A Science and Technology Society Model to Enhance Critical Thinking Social Studies Students in Indonesia

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Abstract

The background of the problem in this study is the low critical thinking of students in class VIII B Og 10th Public Junior High School Yogyakarta, Indonesia. The aim is to improve student learning outcomes using the Science Technology Society learning model. This type of research is classroom action research conducted in two cycles. Each cycle consists of four stages: action planning, action, observation, and reflection. The results of this study indicate an increase in the value of student learning outcomes with a minimum completeness criterion of 70. As seen from students before the action, out of 34 students in class VIII B, only 11 students reached minimum completeness criteria, with a 32% percentage. Then, the action in cycle I to 23 students reached the minimum completeness criteria with a percentage of 67.65%. In cycle II, learning outcomes have increased, namely reaching minimum completeness criteria 27 students with a percentage of 79.41%. The conclusion is that the use of the Science Technology Society learning model can improve students' critical thinking in social studies subjects.

Keywords: critical thinking, learning model, science technology society

1. Introduction

Good education certainly requires effective learning strategies and processes through teacher skills in teaching in class. Teacher skills greatly support the learning process so that it is not monotonous. The learning process should be carried out interactively to motivate students to be active in learning. Therefore, teachers are required to create maximum planning to improve the learning process following learning objectives. In education, students need to think critically to determine the solution in solving a problem. Critical thinking is a thought process of a person managing his way of thinking more profound, not a way of thinking hard. Still, his critical thinking ability is processed in more detail his thoughts, something that is made concrete. According to Hidayah (2015); Agustini, et al. (2013), critical thinking is a cognitive activity related to reasoning / thinking power. Meanwhile, according to Arono., Arsyad, Syahriman., Nadrah., & Villia. (2022), thinking is an activity that helps to find true knowledge. Therefore, everyone has different thinking patterns because of the critical knowledge process. In honing essential thinking skills, learning is needed to improve this, such as learning Pancasila Education.

In social studies learning, there is character learning and understanding of problem-solving with critical thinking skills; through social studies, learning is expected to determine solutions and be able to overcome the problems encountered in everyday life. Content standards for primary and secondary education units issued by the Ministry of National Education (2006) stipulate that social studies subjects are subjects that focus on fostering understanding of citizens aimed at making citizens able to do what is the right and obligation as a citizen who is intelligent, skilled, and wise and has the characteristics or character following the values of social values, culture, and Humanist based on Pancasila and the 1945 Constitution. Therefore, in honing the skills of thinking critically, students need social studies learning and learning models that can support the learning process.

The initial observation process shows that the facts in the field regarding the critical thinking skills of class VIII B Og 10th Public Junior High School Yogyakarta students is quite low in social studies subjects. Through the interview process with the homeroom teacher concerned, the cause of the low critical thinking skills of students is due to the lack of an interactive learning process and the lack of active role of students in learning so that the process of teaching and

learning activities becomes monotonous focusing on the teacher not focusing on students. In addition to this, the transition period from elementary school to secondary school is also a contributing factor to the low critical thinking of students; therefore, through this study, researchers want to improve students' critical thinking through an interactive learning model.

Based on research conducted by Casey & Ganley. (2021). to improve students' critical thinking through the Science Technology Society model. This research uses experimental methods. The results of this study show that there is an effect of the Science Technology Society learning model assisted by animated videos on the creative thinking skills of class X students of SMAN 17 Bandar Lampung in biology subjects indicated by the results of the N-gain calculation of 0.70 classified as a high category.

The research entitled The Influence of the Science Technology Society Learning Model on material mastery and Student problem-solving skills in science subjects at MTS Negeri Patas conducted by D. Agustini et al. (2013); Dwi Marwah, et al. (2017). This research shows that the achievement of science problem-solving skills for groups of students who learn by using the STS learning model is higher. This is because, theoretically, Science Technology Society can improve cognitive skills and train process skills in the six domains of science so that students are accustomed to designing the processes that need to be done to achieve scientific products. This means that even in everyday life, students will plan the steps they will take to solve problems efficiently and successfully.

