Pak. j. life soc. Sci. (2024), 22(2):16594-16605 E-ISSN: 2221-7630;P-ISSN: 1727-4915

Pakistan Journal of Life and Social Sciences
www.pjlss.edu.pk

https://doi.org/10.57239/PJLSS-2024-22.2.001205

RESEARCH ARTICLE

Science, Environment, Technology, and Society Learning Methods on Critical Thinking and Problem-Solving Skills

Jossapat Hendra Prijanto[1*], I Putu Sriartha[2], I Made Pageh[3], Ida Bagus Made Astawa[4]

[1,2,3,4] UGanesha University of Education, Singaraja Bali, Indonesia

ARTICLE INFO

Received: Aug 16, 2024

Accepted: Oct 10, 2024

Keywords

SETS learning method
Critical thinking
Social problem solving

***Corresponding Author**

jossapat@undiksha.ac.id

ABSTRACT

The objectives of this study are analyzed efficacy of SETS learning methods on improving students' critical thinking and social problem-solving skills, and the partial and simultaneous effects of the SETS learning model on problem-solving and social critical thinking skills. Type of research Quasi-Experimental Research. The research was conducted in Tangerang Regency Banten, by selecting stratified schools according to accreditation, each school determined the experimental and control classes. Schools were randomly selected one school each, namely SMPN 1 Curug Accreditation A, SMPN 4 Curug Accreditation B, and SMPN 5 Curug Accreditation C. The research was conducted in class 7 (seven) purposively selected using a pseudo-experimental design Nonequivalent Control Group Design. Data on the process of applying the SETS learning model was collected using observation techniques, and data on problem-solving and critical thinking skills were used using the essay test method. Data analysis was carried out with descriptive gain score techniques and inferential statistics (Manova). The process of applying the SETS learning model was carried out in a good category looks average value of the Experiment class using the SETS learning model is higher than the conventional class. The effectiveness of learning method for improving problem-solving and critical thinking is quite effective. The SETS learning model has a statistically significant and statistically smaller-than-0.05 significance value when it comes to both problem-solving and critical thinking skills (104,931). The SETS learning model also has a partial impact on problem-solving skills with F statistical findings and critical thinking skills with 191.886 statistical results with a significance value of 0.000 or less than 0.05 and on the ability to solve problems with F statistical results of 40.700 with significance is 0.000 or less than 0.05.

INTRODUCTION

Facing global competition in the twenty-first century, problem-solving skills and critical thinking skills are required. To produce high-quality and competitive graduates in today's world, (Indraswati et al., 2020) demanded a paradigm to break through thinking. Some problems in education are (1) learning that is focused on mastering theory and memorization causes students to have low reasoning; (2) the curriculum is centralized and ignores the context of the student's environment. Goals can be achieved objectives social studies learning in junior high school, students must learn to solve problems and develop critical thinking. Thus, they should be sensitive to social problems and skilled in solving them. (Hardianti et al., 2022) stated that the importance of social studies learning is to foster students' curiosity and involvement in learning by using issues around them to encourage them to think critically and solve problems.

The facts of previous research show that students have low critical thinking and problem-solving skills. The results of research by (Indraswati et al, 2020) and (Anisa et al, 2021) show that

students have low critical thinking and problem-solving skills because social studies lessons are usually monotonous. Students are not accustomed to asking questions, arguing, and concluding, and teachers fail to determine the right learning model for the material being taught (Indrahadi and Junaidi, 2017: 23). Students are motivated to learn because the SETS learning model is fun, conducive, and achieves learning objectives (Riwu et al, 2018: 162). Furthermore (Fazrina et al, 2023) stated that SETS learning students can understand science better, more interesting, and more fun. The condition of students' ability to think critically and social problem-solving ability in the school where the research, can be developed, because the SETS learning model applied by the teacher, is very interested in students to social studies learning outcomes, seen from observations and interviews. This study aims to determine the effect of critical thinking and problem-solving expertise between the use of SETS learning models with conventional and to find out the hypothesis test of MANOVA analysis.

LITERATURE REVIEW

SETS Learning Model

The SETS (Science, Environment, Technology, and Society) learning model initiated by Achmad Binadja is a learning model consisting of several components, including constructivism, discovery, questioning, modeling, reflection, and assessment (Asminah, 2021: 35); (Gathong and Chamrat, 2019) define SETS learning as a combination of science, technology and the environment. In learning, students learn with their sensitivity to study the conditions of society directly. Sensitization to the environment that stimulates critical thinking and problem-solving are associated with science (Riwu et al, 2018: 162). The SETS Learning Model is enjoyed by students because it is fun, conducive, and achieves the learning objectives that have been set (Aprianingtyas, and Sumadi, 2016: 2). The figure below shows the relationship between SETS components and science.

