

**IMPROVING CRITICAL THINKING SKILLS AND LEARNING
OUTCOMES USING SCIENCE, TECHNOLOGY, AND SOCIETY (STS)
LEARNING MODEL ON THE 5TH GRADE ELEMENTARY SCHOOL
STUDENTS**

Siti Hanifa Ari Utami, Mawardi, Suhandi Astuti

Universitas Kristen Satya Wacana

292015112@student.uksw.edu

Abstract: This study aims to improve the critical thinking skills and students' learning outcomes using the Science, Technology, and Society (STS) learning model on the 5th grade students of SDN Dukuh 05 Salatiga. The type of this research is a Classroom Action Research (CAR). The data were collected through tests, observations, and documentations. The instrument that used in this research is questionnaire sheets of critical thinking skills with the total of 25 statements and the evaluation questions with the total of 20 questions. The data analysis was carried out by qualitative and quantitative analysis. This research was conducted in two cycles. Obtaining the mean score of critical thinking skills of students in the first cycle are 62, 96 (enough). Then in the second cycle increased to 75 (high). Furthermore, the students' learning outcomes also increase, which can be seen from the grade mean scores and the number of students who get score above the Minimum Criteria of Mastery Learning ≥ 66 . Ratio of the percentage of completeness in the first cycle is 48% with the mean score of 70.2, then in the cycle II increased to 84% with the mean score of 80.8. In this research was concluded that critical thinking skills and learning outcomes are improved after the learning action of the Science, Technology, and Society (STS) learning model.

Keywords: Critical thinking, Science, Technology, and Society (STS).

A. Introduction

The learning process in the 2013 curriculum for Elementary School/Madrasah Ibtidaiyah levels must be developed from partial learning to integrated learning. This was emphasized by the Minister of Education and Culture Regulation Number 67 concerning the Basic Framework and Curriculum Structure which stated that "Implementation of the 2013 Curriculum for Elementary School/Madrasah Ibtidaiyah was conducted through learning with the thematic-integrated approaches from Class I to Class VI." According to Usmaedi (2017), the learning process done in accordance with modern learning models, from passive learning to active-investigating; from the abstract to the real-world context; from teacher-centered control to learning that gives students autonomy and from factual memorization to creative-critical thinking skills.

Based on the preliminary observations results of researchers in 5th grade of SDN Dukuh 05 Salatiga, it was found that the learning that was done was more about the aspect of memorization only, without being followed by the deep insight and understanding. Teachers also less using the learning resources in the environment that engages students in its application. Considering that, students in elementary

school age are still in the concrete operational stage, so it will be better if the learning process is done by involving the students directly. This causes some students are less able to connect between what they learn at school and how it used in real life. Then, the application of the Science, Technology, and Society (STS) learning model was agreed to be the solution to improve the critical thinking skills of 5th grade students in SDN Dukuh 05 Salatiga.

According to Poedjiadi (2010: 123) the learning model of Science, Technology, and Society (STS) is a learning model that conducted by combining science and technology which is used as a liaison to implement science-related and environmental issues and community problems. In line with the above opinion, Septiawan, I.G.K (2014) revealed that STS allows students to be able to connect things that have been understood with phenomena that exist in their environment. In the learning process, students are also encouraged to find solutions to overcome these problems.

Supported by Wuryastuti (2008), the learning model of the Science Technology Society (STS) is one of the model innovations in Science learning at the elementary school level, where this

learning model applies technology as a link between science and society.

Based on the opinion above, it was concluded that the learning model of the Science Technology Society (STS) is a learning of knowledge (science) which are supported by the use of technology for discovery activities in obtaining the information that involves problems that are relevant to student life in society.

Rahayuni (2016) argues that the use of Science, Technology, and Society (STS) learning models in learning can improve students' critical thinking skills because the learned concepts will be sought and found by students themselves.