According to Hunaepi (2014), the Science Technology Society model known as Science Technology Society emerged as an answer to criticism of traditional social science education (textbooks) which still revolves around education. Facts and theories around connecting them to the essential real world. The Science Technology Society approach is based on three essential things, namely: 1) There is a connection between knowledge, technology, and society, 2) The learning process adheres to the view of constructivism, which describes that students form or build their knowledge through interaction with the environment, 3) Teaching contains five domains, consisting of the realm of knowledge, the realm of attitudes, the realm of process, the realm of creativity, and the realm of relationships and applications.

Social Science material with the Science Technology Society learning model makes students an active actor in the Social Science lesson itself because through the Science Technology Society learning model, it will heighten aspects of student creativity (Jailani et al 2018). Students have more original ideas, explanations, and evaluations of themselves. In addition, students can solve problems that are presented to them in other forms and situations. Based on this background, researchers are interested in analyzing the application of the Science Technology Society model in improving students' critical thinking skills in social studies class VIII B Og 10th Public Junior High School Yogyakarta.

2. Method

This research uses a class action research method conducted in two cycles where each cycle consists of several stages, namely, planning (planning), implementation (action), observation (observing), and reflection (reflection). These stages are carried out repeatedly in each cycle, namely cycles I and II.

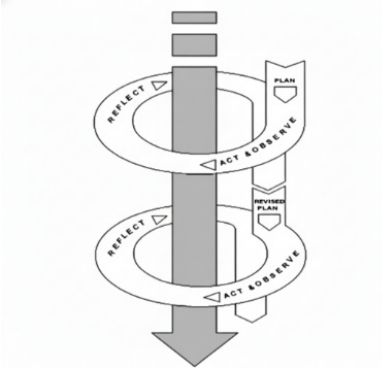

Figure 1. Research Stage

This research was conducted in class VIII B in social studies subjects at SMP N 10 Yogyakarta. The research was conducted in January 2025, and the number of research subjects was 34 students. This study examines the critical thinking skills of students. This research instrument uses observation sheets (observation), written tests consisting of *pre*-tests, namely tests conducted before the application of the Science Technology Society model, and *post*-tests,

namely tests conducted after the process of applying the Science Technology Society model, and documentation. Observations in this study were carried out to see the activeness of students and teachers who had been formed in the planning stage. The test in this study consisted of 10 essay questions, which were scored using a 0-4 Likert scale and then processed into 0-100 decimal values to see the achievement of each student using the following formula.

$$\mathbf{P = \frac{JUMLAH\ NILAI\ DI\ PEROLEH}{MAKSIMAL\ SKOR}\ X\ 100}$$

Learner Achievement Formula

Processing the scores of students using the percentage formula to determine the overall percentage of students who have achieved the research objectives, the formula used is:

$$\mathbf{DP = \frac{\Sigma F}{\Sigma N}\ X\ 100\%}$$

Percentage Formula Number of Learners Achievement

Description:

P: Learner Value

Number of Values Obtained: 0-40

Maximum Score: 40

DP: Percentage of Achievement

∑F: Number of Learners Achieved

∑E: Number of Learners (34)

100: Fixed Value

100% : Fixed Value

In this study, there are indicators of success to determine the success of the research. in this class action research, the success criteria that must be met are that the research is considered successful if 70% of the total number of students who take part in the learning process obtain a minimum score of 70. The percentage of achievement is included in the criteria for a high level of critical thinking.

Table 1. Critical Thinking Level Criteria

Range (%)	Criteria
81-100	Very high
61-80	High
41-60	Fair
21-40	Low
0-20	Very Low

(Dwi Nuru A., 2024)

According to Ennis (2011), there are five aspects of critical thinking skills, including: (1) elementary clarification, or providing a simple explanation; (2) essential support, building basic skills; (3) inference, namely concluding, (4) advanced clarification, namely providing advanced explanations, and finally (5) strategies and tactics, namely organizing strategies and tactics. Through these indicators, researchers made essays designed in the planning process together with partner teachers who served as observers.