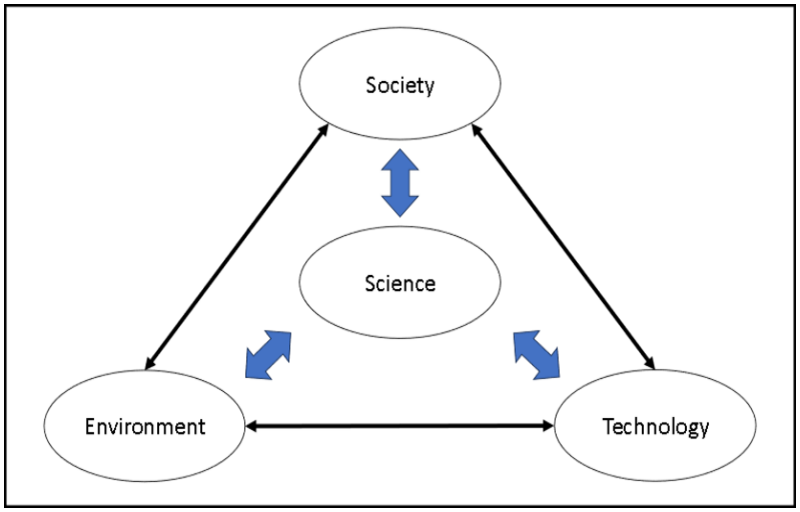

Figure .1. Relationship between Learning Components

The picture explains that learning with SETS method integrates Science, Environment, Technology, and society with a focus on addressing environmental issues. The method in implementing SETS learning is that students are given training to have the ability to solve problems with their bright ideas and ideas, and students have the opportunity to have thinking beyond the average expertise both problem-solving and critical thinking skills.

The SETS Learning Model emphasizes concepts and processes as they are used to identify and solve problems. (Tessarani et al., 2016: 3) explain the syntax of the SETS learning model, namely: In the first stage (invitation), students are encouraged to express their initial knowledge about the concepts to be discussed. In the second stage (concept formation), students have the opportunity to discover concepts and investigate through organizing, interpreting and collecting data. In the third stage (application of concepts in everyday life), students explain and provide

solutions. In the fourth stage (concept consolidation), the teacher provides concept reinforcement. In the fifth stage of assessment, the teacher evaluates the extent of the success of SETS learning. The syntax of SETS Learning is a flow chart as below:

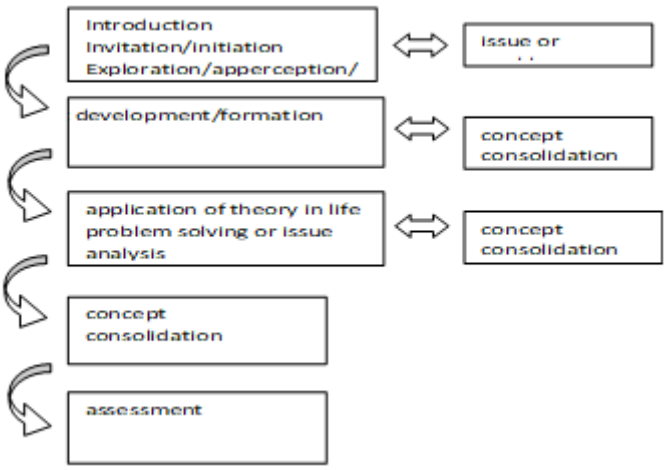

Figure 2. Syntax of the Learning Model

Students' Critical Thinking Ability

Critical thinking skills according to (Snyder and Wiles, 2015) students' efforts to think reflectively, and creatively, solved for problems, higher-order thinking, and metacognition. Critical thinking is closely related to higher-order thinking which is the goal of education in schools. Furthermore, (Ariyana et al, 2018: 5) defines higher-level thinking efforts where it is an abstract thought process in explaining a material, concluding, and analyzing. The indicators of critical thinking are (1) analyzing, (explaining), (interpreting), (evaluating), (concluding), and (self-regulation. (Facione, 2020); (Furthermore and Ennis, 2011) outlines the ability of critical thinking ideals including (1) basic categories; (2) the basis for decision-making; (3) conclusions; (4) advanced explanations; and (5) expressions and combinations. (Prameswari etal., 2018) explained that critical thinking is reasonable thinking through the scientific method which includes actions in the form of synthesizing activities to identify problems, analyze and solve them, conclude, and evaluate. The parameters used in this review include analyzing, evaluating, and interpreting.