Critical thinking skills are the intellectual processes from someone to analyze ideas/thoughts on more specific observations, distinguish them clearly and logically, choose, identify, study, grow and increase the understanding towards a more perfect understanding (Wijaya, 2010). Whereas according to Sitohang (2012) critical thinking is a mental process that works actively in analyzing, synthesizing, applying and evaluating the various information that obtained. Hendracipta, and friends (2017) also revealed that by thinking critically, students are able to differentiate between good and bad information, and can make decisions about the information that they get. From these opinions, briefly, it can be said that

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critical thinking is a mental process to be able to analyze, solve problems, and evaluate information logically and specifically.

In addition to improving critical thinking skills, according to Widyatiningtyas (2009), the level of mastery of the science, technology, and society (STS) model can be measured through an evaluation. Evaluation is a measurement or assessment of the results that have been achieved.

Based on the Minister of Education and Culture Regulation No. 23 of 2016 concerning about Educational Assessment Standards that the learning outcomes can be seen through 3 areas. The cognitive areas are includes the understanding of the participants' factual and intellectual knowledge. Affective areas are related to student behavior such as discipline, politeness, caring, honesty, confidence and responsibility in interacting with family, friends, teachers and neighbors. Psychomotor areas are appear in skills and the act ability of each individual.

The research using the Science, Technology and Society (STS) learning model has been conducted by Chandra Almas Budhiaji in 2014 to improve the critical thinking skills of 3rd grade students at SDN Kutoanyar II Tulungagung. The results of the average score in the pre-action were 63 (13%), the first cycle score was 74 (58%) and in

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the second cycle it increased to 89 (92%). So it can be said that the students' critical thinking skills can be improved. Whereas from Santi's research (2014), shows the learning outcomes of students who completed the pre-action as much as 7 students (631.81%). In the first cycle, it is increased to 13 students (59.09), on the second cycle are increased to 20 students (90.90%). Thus, the learning outcomes are said to be increase and succeeded to use the Science Technology Society learning model.

Other research was also conducted by Pratomo, Sumiati & Mursilah (2017) by applying the Science Technology Society (STS) Model to improve the creative thinking skills of 5th grade students, the results in first cycle were 15 students who completed, then the second cycle increased to 17 students completed,

and the third cycle increased again to 18 students who completed. It is said that students' creative thinking skills can be improved using the Science Technology Society (STS) learning models.

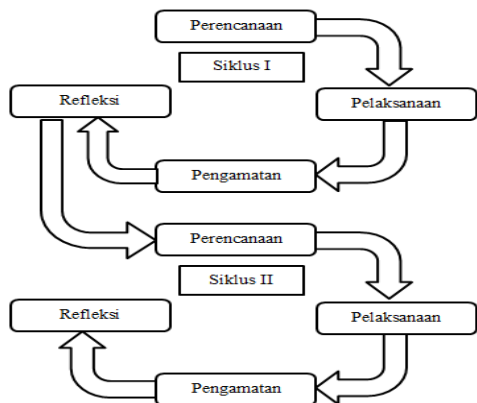
In line with the research by Renold, and friends (2013) which examined efforts to improve students' learning outcomes through the Science Technology Society (STS) approach in Science with the water cycle as the main discussion in the research. This research was also conducted in 5th grade of SDN 2 Dataran Bulan. This is also supported by the research of Rintayati and Putro (2014) where the results of their research show that the learning system that uses the Science Technology Society (STS) approach are able to support the creative and intelligent thinking in elementary school students.

B. Research Methodology

The type of this research is a Classroom Action Research (CAR). Class action research is an examination of learning activities of an action, which is deliberately raised and occurs in a class simultaneously (Arikunto, 2015). This research was conducted at SDN Dukuh 05 Salatiga. The subjects of this research were all the 5th grade students of SDN Dukuh 05 Salatiga with the total of 25 students. Kunandar (2011: 46)

explains that CAR are done through the several cycles in a collaborative and participatory manner to improve or increase the quality of the learning process. The design of the class action research model that used in this research is referring to the cycle by Kemmis and Taggart, which includes four stages that are includes planning, action, observation, and reflection that conduct

in two cycles. For more details, can be seen in the following picture:



