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The Effectiveness of the SAVI Learning Model in Improving Students' Metacognitive and Critical Thinking Skills in MAN Kota Magelang

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ABSTRACT

This study aims to determine the effectiveness of the SAVI (Somatic, Auditory, Visualization, and Intellectual) learning model on students' metacognitive and critical thinking skills. The SAVI model has four stages: preparation, delivery, training, and results display. The researchers chose imagery and metaphor to convey material about the circulatory system in humans. This research is a quasi-experimental study with the Nonequivalent Control Group Design. The SAVI model is applied to the experimental class. Data collection was carried out by pretest and posttest to assess the improvement of these two skills. The test used is the independent sample t-test and normalized gain. The results showed significant differences in improving metacognitive and critical thinking skills between students in the experimental and control classes (0.00 <0.05). The SAVI model is also quite effective in improving these two skills, with an N-Gain of 51.58% and 62.41%, respectively.

Efektivitas Model Pembelajaran SAVI dalam Meningkatkan Keterampilan Metakognitif dan Berpikir Kritis Peserta Didik di MAN Kota Magelang

ABSTRAK: *Penelitian ini bertujuan untuk mengetahui efektivitas model pembelajaran SAVI (Somatic, Auditory, Visualization, and Intellectual) terhadap keterampilan metakognitif dan berpikir kritis peserta didik. Model SAVI memiliki empat tahapan yaitu persiapan, penyampaian, pelatihan dan penampilan hasil. Peneliti memilih imagery dan metafora sebagai alat bantu penyampaian materi sistem sirkulasi pada manusia. Penelitian ini merupakan penelitian quasi eksperimen dengan desain Noenequivalent Control Group Design. Model SAVI diterapkan pada kelas eksperimen. Pengumpulan data dilakukan dengan pre-test dan post-test untuk menilai peningkatan dua keterampilan tersebut. Uji yang digunakan adalah uji independent sample t-test dan normalized gain. Hasil penelitian menunjukkan adanya perbedaan signifikan dalam peningkatan keterampilan metakognitif dan berpikir kritis antara peserta didik kelas eksperimen dengan kelas kontrol (0.00 < 0.05). Model SAVI juga cukup efektif untuk meningkatkan dua keterampilan tersebut dengan N-Gain masing-masing sebesar 51.58% dan 62.41%.*

INTRODUCTION

Students as Indonesian's human resources in the future must certainly master some 21st-century skills, such as metacognitive skills (Arafa et al., 2021). Metacognitive skills are skills in the learning process characterized by a person's ability to make plans related to what is done, monitor progress in learning, and evaluate learning outcomes (Lobczowski et al., 2021). In simple terms, metacognitive skills are knowledge about one's thinking processes.

According to Haka et al., (2021), a learner knows his memory skills in a particular subject matter. To assess their achievements, these students make a small journal about their accomplishments. Based on the record of achievement in the learning process that has been carried out, he can reflect on his strengths and weaknesses related to learning (Diani et al., 2021). This idea aligns with the opinion of Marantika (2021), who argues that "Metacognitive skills can help students to increase their knowledge and improve their intellectuality in the learning process and their learning experiences ."These skills are helpful in the learning process and will be very beneficial for students' future. According to Hindun et al., (2020), metacognitive skills are divided into five indicators: planning, monitoring, information management, debugging, and evaluation.

Critical thinking is also a skill that students must possess. Nur & Nurul (2020) stated that critical thinking is reflective thinking that makes sense in making decisions about actions or beliefs owned as the primary focus. Critical thinking skills are expressed as reflective thinking skills that make sense to decide what can be trusted and what can be done (Armana et al., 2020). This statement agrees with Darmaji et al. (2022); critical thinking skills are a tool for constructing students' knowledge in selecting the information and arguments they get.

The 21st century is when the world is developing rapidly and dynamically. Therefore, individuals are required to have 21st-century skills consisting of; (1) effective communication, (2) collaboration and team building, (3) critical thinking and problem solving, (4) creativity and innovation (Hugonnet et al., 2021), (Badiei et al., 2020). Heard et al., (2020) argue that the process of developing critical thinking has gone wrong on an educational agenda because these skills can develop the nation's potential.