Critical thinking skills are part of the effort to have higher-order thinking and one of the prerequisites for problem-solving skills (Cahyono, 2016). According to Bloom, thinking above the normal average and creating, analyzing, evaluating which is explained in the following figure:

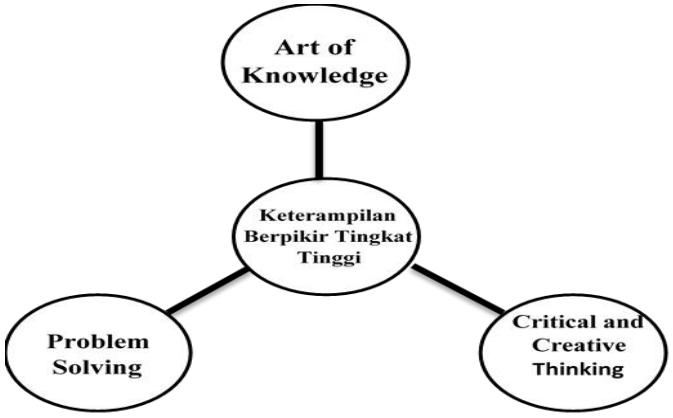

Figure. 3. Aspects of Higher Order Thinking Skills

Students' Social Problem-solving Ability

The skill of solving social problems said (Hidayatulloh, et al., 2020) is a series of thought processes creating methods in obtaining solutions to cases, in the form of expertise in recognizing problems through collecting real things, analyzing data, compiling various alternative solutions, so that students can unpack problems more efficiently. The indicators of problem-solving ability are: analytical, creative, and critical. Solving social problems requires a sensitivity that aims to gather the necessary information to find a way out of the problem. Problem-solving students are directed to think contextually, because with the solutions implemented in learning, students understand the learning objectives, so Problem-solving can make learning more meaningful because there is an element of sensitivity to the problems presented to students. (Rosardi, 2013: 23). (Purnamasari and Setiawan, 2019) the ability to solve problems includes: problem understanding, developing a Completion plan, manifestation a Completion plan, and re-examining the procedure and Completion results. Then the same thing was stated by (Lestari et al., 2021) that the indicators of students' social problem-solving ability consist of understanding the problem, making a plan, implementing the plan, and re-examining the solution that has been obtained. The indicators used in this study are: analytical, creative, critical, compiling, implementing problem-solving plans, and re-examining solution obtained.

METHOD

Research Design

This research design is a type of quasi-experimental research, because it is considered appropriate in educational research because it involves a sample of students whose participants are not possible to be taken randomly considering that they are in a particular community.

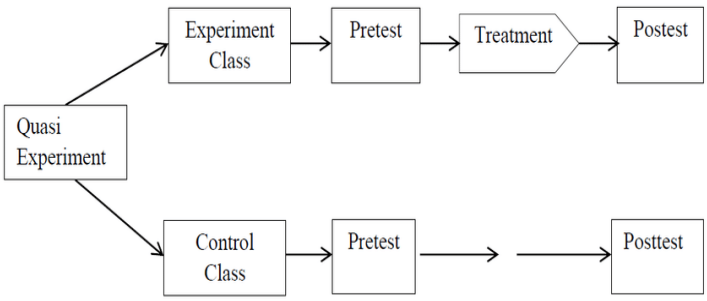

Figure 4. Design of Quasi-Experiment

It's a Dependent Variable and an Independent Variable.

The independent variable in this observation is the learning method, which embodies the SETS method in the learning process that combines elements of Technology, Society, Science, and Environment, the dependent variable in this writing analysis is the student 'critical thinking skills (Y1) and students' ability to solve social problems (Y2).