On the observation sheet, there are criteria for categorizing the activities of the learning process following the planning or not the category is in the form of a percentage range of learner and teacher activities.

Table 2. Observation Sheet of Activity Level criteria

Percentage	Qualification
76%-100%	Very high
56%-75%	High
40%-55%	Fair
<40%	Very Low

3. Results

The implementation of the research began with pre-cycle activities carried out before the application of the Science Technology Society model in January 2025 with the research subject of class VII B students of SMPN 10 Yogyakarta totaling 34 students; pre-cycle activities were carried out by giving 10 description tests (pre-tests) to students containing my country's guideline material, the test results were used to determine the percentage of students' critical thinking skills, in pre-test activities 52.94% of students achieved the predetermined indicators, the minimum value that must be obtained by students to attain indicators is 70.

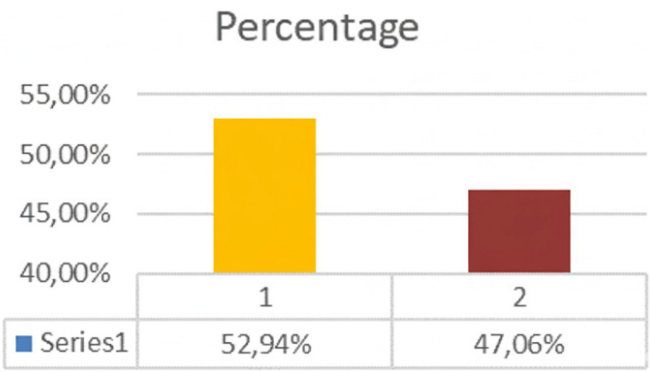

Figure 2. Pre-cycle Achievement Graph

Based on discussions conducted by teachers and researchers to improve students' critical thinking skills, it was agreed to use the Science Technology Society learning model; it is hoped that the application of this learning model can improve students' critical thinking skills to achieve research objectives.

Based on the results of the pre-test that has been carried out, it can be seen that the percentage of students' critical thinking skills is quite low, and there needs to be action to improve these critical thinking skills, in the process of implementing cycle I there are several stages in its application including: First, the Cycle I Planning Stage. at this stage, the researcher together with the partner teacher compiled several plans, namely, teaching modules in accordance with the independent curriculum, teaching materials used as a reference in the learning process, observation sheets used by partner teachers as observers to see teacher and student activities during the learning process, and compiled tests used as evaluation tests and post-tests to measure students' critical thinking skills.

Second, in the Implementation Stage of Cycle I, at this stage there are several steps of the learning process in accordance with the Science Technology Society model, steps or syntax in the implementation of the Science Technology Society model, namely the introductory stage, the researcher opens the learning process and conveys apperceptions related to the material that has been planned previously, this introductory stage contains the activities of researchers providing opportunities for students to express their opinions regarding the importance of what happens if a country does not have rules. Continued to the second stage, namely the concept formation stage; after several students expressed their opinions, the researcher formed several groups to discuss some material related to my country's guidelines. In the concept application stage, at this stage, each group that has discussed their respective materials presents to the class to explain the material they have discussed. Furthermore, entering the concept stabilization stage, at this stage after all groups have presented the results of their discussions, the researcher provides stabilization related to the materials that have been discussed. Then, proceed to the assessment stage the next day.

At this stage, the results of the implementation of the cycle I were obtained through a post-test with a test of 10 essay

questions, the percentage of students was at 67.65%, indicating that there was a need for a further cycle to improve students' critical thinking skills, the data obtained by the researcher is included in the following graph.

