI), which needs to be clarified [21].

Student learning response

Data on student responses to learning socio-scientific issues were obtained from the results of student response questionnaires. The questionnaire sheet includes 22 statements given and filled in by students after learning about problems socio-scientific during two meetings, with 23 students as respondents. Data on the results of student learning responses will be analyzed based on the mode values presented in Figure 3 as follows.

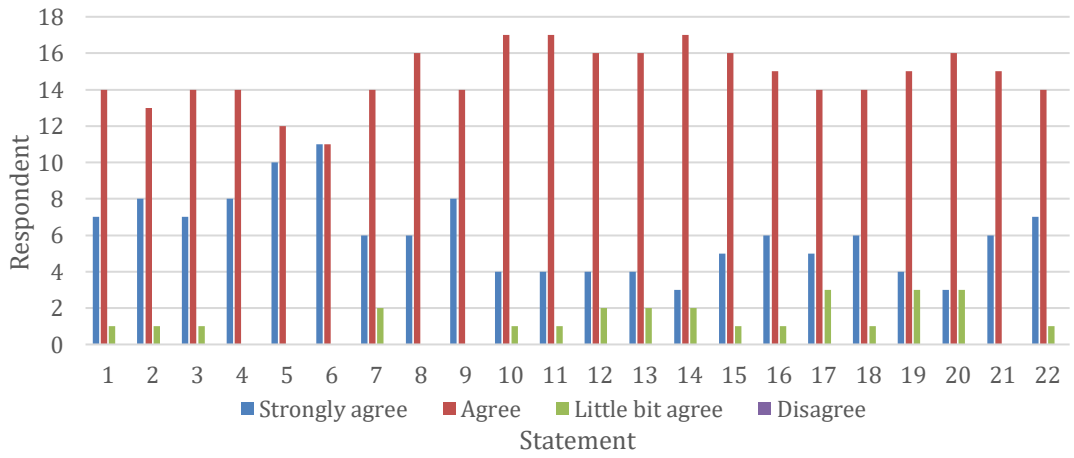

Figure 3. Student learning response

Student responses to learning tend to agree with all aspects of the statement. Almost all students agree that the phenomena presented in learning attract attention and can foster student motivation in learning. These results are supported by student responses related to exciting learning activities that make students more active in participating in learning. Almost all students agree that the lessons presented are easy to understand and encourage students to identify issues to improve students critical thinking skills.

CONCLUSION

The research results and discussion show that learning with the socio-scientific issues approach can be carried out very well. Students can complete learning, starting from stating problems, identifying problems, and presenting impacts to solving problems. Learning with a socio-scientific issues approach can improve students' critical thinking skills, as evidenced by the t-test results with a significant level of 0.000 <0.05 so that H0 is rejected and Ha is accepted, proving a significant difference between pretest and post-test scores. As well as the calculation of the effect size, the result is 3.924 with a very large category which indicates that socio-scientific issue learning effectively influences students' critical thinking skills. The application of socio-scientific issues learning also received a positive response from students. According to students, learning socio-scientific issues is interesting, easy to understand, and exciting because it presents problems in the surrounding environment, making students understand and remember more about the material being studied.

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