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The Development of Science Learning Tools with the SSCS Model Integrated with Islamic Values to Improve Critical Thinking Skills

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Abstract

The implementation of the revised 2013 Curriculum requires the establishment of religious character and supports students to have 4C skills which include critical thinking, creativity, collaboration and communication. The previous study shows that there is a need to increase students' 4C skills. The integration of Islamic values has not been fully carried out in the learning process. This study aims to analyze the effectiveness of science learning tools to improve students' critical thinking skills. The research method used is Research and Development (R and D) with a 4-D model (Define, Design, Develop and Disseminate). The subjects of this study were students in class VIII B and VIII C at Junior high school MTsN 1 Semarang. The data collection techniques used are observation, interviews, questionnaires and tests. The result of the N-Gain score for critical thinking skills is 0.34 which is in the moderate category. The average results of the self-regulation questionnaire for the experimental class are 2.76 and 2.74 for the control class, both of them are in the very good category. Based on the results of this study, the science learning tool with the SSCS model integrated with Islamic values is effective for improving critical thinking skills.

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INTRODUCTION

Natural Sciences is the meaning of nature and its various phenomena/ behaviors/ characteristics which are provided into a set of theories and concepts through a series of scientific processes carried out by humans (Mariana & Praginda, 2009). Natural science is also not only related to how to systematically find out about nature, but it is also a process of discovery to cultivate scientific thinking skills, work and behave scientifically and communicate it as an important aspect (Putriyana et al., 2020). The goal of science learning according to the 2013 curriculum is that students can understand knowledge about facts and concepts, have curiosity, and apply the knowledge they get in real life (Susilawati & Rosidah, 2020). Science learning provides an opportunity for students to associate scientific knowledge with phenomena that exist in the surrounding environment.

The result of the 2018 PISA study released by The Organization for Economic Co-operation and Development (OECD) shows that the science skills of Indonesian students reach 389 with an average OECD score of 489 (Ministry of Education and Culture, 2019). One effort that can be done is to choose the right learning strategy to create an effective learning. Entering the 21st century, technological advances are increasingly advanced, including in the field of education. One of the efforts made by the Ministry of Education and Culture is to revise the 2013 curriculum. It aims to prepare young people who have a certain quality and are able to compete in the globalization era. Mulyasa (2018: 4) explains that the implementation of the revised 2013 curriculum requires teachers to develop learning by integrating four things, namely Strengthening Character Education (PPK), literacy, 21st century skills (4C) and Higher Order Thunking Skills (HOTS) which require teacher creativity in concocting it (Darise, 2019). The teacher's task in implementing the 2013 curriculum is to create a learning atmosphere which makes students more active in the learning process

In the 21st century learning process, teachers are expected to be able to improve 4C skills, one of which is critical thinking skills. According to Facione (2018), critical thinking skills are seen as cognitive skills in interpretation, analysis, evaluation, inference, explaining and self-regulation (Khaeruddin et al., 2019). Critical thinking skills helps students in the problem solving process. The skills can be achieved by creating a learning environment which encourages students to be active in learning. One alternative to improve students' critical thinking skills, teachers must develop the learning tools. Learning devices greatly determine the success of a teacher in making students active, creative and making students like the lesson (Anny et al., 2021).

Science learning which emphasizes problem solving skills is one of the SSCS models (Search, Solve, Create and Share) which invites students to be active in solving a problem (Yuniartini et al., 2018). The SSCS learning model is a learning model which is centered on student activities (student centered) and uses a problem solving approach (Yuliarini & Ruhimat, 2018). The SSCS learning model trains students to explore information in the problem-solving process independently, enhancing students' interest in asking, so that it can improve students' critical thinking skills (Utami, 2011).

According to Pizzini (1991) the SSCS learning model has four stages, namely the search stage, students are involved in the process of gathering ideas in formulating problems. Solve stage, students are involved in the problem solving process. At the create stage, students are involved in the process of concluding answers to problems and at the share stage, students are required to present the results of their responses interactively to the audience (Zulkarnain et al., 2020). The SSCS learning model also has advantages and disadvantages. According to Pizzini (in Diani et al., 2019) the advantage of the SSCS model is able to provide opportunities for students to practice and improve problem-solving skills. The drawbacks of the SSCS model lie in determining the level of difficulty of the problems given to students and the adequacy of the learning resources used during learning, so that the teacher requires sufficient experience and knowledge (Abadi, 2020).