Picture 1. The Model of Classroom Action Research (CAR) by Kemmis and Taggart

The data of this research are qualitative and quantitative data. Qualitative data is the data implementation of learning by applying the Science, Technology, and Society (STS) learning model that conducted by teachers and students. While the quantitative data are the values of critical thinking skills and students' learning outcomes in thematic learning. The collecting data techniques in this research were taken in two ways, that are test and non-test techniques. The test technique were done by giving evaluation questions to the students. While the non-test technique were done by giving questionnaires to students and observation sheets to the collaboration teacher. The test questions and

questionnaires of critical thinking skills are used to measure the level of critical thinking skills and students' learning outcomes compiled by researchers and validated using Anates Ver 4.9 and SPSS 22 for Windows. Observation activities are conducted by direct observation by peer researchers and collaboration teachers. Observations to the teachers were observed according to the teacher's observation sheet and observations of students were conducted in accordance with the student's observation sheet. All of that are based on the stages stated by Yager (1996: 32), there are four learning phases, that are, invitation, exploration, explanation and action or application.

The data from students' critical thinking results are the quantitative data, so the data will be analyzed descriptively. The final score of the research results data will be calculated, then it adjusted to the range of scores. The improvement of students' critical thinking skills are seen from the high of the final score that obtained by students. While the completeness of learning outcomes can be seen from the number of students who achieve the Minimum Criteria of Mastery Learning (KKM).

C. Research Results and Discussions

The results of the pre-cycle research that has been done on 5th grade students of SDN Dukuh 05 Salatiga, showed the results of critical thinking skills in the low thinking category as many as 11 students (44%), the category of adequate thinking was 7 students (28%), the high thinking category was 4 students (16%) and the very high category was 3 students (12%). The less optimal of students critical thinking skills are have impact on obtained learning outcomes. Based on the data from the study documents, the completeness of the students' scores in each thematic lesson are obtained by the average score, Civic Education 66,4; Indonesian 51,5; Science 51,4; Social Studies 67,5; and cultural arts and crafts 80,4. Based on these data, it obtained that the two subjects that have low average scores were Science and Indonesian subject. There were 18 out of 25 students who scored below the Minimum Criteria of Mastery Learning (KKM) which was below 64 with an average score of 51.4 for Science subject, and there were 16 out of 25 students who scored below the Minimum Criteria of Mastery Learning (KKM)

which was below 67 with an average score of 51.5 for Indonesian language subject in the midterm test of I semester for 2018/2019 academic year. To overcome this problem, researchers have discuss with the class teacher to take action. The improvement of critical thinking skills and students' learning outcomes using the Science, Technology and Society (STS) learning model that conducted in two cycles.

In the first cycle of action, the lowest score of students' critical thinking skills is 45. While the highest score is 83. The score of students' critical thinking skills in the first cycle of action was obtained that the students with the low critical thinking skills are 8 students (32%). While students who have adequate categories of critical thinking skills are 11 students (44%). While the students who are classified as having the high categories of critical thinking skills are amount to 3 students (12%) and students who have the very high categories of critical thinking skills are amount to 3 students. These results can be clarified through this following table.

Table 1
The Results of Critical Thinking Skills in Cycle 1

Range of Critical Thinking Scores	Number of Students	Category	Percentage
81-93	3	Very High	12%
68-80	3	High	12%
67-55	11	Adequate	44%
42-54	8	Low	32%
Average Score			62,96
Category			Adequate

The results of students' critical thinking skills in the first cycle above have not fulfill the indicators of successes in this research, so the research in cycle 1 must be continued to the next cycle, cycle II to improve students' critical thinking skills as desired, which was reaches the work indicators $\geq 70\%$ or high category.

While, the results of the learning evaluation in cycle 1, there were 13 students (52%) who had not yet completed because they scored below the Minimum Criteria of Mastery Learning ≤ 66 . And there were 12 students (48%) who had scored above Minimum Criteria of Mastery Learning ≥ 66 and completed. As described in the following table.