Critical thinking skills are part of the Higher Order Thinking Skills (HOTS). Based on Bloom's cognitive taxonomy, critical thinking skills are in the C4-analyzing & C5-evaluatingcategories (Khishaaluhussaniyyati et al., 2023). According to Chusni et al. (2020), six aspects of critical thinking are the main skills, including focus, reason, inference, situation, clarity, and overview (FRISCO).

However, students' critical thinking and metacognitive skills in Indonesia still need to improve. Based on a survey conducted by the Organization for Economic Co-operation and Development (OECD) in 2019 it stated that in 2018, Indonesia's Program for International Student Assessment (PISA) was ranked 7th from bottom in the aspect of critical thinking skills and metacognitive (Lestari & Annizar, 2020) even though educators can improve student's critical thinking skills by implementing more varied and innovative learning strategies so that students are more interested and motivated to take part in learning (Zubaidah, 2020).

Based on observations made at MAN in Magelang City during the Introduction to the School Environment, 85% of the 50 students needed help understanding their metacognitive skills in themselves. In addition, students' critical thinking skills need to be visible. At the time of learning, 90% of the 50 students were still reluctant to express ideas through statements or statements based on what had been learned.

In addition, 80% of the 50 students did not know what they would understand because they needed to try to find information about the material before learning. Then this also affects educators not to apply learning models other than conventional models because students are quite difficult to interact with the aim that learning is not teacher-centered. This is in agreement with Syara et al. (2020) with their research that the learning model teachers use greatly affects student interaction during the learning process.

One example of a learning model that makes students more active is the SAVI (Somatic, Auditory, Visualization, and Intellectual) learning model. The SAVI learning model is a learning model that optimizes all the five senses possessed by students and the intellectual abilities of students to understand the information they get (Rahayuningtyas et al., 2022). This model uses the Accelerated Learning approach or learning quickly, naturally, and meaningfully. There are four stages to implementing SAVI learning: preparation, delivery, training, and display of results (Nainggolan et al., 2021).

This learning model can help educators to increase student motivation and critical thinking skills because the content and design of this model are oriented toward the needs of students on how to become creative and innovative individuals. The SAVI learning model also significantly influences improving students' metacognitive skills.

METHOD

This research employed the quantitative approach using a quasi-experimental research method. The quasi-experimental method used by the researchers is the Nonequivalent Control Group Design.

The population in this study were the eleventh-grade students of MIPA MAN Kota Magelang who had not been given the material on the circulation system in humans consisting of 4 classes with a total of 132 students. The method used for determining the sample is non-random sampling with a purposive sampling technique.

The research instruments chosen were tests and observation sheets. Observation sheets are used to observe learning activities. The test tests students' metacognitive and critical thinking skills with material on the human circulation system. The type of test the researcher chose in this study was an essay test. The form of essay questions refers to the levels of Bloom's taxonomy developed by Anderson and Karthwol. The domain of the questions ranges from C4 (analysis) and C5 (evaluation) levels. The tests are arranged as pretest and posttest and are based on a grid of questions.

The selected data collection technique is test, observation, and documentation. The researcher used a documentation technique on Biology test scores data for class XI MIPA MAN Magelang City, which would later be used to analyze the prerequisite test data. Data collection was carried out from October 19th to October 26^{th,} 2022.

The data analysis technique in this study consisted of two tests, namely the prerequisite test and the hypothesis test. The prerequisite test consists of normality and homogeneity tests. The normality test is carried out to determine whether a data distribution is normal (Kwak & Park, 2019). The population normality test must be fulfilled and is required to carry out calculations in the next hypothesis test (Nachar, 2008). The analysis chosen by the researcher to carry out the normality test is the Kolmogorov-Smirnov analysis or the Shapiro-Wilk test with the SPSS application.

Homogeneity testing is carried out to prove that the data set we examine has the same characteristics or comes from populations that are similar in diversity (Shwartz-Ziv & Armon, 2022). Homogeneity testing in this study used Levene's analysis of Equality of error Variance through the SPSS application.

Hypothesis testing is carried out to test the validity of the statistical hypothesis of a population with research data from samples

that have been obtained (Supena et al., 2021). This study uses a descriptive hypothesis consisting of an Independent Sample T Test and N-Gain (Normalized Gain).

T-test is a statistical method used to determine the average comparison of two samples. This test is also applied to test the truth of the hypothesis in a population with the SPSS application (Kelter, 2020). The N-Gain test determines whether a particular population treatment has an effect, so N-Gain (Normalized Gain) data analysis is used (Fathurohman et al., 2023). The processed data comes from the pretest and posttest scores done by students.