The previous research on the results of the development of SSCS-based textbooks conducted by Carolina et al. (2017) shows that the development of SSCS-based textbooks can improve students' critical thinking skills. A research conducted by Tiyaswati (2021) obtained that the average validation results by experts are very good. The results of his research show that science learning tools with a scientific

approach and the SSCS model can improve students' 4Cs skills.

Based on preliminary observations which was conducted at MTsN 1 Semarang City, science lessons during the day made students less focused, so various kinds of student-centered learning models were needed. The results of interviews with science teachers show that the SSCS learning model has never been used in the learning process. The science teacher also said that the 4C skills had not been fully achieved, so they needed to be improved. In addition, science teachers have not fully integrated Islamic values into science learning.

The stages of the SSCS learning model which include search, solve, create and share are listed in the science learning tool developed. The stages of the SSCS model make students more active and focused in the problem solving process, so that their critical thinking abilities can be trained. Islamic values contained in learning tools are integrated by including the Qur'an and Hadith related to learning materials.

The purpose of this study is to analyze the effectiveness of science learning tools to improve students' critical thinking skills. The benefits of this research are obtained by science learning tools that can improve students' critical thinking skills in the material of the human respiratory system.

METHODS

This research uses Research and Development (R and D) by using the Thiagarajan 4D (Define, Design, Develop and Disseminate) model research design. The research subjects are from students of class VIII B and class VIII C at MTsN 1 Semarang. Class VIII B as the experimental class and class VIII C as the control class.

The data collection techniques used in this study include observation, interviews, questionnaires, tests and documentation. The observation method is used to obtain existing information during the learning process. The interview method is used to find out more in-depth learning problems. Questionnaire and test methods are used to determine students' critical thinking skills. The documentation method is used to obtain data regarding a matter, either in the form of notes, photos or videos.

The data analysis technique used was the N-Gain test from the results of the students' pre-test and post-test to find out the increase in students' critical thinking skills. The N-Gain formula from Hake (1999) is as follows (Roosyanti, 2017):

$$\langle g \rangle = \frac{Posttest\ Score - Pretest\ Score}{Maximum\ score - pretest\ score} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The results of the N-Gain calculation on critical thinking skills can be seen in Table 1.

Table 1. Normalized Gain Score Category

Gain score	Category
(<g>) > 0.7	High
0.3 < (<g>) < 0.7	Moderate
(<g>) < 0.3	Low

The data on critical thinking skills indicator of self-regulation were obtained from a closed questionnaire in which the answers were provided. The formula used is:

$$\text{Score} = \frac{Obtained\ score}{Number\ of\ questions} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The results of self-regulation questionnaire calculations are categorized based on the table adapted from Keller (1987) based on Table 2. (Rizki et al., 2019).

Table 2. Self Regulation Indicator Criteria

Average Score	Category
1.00 - 1.49	Not good
1.50 – 2.49	Quite good
2.50 – 3.49	Good
3.50 – 4.00	Very good

RESULTS AND DISCUSSION

Critical thinking skills test using a pre-test and post-test in the form of essay questions. The indicators of critical thinking skills tested by tests include indicators of interpretation, analysis, evaluation, inference and explanation. Self regulation is measured by using a questionnaire. The average pre-test result for critical thinking skills in the control class is 75.89 which is included in the high category, while in the experimental class the average pre-test score is 77.32 which is included in the high category. The average post-test score for the control class is 82.68 which is included in the very high category, for the experimental class the average

post-test value is 85.89 which is included in the very high category. The average pre-test and post-test values can be seen in Figure 1.