Population and Research Sample

This study was conducted in junior high schools in Tangerang Regency Banten, the research procedure was to purposively select junior high schools in Curug sub-district, Tangerang Regency for schools that were accredited (A) = SMPN 1 Curug, Accredited (B) = SMP Negeri 4 Curug and Accredited C = SMPN 5 Curug Tangerang Banten. Multistage random sampling. Based on the opinion of (Supranto, 2008) the sample is taken by randomizing technique is combined sampling strategies. How many stages of determining the sample, among others, are: The first stage determines the sub-district that will be used as a sample with areal sampling. Second, determine the number of schools that will be used as samples according to their accreditation in each purposively selected area. Third, randomly selecting the schools to be used from the schools in the sample area according to their accreditation.

Research Data

Data on the process of applying the SETS learning model was collected using observation techniques, and data on problem solving skills dan critical thinking and using the essay test method. Validity and reliability test results after being interpreted proved to be valid and reliable.

Data Analysis

Effectiveness can be known by implementing the SETS learning method on critical thinking and problem-solving expertise, descriptive statistical analysis with normalized Gain Score (GSn) technique was used.

$$Gsn = \frac{S\ posttest - Spretest}{SMI - Spretest} \times 100\%$$

Number	Percentage	Interpretation
1	0<40	Ineffective
2	40<56	Less effective
3	56>75	Quite effective
4	>76	Effective

Descriptive statistical analysis

Used to describe mean, SD, highest value, lowest value, median. To analyze of problem-solving and critical thinking inferential statistical analysis of the multivariate technique of Analysis (Manova) using SPSS27 tools used in data analysis (SPSS27) and with the result being an interpretation of partial and simultaneous influence.

RESULTS

The results showed Quantitative descriptive data analysis informs that critical thinking skills in participation in the SETS learning model have a range = 27, minimum score = 73, maximum score = 100, average = 84.12, median = 83, mode = 80, standard deviation = 6.47, and variance = 41.81. When viewed from the average (mean) = 84.12 and converted into the table, stated that his critical thinking skills data following the SETS learning model is categorized as good. Furthermore, quantitative descriptive data analysis states that the ability to solve problems that follow the SETS learning model has a range = 27, minimum score = 73, maximum score = 100, average = 87.50, median = 87, mode = 88, standard deviation = 6.66, and variance = 44.31. When viewed from the average (mean) = 87.50 and converted into the table, it is known that the data of the ability to solve problems that follow the SETS learning model is categorized as good.

Table 1. Quantitative Descriptive Data Analysis

Source	SETS Critical Thinking	SETS Problem	Conventional Critical Thinking	Conventional Problem Solving
Mean	84,12	87,50	70,62	81,14
Median	83	87	70	81,5
Mode	80	88	70	80
Std. Deviation	6,47	6,66	7,42	7,56
Variance	41,81	44,31	55,07	57,15
Range	27	27	31	31
Minimum	73	73	54	65
Maximum	100	100	85	96
Sum	8580	8925	7203	8276

To understand the effectiveness of SETS learning model on problem solving and critical thinking skills, the normalized gain formula (Gsn) was used. Based on the averages in the table, critical thinking skills are more effective than critical thinking skills that follow the learning process method with SETS of 64.90 are in the moderately effective category.

Table 2. Calculation of Gsn Critical Thinking Ability Data

No	Experiment				Control			
	Pre-test	Post Tes	Gsn	Gsn 100	Pre tes	Post Tes	Gsn	Gsn 100
	Average		0.65	64.90	Average		0.41	40.56

While critical thinking skills that follow conventional learning of 40.56 are categorized as less effective. Based on the table, the average problem-solving ability that follows the SETS learning model is 70.00 which is quite effective. While the ability to solve problems of conventional learning model students is 41.59 which is categorized as less effective.

Table 3. Calculation of Gsn Data of Problem-Solving Ability

No	Experiment				Control			
	Pre-test	Post Tes	Gsn	Gsn 100	Pre tes	Post Tes	Gsn	Gsn 100
	Average		0,70	70.00	Average		0.42	41.59

To understand the effect of SETS learning on problem solving and critical thinking skills, a hypothesis test was conducted, namely MANOVA analysis. The results show F of 104.931 has a significance of <0.05. So, F is significant, it is concluded that the application of the SETS learning model has a simultaneous and significant effect on critical thinking and problem-solving skill.

Normality Test of Data Distribution

Based on testing the normality of the data distribution that has been carried out, the following results are obtained.