RESULTS AND DISCUSSION

The normality test was carried out using K.D. Biology test scores. 1 class XI MIPA 2, XI MIPA 3, and XI MIPA 4. This test uses the SPSS 26.0 application. The Shapiro-Wilk test was chosen because the sample was under 50 people per sample group. The results of the sample normality test are listed in Table 1.

Table 1. Normality Test

No	Class	Signification
1.	XI MIPA 2	0.223
2.	XI MIPA 3	0.074
3.	XI MIPA 4	0.127

The data is said to be normally distributed if the significance level is > α, with α = 5% or 0.05 and vice versa if it is less than α. Table 1 shows that the significance value for class XI MIPA 2 is 0.223, which meets the requirements for normal data distribution. Two other classes are also said to be normally distributed with XI MIPA 3, a significance of 0.074; for class XI MIPA 4, it is 0.127. That way, all classes meet the requirements to be the sample because they are all normally distributed.

Two samples that have been declared normal must fulfill the next requirement, namely having a homogeneous level of achievement. Because the data is normally distributed, Levene's Equality of Error Variance test is used to determine homogeneity. Both samples are declared homogeneous if the significance value is greater than or equal to 0.05 (5%). Based on tests conducted through SPSS, it is known that the significance value for class XI MIPA 2 and XI MIPA 4 is 0.687. Therefore the two samples are stated to have equivalent achievement levels.

Class XI MIPA 2 was selected as the experimental class, treated with the SAVI learning model. According to the suggestion of the biology subject teacher who taught the two sample classes, class XI MIPA 2 was more active. Therefore, it was more suitable if you wanted to be treated with a learning model. Class XI MIPA 2 consists of 34 students.

The experiment was designed in 3 meetings. The first meeting begins with preparatory activities according to the syntax of the SAVI learning model. Students also do a pretest at the beginning of the meeting. The average value of the pretest metacognitive skills of the experimental class was 27.08. The early metacognitive level of the experimental class is in the undeveloped category. And the average posttest score for metacognitive skills in the experimental class was 65.23, which was included in the well-developed category.

For the control class, the average pretest value of the early metacognitive skills of the control class was 26.79. The metacognitive skills of the control class fall into the undeveloped category. And the average posttest score of the control class's metacognitive skills after treatment was 43.72, which was included in the starting to develop the category.

The average pretest score for the experimental class' critical thinking skills was 34.52. The early level of critical thinking skills in the experimental class was low. And the average posttest value of the experimental class' critical thinking skills was 75.73, which was in the medium category.

As for the control class, the average value of early critical thinking skills for the control class was 34.79. The critical thinking skills of the control class are low. And the

average posttest score for critical thinking skills in the control class after being given a conventional learning model was 48.58. Therefore, the critical thinking skills of the control class are in a low category.

The independent sample t-test was used to determine whether there was a significant difference between the two samples that were given different treatments. The significance (sig) determined is α = 0.05. If sig < α is found, H0 is rejected, and H1 is accepted. Conversely, if sig > α, H0 is accepted, and H1 is rejected. The results of the independent sample t-test for both metacognitive skills and this study are listed in Table 2.

Table 2. Metacognitive Skills Independent Sample T-Test

No	Class	Mean	Signification
1.	Experiment	38.15	0.000
2.	Control	16.93	0.000

Based on the calculations presented in the table, it was stated that the significance value for the experimental and control classes was 0.000. It can be concluded that there is a significant difference between the experimental class treated with the SAVI learning model and the control class given the conventional model treatment in the aspect of metacognitive skills.

While the independent sample t-test results are good for critical thinking skills in this study, they are listed in Table 3.

Table 3. Critical Thinking Skills Independent Sample T-Test

No	Class	Mean	Signification
1.	Experiment	41.21	0.000
2.	Control	13.79	0.000

The results of the independent sample t-test on critical thinking skills show a significance of 0.000. It can be concluded that there is a significant difference between class XI MIPA 2, which was treated with the SAVI learning model, and class XI MIPA 4, which was used as the control class by applying the conventional learning model.

After treatment, the normalized gain is also used to determine increased metacognitive skills and critical thinking. After calculating with SPSS 26.0, it is stated that the N-Gain value of metacognitive skills is shown in Table 4.