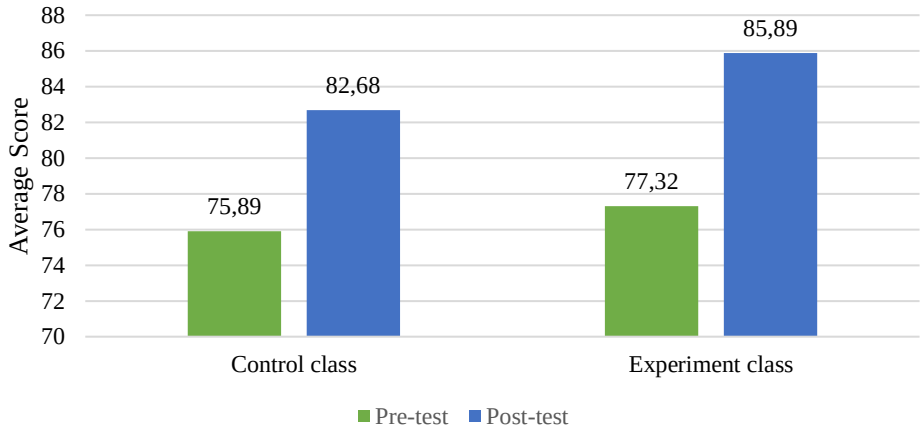

Figure 1. Average results of Pre-test and Post-test Critical Thinking Skills

Based on the results of the pre-test and post-test show an increase in both the control class and the experimental class. The average test scores show that the experimental class is higher than the control class. The average percentage of each indicator of critical thinking can be seen in Table 3.

Table 3. Percentage Results of Critical Thinking Indicator

Class	Indikator	Hasil Pre-test Percentage (%)	Categhory	Hasil Post-test Percentage (%)	Category
Control	Interpretation	80	High	81	Very high
	Analysis	82	Very high	85	Very high
	Evaluation	88	Very high	94	Very high
	Inferention	72	High	84	Very high
	Eksplanation	57	Moderate	70	High
Experiment	Interpretation	89	Very high	96	Very high
	Analisys	75	High	79	High
	Evaluation	93	Very high	96	Very high
	Inferention	67	High	78	High
	Eksplanation	63	High	79	High

The higher increase in critical thinking skills in the experimental class is shown by the post-test results on the indicators of interpretation, evaluation and explanation in the experimental class which are higher than the control class. The average percentage results for the interpretation indicator for the control class is 81% and the experimental class is 96%, both classes are in the very high category. The evaluation indicators for the control class and experimental class are also in the very high category with a control class value of 94% and an experimental class of 96%. The explanation indicator for the control class is 70% and the experimental class is 79%, both classes are also in the high category. This shows that the use of learning tools with the SSCS model can improve students' critical thinking skills on indicators of interpretation, evaluation and explanation.

On indicators of analysis and inference, the control class is higher than the experimental class. This is indicated by the average percentage of the analysis indicators in the control class, which is 85%, which is in the very high category, and 79% in the experimental class, which is in the high category. In the inference indicator (drawing conclusions) the average percentage value of the control class is 84%

including the very high category and the experimental class 78% including the high category. It can be caused by external factors or internal factors. External factors can be in the form of a lack of teacher habituation in training students to analyze a problem and draw conclusions from the learning that has been done. Internal factors come from within students who do not have a strong will to continue to develop. Because the formation of critical thinking skills requires a long time and habituation from the teacher through the learning process.

The results of the pre-test and post-test of the experimental class and the control class were tested by using the N-Gain test. The N-Gain test was conducted to determine the increase in students' critical thinking skills on the results of the pre-test and post-test. The N-Gain test results obtained by the control class is 0.26 which is included in the low category, while the N-Gain test results for the experimental class is 0.34 which is included in the moderate category. The increase in the results of the experimental class' critical thinking skills test is higher than the control class due to the use of science learning tools with the SSCS model integrated with Islamic values. A treatment for the experimental class is said to be effective if the Gain Score obtained is > 0.3 or at least is/ in the medium category (Dewi & Yahya, 2022). Comparison of the N-Gain test results for the control and experimental classes can be seen in Figure 2.

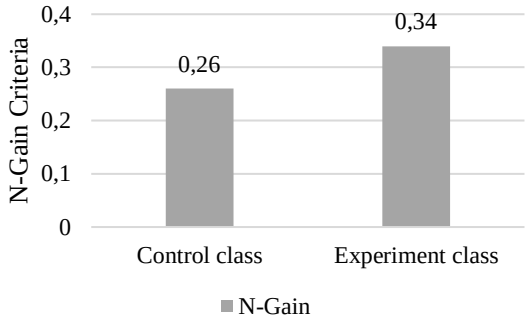

Figure 2. Comparison of the N-Gain Test Results

Critical thinking skills test on self-regulation indicators by using a closed questionnaire. Some of the indicators used in the questionnaire include attitude, motivation, alertness, concentration, self-regulation, self-examination and finding learning resources. The average result of the self-regulation questionnaire for the control class was 2.74 which was included in the very good category, while the average result of the self-regulation questionnaire for the experimental class is 2.76 which is included in the very good category. The results of the comparison of the average value of each indicator of self regulation between the control class and the experimental class can be seen in Figure 3.