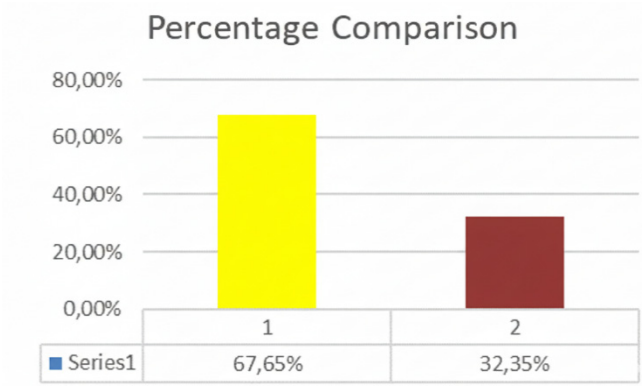

Figure 3. Graph of Cycle I Achievement

The results of the first cycle of action on critical thinking skills of VIII B class students, namely 23 students entered the minimum criteria for critical enough in the range of 60-70 with a percentage of 67.65%. This shows that after the action is taken, there is an increase in the percentage of students' critical thinking skills from the implementation of the pretest, which is at 52.94%. From the results of the implementation of post-test one, it shows that cycle I is considered not to have met the target or indicator of the success of the action. Therefore, it is necessary to hold further action in cycle II.

Third, in the Cycle I observation stage, at this stage the partner teacher as an observer observes the learning process and fills in the observation sheet that has been previously designed in the process of observing teachers and students obtaining 60% for student activities and 73% for teacher activities, related data are listed in the table below.

Table 4. Observations of Students in Cycle I

No.	Aspects Observed				
		1	**2**	**3**	**4**
1.	Learners pay attention to the learning process.			√	
2.	Learners utilize existing resources, such as videos, textbooks, and power points.		√		
3.	Learners ask the teacher about material they do not understand.		√		
4.	Learners answer the teacher's questions during the learning process.			√	
5.	Learners carry out the discussion well.			√	
6.	Learners make presentations optimally.		√		
7.	Learners can solve problems optimally.		√		
8.	Learners interact with each other about the material learned.			√	
9.	Learners can summarize the learning material.		√		
10.	Learners will provide a reflection on the material at the end of the lesson.		√		
	Total		**12**	**12**	

$$\textbf{Percentage Score} = \frac{24}{40} \; X \; 100\% = 60\%$$

Based on the observations made by observers or partner teachers, each observation process is obtained in the high category at this stage. Continued at the reflection stage. Fourth, the Cycle I Reflection Stage, the reflection stage was carried out by researchers with partner teachers by discussing the weaknesses and shortcomings in the Cycle I action process. The results of the joint discussion are factors that influence students' not optimal critical thinking skills. The results of the implementation of the post-test conducted at the second meeting showed that the cycle I action was not optimal because these results had not yet reached the category of success indicators of class action research. Based on the results of this reflection, researchers, together with partner teachers, make learning improvements that will be

implemented in cycle II so that the improvement of students' critical thinking skills can be more optimal.

Cycle II class action research was carried out based on the results of cycle I actions which were still less than optimal. The implementation of this second action includes planning carried out by researchers with partner teachers about optimizing cycle II actions to improve students' critical thinking skills per the desired success indicators.

First is the Planning Stage of Cycle II; at the planning stage for the implementation of Cycle II actions, researchers and teacher partners strive to optimize the learning process to improve students' critical thinking skills. The implementation of this cycle II action was carried out on Monday, October 18, 2024, with 3 hours of subjects, namely in the sixth, seventh, and eighth hours. The planning prepared by researchers and teacher partners is as follows. (a) Making teaching modules with advanced material, namely the material of my State Regulations. (b) Preparing the steps of the learning model in accordance with the science technology society model. (c) Before starting the material, prepare learning media in the form of power points as explanatory media, videos, and images as apperception and motivation. (d) Preparing group assignments in the form of short stories about rule violations in the surrounding environment for discussion materials. (e) Preparing evaluation questions to measure students' skills at the end of the action. (f) Preparing observation sheets for observers during the learning process.