Tabel.4. Data Distribution Normality Test Results

Variable	Group	Kolmogorov-Smirnov[a]			Description
		Statistic	df	Sig.	
Critical thinking	experiment	0,078	102	0,128	Normally distributed
	Control	0,082	102	0,086	Normally distributed
Problem-solving	experiment	0,088	102	0,051	Normally distributed
	control	0,086	102	0,062	Normally distributed

Based on the results of the data distribution normality test analysis above, it can be said that the variable data groupings mentioned above are all regularly distributed.

Variance Homogeneity Test.

When based on the homogeneity of variance test, the results are.

Table. 5. Test of Homogeneity of Variance Together

Box's M	**3,517**
F	1,160
df1	3
df2	7344720
Sig.	0,323

Table. 6. Calculation Separate Variance Homogeneity Test

Variable	F	df1	df2	Sig.
Critical thinking	1,904	1	202	0,169
Problem-solving	2,803	1	202	0,096

It can be concluded that all data groups are homogenous if, according to the results of the homogeneity test above, the significance value, either taken together or separately, is more than 0.05.

Correlation Test Between Related Variables

The results of the correlation test between the dependent variables in this analysis are shown in the table below.

Table. 7. Correlation test between dependent variables

Group	Value recalculates (Pearson's Correlation)	Significance level (sig.)	Decision
Experiment	0,111	0,267	Not correlated
Control	0,179	0,072	Not correlated

A value of 0.111 and 0.179 with a significance value of 0.267 and 0.072 or greater than 0.05 (sig. > 0.05) is displayed in the above table. This suggests that either there is no correlation between the dependent variables or the correlation between them is not significant. The MANOVA test is therefore possible.
The table above is valued at 0.111 and 0.179 with a significance of 0.267 and 0.072 > 0.05 (sig. > 0.05). This indicates that either there is no correlation between the dependent variables or the correlation between them is not significant. The MANOVA test is therefore possible.

Table. 8. multivariate test

Statistic	F Value	Significancy Level (sig.)	Conclusion
Pillai's Trace	104,931	0,000	Significant
Wilks' Lambda	104,931	0,000	Significant
Hoteling's Trace	104,931	0,000	Significant
Roy's Largest Root	104,931	0,000	Significant

The critical thinking ability variable reveals a significant F value of 191.886 for the critical thinking ability variable, with a significance level of 0.000 or less than 0.05. In conclusion, critical thinking abilities are greatly impacted by the use of the SETS learning approach.

Tabel. 9. Between-Subjects Factors

		Value Label	N
Group	1.00	Experiment	102
	2.00	Control	102

Table 10. Second Hypothesis Test

Dependent Variable	Source	JK	Df	RJK	F	Sig.
Critical thinking skills	Between	9294,750	1	9294,750	191,886	0,000
	In	9784,676	202	48,439		
	Total	1240173	204			

Furthermore, the problem-solving ability variable The F value of 40.700 has a significance value of 0.000 or <0.05, indicating that the F value of the problem-solving ability variable is significant. In conclusion, the application of the SETS learning model has a significant effect on problem-solving abilities.

Table. 11. Third Hypothesis Test

Dependent Variable	Source	JK	Df	RJK	F	Sig.
Social problem-solving skills	Between	2064,711	1	2064,711	40,700	0,000
	In	10247,578	202	50,731		
	Total	1462677	204			

DISCUSSION

Based on the research results as stated above, the SETS education model is suitable for students, because of their involvement in learning social studies with the theme of local wisdom bathing in the Cisadane river Tangerang Banten. In the Science (S) factor, students understand local wisdom that guides life and makes learning resources. Students are led to observe, think critically, and see if there are problems that need to be solved so that students focus on the teacher's description, the Environmental factor (E) students recognize local wisdom related to human life, as inspired by the big bath in Islamic teachings, the river is a symbol of purifying themselves. The tradition of bathing is carried out every Ramadan, this situation makes students aware of criticizing areas that must always be protected, technology factors (T) students use social media to facilitate learning, Society factors (S) students are made aware of local wisdom to guide life in responding to daily problems. Reflection on Ramadan to clean ourselves to be prepared to face life's upheavals.

(Sugiharti & Sukowati, 2020) state that the Science Environment Technology Society) education model has an approach, namely: (1) Invitation: The teacher informs problems related to learning material (2) Exploration: Students independently collect data related to the case given by the teacher (3) Solving: sourced from the results of exploration, students analyze the case by discussing (4) Application: students practice some of the concepts they have understood in an area. Based on these stages, there are elements of SETS which can foster social skills and critical thinking abilities problem solving by listening to the data informed by the teacher regarding the theme of the customs of Tangerang residents, (Science) students are motivated listen intently to the teacher's teaching, in carrying out dialogue and presenting the results of their discussion regarding local wisdom that is always maintained amid advances in digitalization technology (environment) so that through (technology) that can support students' skills in mastering social studies subjects.