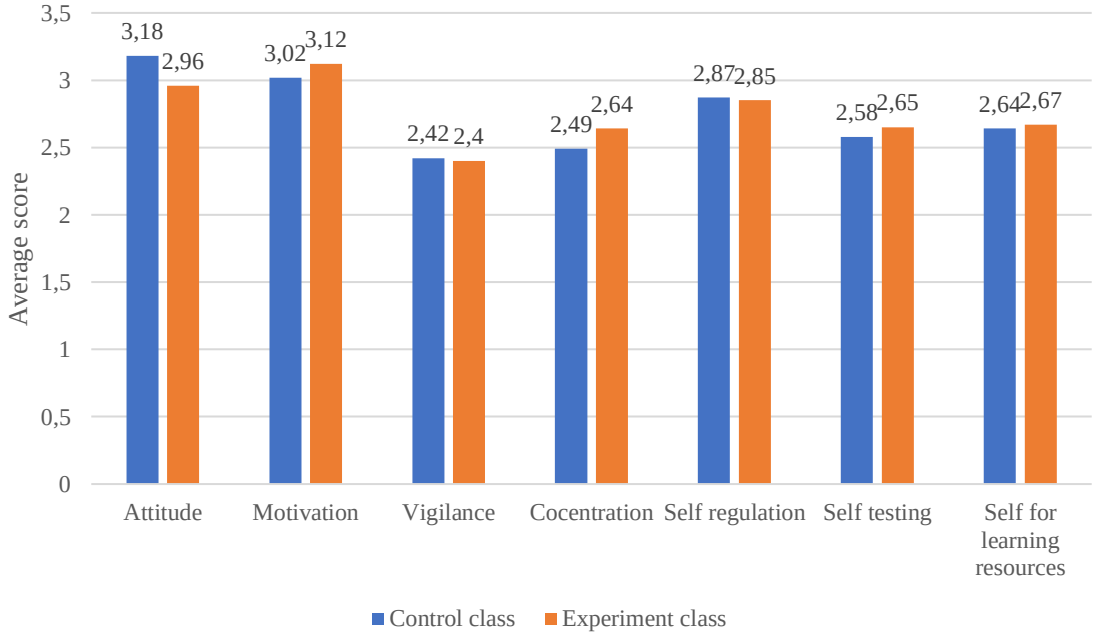

Figure 3. Comparison of the Average Scores of Self Regulation Indicator

In the indicators of attitude, alertness and self-regulation the control class is higher than the experimental class, while in the category of motivation, concentration, self-examination and finding learning resources the experimental class is higher than the control class. The difference in the results of the questionnaire is caused by students' self-assessment which can be used as learning evaluation material so that the learning process is getting better. Based on several analytical tests carried out, the science learning tool with the SSCS model integrated with Islamic values is effective in improving students' critical thinking skills.

Science learning tools with the SSCS model make learning more structured, from the problem solving process to the discussion process or conveying the results of problem solving. The stages in the learning process with the SSCS model make students' critical thinking skills increase. In accordance with research conducted by Hakim (2020), the developed SSCS-based LKS (student worksheet) can improve students' critical and creative thinking skills.

The science learning tools developed include syllabus, lesson plans, teaching materials and LKPD. The stages of learning with the SSCS model are coherent in the LKPD. Students become more active and enthusiastic in carrying out a series of learning activities in the LKPD. The stages of work on LKPD help students to practice critical thinking skills. This is in line with Ubaidillah (in Irfana et al., 2019) who said that LKPD can be used to improve science process skills and higher order thinking skills. In addition, there are also teaching materials that can be used as additional learning resources for students or as a source for solving problems in LKPD.

Learning stages with the SSCS model can train students' critical thinking skills which are located in the search and solve stage. Both stages can train students' critical thinking skills. This is in accordance with the statement of Yuliarini & Ruhimat (2018), that the SSCS learning model helps students solve problems, stimulates interest in asking questions and is actively involved in the learning process so as to improve their critical thinking skills.

CONCLUSION

Based on the objectives and data analysis, it can be concluded that science learning tools with the SSCS model integrated with Islamic values can improve students' critical thinking skills. This is indicated by the results of the N-Gain test obtained by the experimental class which is in the moderate category and the control class which is in the low category. In addition, the average self-regulation questionnaire results for the experimental class are higher than those for the control class.

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