Table 2
The Evaluation Results of Cycle 1

Score	Completeness	Frequency	Percentage
≤ 66	Students Not Completed	13	52%
≥ 66	Students Completed	12	48%
Average Score		70,2	

The results of the learning evaluation in the first cycle have not shown the successes in this research, so the research in the first cycle needs to be continued to the second cycle to increase and improve students' learning outcomes where the percentage of completeness of students are able to reach $\geq 75\%$. Following are the results of actions in cycle II:

The skills of students had increased. The lowest score of students' critical thinking skills is 49. While the highest score of students' critical thinking skills is 93. From all student scores, the average score that obtained in the second cycle of students' critical thinking skills are 75 students or already in the High category. For more details can be seen in the following table.

The results of the research that has been conducted in the second cycle, stated that the average critical thinking

Table 3
The Results of Critical Thinking Skills in Cycle 2

Range of Critical Thinking Scores	Number of Students	Category	Percentage
81-93	9	Very High	36%
68-80	8	High	32%
67-55	5	Adequate	20%
42-54	3	Low	12%
Average Score			75
Category			High

From the results of implementation of action in the second cycle of above, it is known that the students who have low critical thinking skills are 3 students (12%). While the adequate category are 5 students (20%). High category were obtained by 8 students (32%). While in the very high category 9 students (36%)

were obtained. From the table, shows that the average of students' critical thinking skills has step in to the high category. Based on the described data above, the evaluation results in the second cycle have also increased from the first cycle. This can be seen in the following table.

Table 4
The Evaluation Results of Cycle 1

Score	Completeness	Frequency	Percentage
≤ 66	Students Not Completed	4	16%
≥ 66	Students Completed	21	84%
Average Score		80,8	

In the second cycle, there were 21 students (84%) who had completed because they scored above the Minimum Criteria of Mastery Learning ≥ 66 . Whereas 4 students (16%) have not yet completed because they have less scores than Minimum Criteria of Mastery Learning ≥ 66 . The average score has also increased to 80.8.

Society (STS) can improve the critical thinking skills and learning outcomes in 5th grade students of SDN Dukuh 05 Salatiga. In the first cycle, the average final score of students' critical thinking skills was 62.96 or included in the adequate category. This can be seen from the students whose have the low category of critical thinking skills are 8 students (32%), students with adequate category of critical thinking skills are 11 students (44%), then students with high category

From the results of the research that has been done, it shows that the learning model of Science, Technology, and

of critical thinking skills are 3 students (12%), and students whose have very high category of critical thinking skills are 3 students (12%). The learning outcomes in the first cycle of action showed that, there were 13 students (52%) who had not yet completed because they scored below the Minimum Criteria of Mastery Learning ≥ 66 . While 12 students (48%) are have scored above the Minimum Criteria of Mastery Learning ≥ 66 and completed. Based on these data, it said that the performance indicators of critical thinking skills in first cycle have not been fulfilled because they have not reached $\geq 70\%$. Likewise with student learning outcomes, in the first cycle of action, the performance indicators of learning outcomes have not reached $\geq 75\%$. So it can be said that the action of the first cycle has not been successful.

While in second cycle, the average final score of students' critical thinking skills has increased to 75 or in a high category. Students have been able to do activities to analyze ideas/thought in a more specific direction, identify, study, and develop them in a more perfect direction. This is proven by the score of students' critical thinking skills in a low category are as many as 3 students with a percentage of 12%, while students with adequate category of critical thinking skills are 5 students with a percentage of 20%, the students with high category of

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critical thinking skills are 8 students with a percentage of 32%, and students with very high category of critical thinking skills are 9 students with a percentage of 36%. The improvement of critical thinking skills has an impact on learning outcomes that obtained by students. In this second cycle, there were 21 students (84%) who had completed because they scored above the Minimum Criteria of Mastery Learning ≥ 66 . Whereas 4 students (16%) have not yet completed because they scored below the Minimum Criteria of Mastery Learning ≥ 66 . The indicators of critical thinking skills performance in the second cycle action have reached $\geq 70\%$. So it can be said that the improvement of critical thinking skills using the Science, Technology and Society (STS) learning model can be successful. While the performance indicators of students' learning outcomes in the second cycle action also have reached $\geq 75\%$ and it can be said that the improvement of learning outcomes using the Science, Technology and Society (STS) learning model can succeed. In addition the number of students whose have critical thinking skills improvement and the increased of the number of students' completeness, the maximum and minimum scores that obtained by students also increased. In the first cycle, the minimum score that obtained by students is 45 and the maximum score is 83. Whereas in the second cycle, the

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minimum score that obtained by students increased to 49 and the maximum score increased to 93.