Second, the Implementation Stage of cycle II, the action stage of cycle II, is the application or implementation of the planning results that researchers with partner teachers have prepared. The entire learning process in cycle II action uses the science technology society learning model, (a) First Meeting, the first meeting of cycle II action was held on Monday, October 18, 2024 at 09.45-11.45. The stages of the implementation of the first meeting are as follows: (1) Initial activities in the initial activities of the learning process, the researcher opens by saying sala, asking how the students are and their attendance. To motivate students in the learning process, researchers invite students to do icebreakers, namely "hands, ladders, catch," so that students can focus more on the learning process. (2) Core activities After doing ice breaking, the researcher played a video of examples of rules in the surrounding environment. Video playback is intended to lure students into learning material so that students can explore the importance of rules around them. After playing the video, the researcher asked students, "what is the meaning contained in the video?". Some learners gave answers explaining existing rules and their impact on everyday life. After the introduction process through the exploration of the appreciation video, the researcher continued by explaining the material points using PowerPoint and occasionally giving real examples of everyday life. Entering the concept formation stage, the researcher divided students into 5 groups to discuss the problem of violating the rules around them through short stories that had been inserted in the previous planning process.

The group discussion lasted 30 minutes, assisted by researchers who continued to provide direction and motivation to students who did not understand the material being studied. The discussion process ended with each group presenting the results of their discussion. In this presentation process, each group that does not present gives at least 1 question related to the results of the discussion of the group that is presenting, and each group gets four questions. (3) Closing In the last stage, researchers, together with students summarize the material and provide affirmation to students. Before closing the learning process, researchers reward or appreciate all students for carrying out the learning process very well and actively. Before the researcher closes the learning process, the researcher also talks about the activities at the next meeting, which ends with a prayer together and thanks. Then, continued at the assessment stage on the following day to see students' critical thinking skills using 10 essay questions.

At this stage, the results of the post-test II were obtained; the implementation of the post-test in cycle II was also slightly different because it was carried out with Android or cellphone media, on the advice of the teacher partner because, in that school, the test was carried out in a go school application. And researchers used Google formulas as a media post-test cycle II. After the time runs out, the researcher checks each student who has done the work. The cycle II post-test results are presented in the following table and graph.

The results of the implementation of the second cycle post-test of students' thinking skills reached a percentage of 79.41% of students in the high category. There were 27 out of 34 students who reached a minimum score of 70, and 7 students reached a score of less than 70 and still needed guidance. This shows that after the implementation of cycle II action; there was an increase of 9%. More than half of the learners have reached the value based on the objectives.

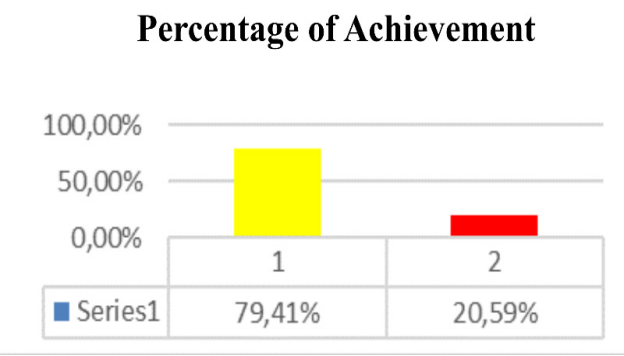

Figure 4. Cycle II Achievement Chart

Third, the Cycle II Observation Stage. The process of observing students in cycle II was carried out to measure the activeness of students during the learning process using an observation sheet. The analysis results of student observation scores are presented in the table as follows.