Table 4. Metacognitive Skills Normalized Gain Test

No	Class	Total	N-Gain	%
1.	Experiment	34	0,51	51.58
2.	Control	29	0,23	23.22

Based on the reference to the normalized gain value category, values in the range of 0.300 to 0.700 are declared to be in the medium category. And based on the guidelines for interpreting the percentage of N-Gain, for the metacognitive skills of the experimental class, it is 51.58%, which is in the fairly effective category.

Whereas for the control class that applied the conventional learning model, the N-Gain result was 0.23, which was in the low category. The percentage of 23.22% is in the ineffective category.

After calculating with SPSS 26.0, it is stated that the N-Gain value of critical thinking skills is shown in Table 5.

Table 5. Critical Thinking Skills Normalized Gain Test

No	Class	Total	N-Gain	%
1.	Experiment	34	0,62	62,41
2.	Control	29	0,20	20,61

The N-Gain test results for the experimental class' critical thinking skills were 62.41%, which was fairly effective. Whereas for the control class that applied the conventional learning model, the N-Gain result was 0.20, which was in the low category. The percentage of 20.61% is in the ineffective category.

The results of the independent sample t-test for metacognitive skills are listed in Table 2, with a significance of 0.000. Therefore, it can be stated that there is a significant difference in the metacognitive skills of the experimental class that has received the SAVI learning model treatment with the control class that has received the conventional learning model treatment.

Natsir et al. (2023) stated significant differences in metacognitive skills between the experimental class that received the SAVI learning model and the control class. Wahyuni et al. (2022) also stated that there were significant differences between the experimental class that received the SAVI learning model treatment and the control class in metacognitive aspects.

The results of the critical thinking skills test are listed in Table 3. It is stated that the significance of critical thinking skills between the control and experimental classes is 0.000. It can be concluded that there is a significant difference in critical thinking skills between the experimental class that has received the SAVI learning model treatment and the control class that has received the conventional learning model treatment. This is in line with Pratama et al. (2020), the treatment given by teachers to students will affect student outcomes.

There were significant differences between the control and experimental classes that were given the SAVI learning model in aspects of critical thinking skills (Nadhiah & Wulandari, 2020). The same thing was stated by Lelela et al., (2021) that there were significant differences in critical thinking skills between the control class that received conventional learning model treatment and the experimental class that received the SAVI learning model.

The results of the N-Gain test in Table 4 state that the SAVI learning model effectively improves students' metacognitive skills. This aligns with research conducted by Erbay (2021), who argued that the SAVI learning model effectively improved students' metacognitive skills. Febriyanti et al. (2021) also stated that the SAVI learning model effectively improved students' metacognitive skills.

Based on the results of the N-Gain test for critical thinking skills listed in Table 5, the SAVI learning model effectively improved students' critical thinking skills. The SAVI learning model effectively improved students' critical thinking skills (Idawati et al., 2020). The same thing was stated by (Jannah & Cipta, 2021). This is also supported by the average pretest score of the metacognitive skills of the experimental class, which has increased in the posttest. The level of metacognitive skills in the experimental class, which was originally in the undeveloped category, is now in the well-developed category.

For the control class, early metacognitive skills were in the undeveloped category. Then after being treated with the conventional learning model and the posttest, it is included in the category of starting to develop. Miarsyah et al. (2021) argue it can be concluded that the metacognitive skills of the control class treated with conventional learning models have increased, but not as well as the experimental class.

Improvements were also seen in the critical thinking skills of the experimental class after the SAVI learning model was applied. Students' critical thinking skills become in the high category after being given treatment. This is in line with the opinion of Ahmad (2021) that there is an increase in students' critical thinking skills after applying the SAVI learning model. The early critical thinking skills of the control class were said to be low. After being treated with conventional learning models, the average value of the control class is still in the low category.

The different stages of the SAVI learning model and the conventional model cause these findings. There is a training stage and results in the display stage that exists in the SAVI learning model and does not exist in the conventional learning model. These two stages are the key to the SAVI learning model. According to Khaidir & Suud (2020), knowledge is not absorbed by students but is formed by students. The stage of training and performance of the results is where educators condition students to develop new knowledge and strengthen the new knowledge or skills acquired (Demchenko et

al., 2021). These two stages are the core of the SAVI learning model.