For this reason, based on the research results that conducted during these two cycles, the findings in the first and second cycle have achieved successes. The successes of this research means that the students are able to improve their critical thinking skills during the learning process by observing, asking questions, collecting data, conducting experiments, finding their own problems and considering solutions, and communicating the results that they find. If we seen from the average score, in the first cycle is 62.96 then in the second cycle increased to 75.

The results of the research above are in line with research by Lestari's, and friends (2016) which examined the Application of Science Technology Society (STS) Learning Model to improve the Physics learning outcomes of 8th grade students of SMPN 3 Mataram. With the results of their research which concluded that the learning model of Science Technology and Society can improve the physics learning outcomes of 8th grade students of SMPN 3 Mataram, especially in the optical instruments subject.

Not only that, this is also in line with the research by Purnamasari, and friends (2017) with the title of the research is the Application of Science

Technology Society Learning Model (STS) to Critical Thinking Skills of students in the Material of Environmental Changes, where the research results are shows that the Science Technology Society model contributes positively and significantly to students' critical thinking skills as indicated by the results of the hypothesis test on two groups.

Besides that, the learning outcomes that conducted during these two cycles also increased, which can be seen from the students who completed in first cycle are 12 students from 25 students then in second cycle the students who completed increased to 21 students from 25 students. This is in line with Santi's research (2014) with the research title of Science Learning Process and Result Skills Improvement Using Science Technology Society (STM) Learning Model in 6th grade students of SDN 1 Kalinanas Wonosegoro. The improvement of students' learning outcomes can be seen in the pre-action the students who completed are 7 students, in the first cycle are 13 students and in the second cycle increased to 20 students who completed. Moreover, this research is also in line with the research by Supriyadi, and friends (2016) with the research title of The Application of Science, Technology, Society Models with Learning Environment Resources In Improving Science Learning About Style

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in 4th grade students of SDN Pandalar, with the improvement results of Science learning from 58.63% from first cycle, increases to 96%. This proves the application of science, technology, and society models with learning environment resources can improve the science learning. In line with the research of Hendrayana (2017) also conducted a study entitled Improving Students' Rational Thinking Skills through Science Technology Society Models on the Concept of Natural Resources, and it

results that the STS model can improve students' rational thinking skills that supported by learning activities and scientific attitudes. This is also supported by the research of Rosalina, and friends (2013) the results of their research found that, there were a significant differences between students who studied with the application of the Science Technology Society (STS) learning model and students with conventional learning models.

D. Conclusions

Based on the description implementation of the research that has been done as much as two cycles, showed that:

1. The Critical thinking skills of 5th grade students at SD Negeri Dukuh 05 Salatiga, can be improved through the Science, Technology, and Society (STS) learning model with the acquisition of an average score in the first cycle of 62.96 (adequate). Then in the second cycle the average final score of students' critical thinking skills increased to 75 (high).
2. Students' learning outcomes can also be improved through the Science, Technology, and Society (STS) learning model. The results showed that in the first cycle action, there

were 13 students (52%) who had not yet completed because they scored below the Minimum Criteria of Mastery Learning ≥ 66 . Whereas 12 students (48%) had scored above the Minimum Criteria of Mastery Learning ≥ 66 and completed. In this first cycle action, the indicators performance of learning outcomes have not reached $\geq 75\%$. It can be said that the action of the first cycle has not been successful. Whereas, in the second cycle an improvement began to occur, there were 21 students (84%) who had completed because they scored above the Minimum Criteria of Mastery Learning ≥ 66 . While the other 4 students (16%) have not yet completed because they have less

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scores than KKM ≥ 66 . So the performance indicators of students' learning outcomes in the second

cycle action have reached $\geq 75\%$ and can be said to be successful.

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