Table 7. Cycle II Learner Observation Sheet

No.	Aspects Observed	Score			
		1	2	3	4
1.	Learners pay attention to the learning process			√	
2.	Learners utilize existing resources, such as videos, textbooks, and power points.				√
3.	Learners ask the teacher questions related to material that they do not understand.			√	
4.	Learners answer the teacher's questions during the learning process.			√	
5.	Learners carry out the discussion well.				√
6.	Learners make presentations optimally.		√		
7.	Learners can solve problems optimally.			√	
8.	Learners interact with each other about the material learned.				√
9.	Learners can summarize the learning material.		√		
10.	Learners will provide a reflection on the material at the end of the lesson.		√		
	Total		6	12	12

$$\textbf{Percentage Score} = \frac{30}{40} \boldsymbol{X}\ \mathbf{100\%} = \mathbf{75\%}$$

Based on the results of the observations listed in the table above, the results of observations of student activities in cycle II are at a percentage of 75% with a high category. This study is similar to that conducted by Dharel Acut and Ranolio Antonio (2023) with the title "Effectiveness of Science-Technology-Society Approach on Students' Learning Outcomes in Science Education: Evidence from a Meta-Analysis" This study aims to determine the effectiveness of the Science-Technology-Society approach in improving students' scientific learning outcomes. A quantitative research design, using a meta-analysis guided by the Preferred Reporting Items for Systematic Review and Meta-Analyses protocol, was used to determine the effect size of previous research on the effectiveness of the Science Technology Society approach in science learning and teaching. The findings of this study indicate that the Science Technology Society approach facilitates the development of students' scientific knowledge, skills, and mindsets to innovate in facing real-world problems. Thus, the Science Technology Society Model can strongly improve student achievement.

4. Discussion

Based on the observations listed in the table above, the results of the observation of the activities of students in cycle II are at a percentage of 75% in the high category. The results of the analysis of the recapitulation score of observations of the teacher are presented in the following table. Based on the results of teacher observations listed in

the table, the results of the analysis of teacher observations in cycle II reached 80% and fell into the high category.

Fourth, Cycle II Reflection Stage, after implementing the improvement of cycle II learning, the researchers, together with the teacher, analyzed the reflection as follows. (a) The implementation of the learning process is in accordance with the implementation plan that has been made. (b) Giving rewards is very effective in motivating students in the learning process. (c) Group discussions went well and actively due to the selection of groups agreed upon by students. (d) Implementing the science technology society learning model is following the procedures and syntax of the model. The results have met the predetermined research success indicators based on the data obtained, both evaluation or post-test data and student observation data. Therefore, this research is sufficiently carried out up to cycle II and does not need to be continued until the next cycle. The discussion section explains a comparison between pre-cycle, cycle I, and cycle II.

The increase in students' critical thinking skills is evidenced by the test results in the pre-cycle (pre-test), cycle I (post-test I), and cycle II (post-test II). Thus, the application of the science technology society learning model in Pancasila Education subjects can improve the critical thinking skills of students in class VIIIB Og 10th Public Junior High School Yogyakarta.

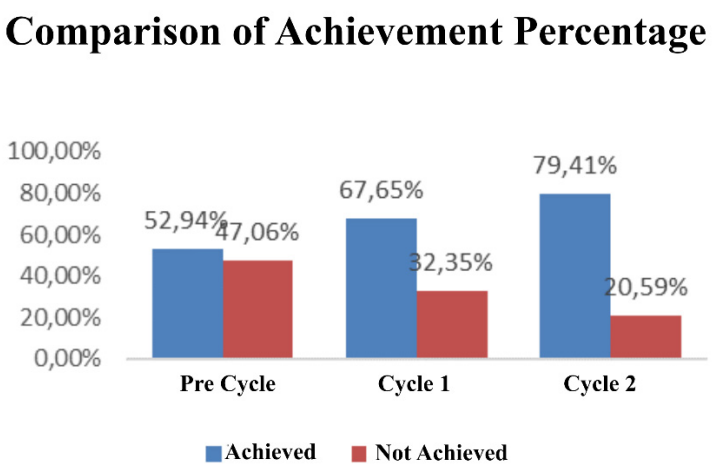

Figure 5. Comparison of Percentage per Cycle

Based on this table, the critical thinking skills of students in social studies subjects in Class VIII B Og 10th Public Junior High School Yogyakarta have increased with each action. In the pre-cycle, the percentage of skills at 52.94% of students obtained a minimum score of 70; this was the reason that action needed to be taken to improve the critical thinking skills of students through the science technology society learning model.