Activities carried out at the training stage include game-based learning, learning training activities, problem-solving activities, discussions, etc. The activities that can be carried out at the stage of the performance of the results are divided into two, namely, at the session and after the session (Suprayogi & Budi, 2020).

The session consists of an evaluation of learning, evaluation, and improvement of learning programs, and implementation planning. While after the session, activities include strengthening a learning, evaluating, and improving the performance of results (Kang & Kim, 2021)

Researchers chose problem-solving activities because they can improve metacognitive skills(Jayul & Irwanto, 2020). In addition, there are similarities in indicators of problem-solving abilities with metacognitive skills, namely in planning, monitoring, strategy, and evaluation; when solving problems, these aspects are needed (Azizah et al., 2019). In problem-solving activities, various strategies are also used to solve problems.

In addition, problem-solving activities require critical thinking indicators such as focus, reason, inferences, situation, clarity, and overview (FRISCO). These aspects help solve problems to assess clarity, relevance, and accuracy when testing theories by looking for a new solution (AlAfnan et al., 2023).

Critical thinking skills can be increased by applying problem-solving activities in learning. Problem-solving activities can improve critical thinking skills, especially regarding clarity, accuracy, precision, relevance, depth, breadth, and logic. Critical thinking and problem-solving are interrelated activities (Alkhatib, 2019).

Discussion activities were also chosen because they can improve metacognitive skills. In discussions, activities such as voicing thoughts, making plans, and reporting the results of thinking can improve metacognitive skills (Bangkom & Sukavatee, 2021). Discussion is part of active learning and is proven to improve critical thinking skills (Fuad, 2020). Critical thinking skills can increase after carrying out discussion activities in learning. Discussion activities that are applied to the learning process can improve students' critical thinking skills.

In implementing the SAVI learning model, researchers chose imagery or parables to help increase the speed and endurance of the learning process, which is in line with the approach of the SAVI model, namely Accelerated Learning. Similes can be integrated into auditory, visual, and physical aspects through graphics (pictures, symbols, icons), metaphors and analogies, mnemonic devices (knowledge of memorizing), physical objects, body language, and stories.

Researchers choose image objects, metaphors, analogies, and stories in applying SAVI. Images are potential messengers that are more meaningful than words. Words are processed by long-term memory; only one code is needed. Meanwhile, images use two codes, visual and verbal, to make them easier to remember. Meanwhile, stories are the best method for forming concrete abstracts that are always remembered (Aryanto, 2021).

Metaphors and analogies are more effective for helping students grasp a concept by doing parables with something familiar with nature or everyday life. Metaphors and analogies can also provide a deep understanding of concepts already known in new ways (Reinhardt, 2020).

The SAVI learning model in this study could not reach a practical level for improving metacognitive skills and critical thinking because it found several obstacles. Based on field notes, it was found that the infrastructure in the class was incomplete. The researchers need more time to prepare the infrastructure. Due to time constraints, The results presentation activity had to be postponed to the second meeting. Students are also unfamiliar with the SAVI learning model. Thus, they need adaptation.

Constraints were also encountered by students who could not start learning on time. The results display stage also could not run optimally because not all groups implemented the results display.

In addition, they also did not do the tasks requested by the researcher. However, due to time constraints, problem-solving activities, discussions, and results presentations were less than optimal.

The weakness of the SAVI learning model experienced by researchers is that educators need comprehensive facilities that meet their needs. The SAVI learning model is also a learning model that is still new. If students' reasoning abilities are weak, then SAVI will experience obstacles. Another weakness of the SAVI learning model that researchers found when collecting data was the absence of a definite measurement tool to determine whether students had maximized the four aspects of SAVI in each stage.

CONCLUSIONS AND SUGGESTIONS

Based on the results of the research data and discussion, it can be concluded that:(1) There is a significant difference in improving metacognitive and critical thinking skills between the control group that was given the conventional learning model and the experimental group that was given the SAVI learning model. (2) The SAVI learning model effectively improves metacognitive and critical thinking skills, with an N-Gain value of 51.58% and 62.41%, respectively. Suggestions that can be considered are that the SAVI learning model should be designed more maturely so that each stage can run optimally. In addition, this model can also be applied to test other abilities, such as higher-order thinking skills, understanding concepts, and others

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