The results of the implementation of the first cycle of action showed an increase in students' critical thinking skills, but still did not reach the indicators of the research objectives. In cycle I, the critical thinking skills of students were at 67.65% of students obtained a minimum score of 70, which was somewhat increased compared to the pre-cycle, but 52.94% 67.65% 79.41% 47.06% 32.35% 20.59% 0.00% 20.00% 40.00% 60.00% 80.00% 100.00% Pre-cycle Cycle 1 Cycle 2 Comparison of Percentage Achievement Achieved Not Achieved 72 has not yet reached the indicator, which is at the level of 70% of students obtaining a minimum score of 70. The implementation of the action in cycle II resulted in a significant increase, namely that 79.41% of students obtained a minimum score of 70. Thus, this class action research is considered successful because it has achieved the research objective indicator, namely, 70% of the students obtained a minimum score of 70 and were in the high category. Based on this data, researchers and partner teachers decided to end the action because the research objectives had been achieved.

Research on the Science-Technology-Society Model conducted by Ramadhana (2022) on learning achievement has similarities with a success index of 75%. As with the research conducted by Dharel Acut and Ranolio Antonio (2023) with the title "Effectiveness of the Science-Technology-Society Approach on Students' Learning Outcomes in Science Education: Evidence from a Meta-Analysis" This study aims to determine the effectiveness of the Science-Technology-Society approach in improving students' scientific learning outcomes. Showing that the Science-Technology-Society model has a very significant influence.

5. Conclusion

Based on the results and discussion, this class action research took place in two cycles; the critical thinking skills of students in class VIII B Og 10th Public Junior High School Yogyakarta can be improved through the Science Technology Society (STS) learning model. Each cycle of this class action research consists of planning, implementation, observation, and reflection. The increase in the results of implementation from pre-cycle to cycle II can be seen from the achievement of research results that show an increase, namely in the pre-cycle 52.94%. In cycle I experienced a growth with a percentage of 67.65% but still required action in cycle II, and a significant increase was produced in cycle II which reached 79.41%, the percentage increase has met the research success indicator, namely 70% of all students obtained a minimum score of 70.

The activeness of students and teachers can be seen through the improvement of observation sheets that observers have carried out. The activeness of students based on the student observation sheet in cycle I reached 60%, and in cycle II, it reached 75%; both cycles were in the high category. While in the first cycle, the teacher observation sheet was at 73% in the high category, in the implementation of cycle II, the teacher observation sheet experienced an increase to 80% in the very high category. Based on the results obtained from the research that has been carried out, the application of the Science Technology Society learning model is proven to improve the critical thinking skills of students in class VIII B Og 10th Public Junior High School Yogyakarta.

Based on the research carried out in class VIII B Og 10th Public Junior High School Yogyakarta. Several suggestions need to be considered as consideration in the thesis including, 1) Teachers a. Teachers are expected to be able to use the Science Technology Society learning model to obtain learning objectives well. And can optimize the potential possessed by students to achieve learning goals. b. This research can have a positive impact on teachers by supporting the implementation of a more varied and innovative learning process, and it is hoped that learning objectives can be achieved optimally. 2) Students The critical thinking skills of students can be improved through the Science Technology Society learning model; it is recommended that students maintain and further develop critical thinking skills through other learning processes to get better results. 3) Other researchers are expected to conduct further research using the Science Technology Society of Learning model by covering aspects of students' critical thinking skills and applying them to other subjects.

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DL were responsible for conceptualization, drafted the manuscript and Assoc.Prof. Septian Aji Permana were responsible for study design, conceptualization, and revising. Dr. Nurulasyikin was responsible for supervision, validation. HP formal analysis, writing-review & editing. All authors read and approved the final manuscript.

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