The research shows this influence originates of the SETS education method on critical thinking and social problem-solving. This result is reinforced by previous research, including (Amilyana and Noer, 2021: 319) that learning with the SETS model can increase students 'critical thinking skills, even supporting that this method is categorized as more advanced critical thinking skills resulting in students' expertise in solving problems around students.

Relevant research appears to be from (Amanda et al., 2018) reporting the influence of the SETS education model in the First High School of Negeri 1 Socah Bangkalan can affect students' critical thinking skills and lead them to think about making solution efforts to the things they face. The things that influence SETS education on critical thinking and skills to make problem solutions, namely: SETS education is oriented towards student participation in expressing solutions to cases experienced daily. The case is brought into the classroom to find a solution in an integrated manner in mutual ties between elements of science, environment, technology, and local residents. Here students are involved in the learning process so that the learning results are very exciting, memorable, and difficult to eliminate in their thinking brains (Maulidati, et al, 2018).

Next, the SETS Education Model influences critical thinking skills. Results are based hypothesis testing, there is a significant effect in the implementation of SETS education methods on critical thinking skills. The research results are These results are reinforced by previous analyze, namely: (Research Marliani, et al., 2017) Research results in class X-IPA 4 in the control class and X-IPA 1 in the experimental class, by being tested with a description question to see critical thinking skills and known significant level of 0.05, and the t-test of critical thinking skills shows that (3.726> 2.00), the conclusion is that there is an effect of SETS learning methods on critical thinking skills. expertise in the area pollution module. Research (Oktaviani et al., 2017) reported the level of critical thinking skills in the critical thinking module there was an increase in the critical thinking skills of the experimental class, and the N-gain value reached 0.59 in the medium category. The social expertise of students was 84.50% with good criteria. Increased practicality of learning is shown by the reaction of teachers and students well about the products presented. It is concluded that in this research, SETS-orientated education can improve social skills and critical thinking in the experimental class. The things that influence the SETS education model on critical thinking, namely: being able to teach students to have the skills to look at science, environment, technology, and community factors and train students to have critical thinking skills.

After that, the SETS Education Model influences student problem-solving. Based on the results of the hypothesis test, it was found that there was a significant influence in the implementation of the SETS education model on social problem-solving skills. These results are reinforced by the results of previous research, namely: (Research Purwanto et al., 2022) reported that the SETS (Science, Environment, Technology, Society) education procedure integrated into exploring and adventuring using Google Earth makes it easier for students to use science and the pleasure of reading science encourages students to have the skills to find problem solutions. (Azizah and Astuti's, 2020) reported that the results of this research produced data showing that I-SETS - oriented science learning module related to community customs is very feasible because it makes for students it is easier to understand the lesson, and encourages an increase in personalities who care about the environment and build critical thinking and social problem-solving in society.

The influence of SETS education methods on problem-solving skills includes SETS education activities sharing real experiences with students in the surrounding area in the context of science and technology, because students are shown to recognize problems and actively seek data to find answers to cases in areas near them (Khoirunisa, et al, 2022: 635).

The novelty of this research lies in its dependent variables, namely critical thinking skills and problem-solving skills. Previous research conducted by (Astuti, et al, 2022; Yulistiana, 2015; Triwidada, et al, 2017; Sudibyo, 2016) has not used the variables of critical thinking skills and problem-solving as dependent variables. The independent variable always uses the SETS education model with a variety of implementations of social studies education grade VII which uses the theme of local wisdom Tangerang Banten district and learning that focuses students to have solve problems and critical thinking skills. The influence of the SETS learning process method on critical thinking and social problem-solving of students means the quality of learning in class is increasing, especially in social studies subjects.

CONCLUSION

The research results show that the average critical thinking ability is the SETS learning method following the SETS learning model was 64.90, which is a fairly effective level. Meanwhile, students who followed the traditional learning model scored 40.56 on critical thinking abilities that are included in the low effectiveness category. Meanwhile, the average problem-solving ability following the SETS learning model was 70.00, which is a fairly effective level. Meanwhile, post-traditional problem-solving skills scored 41.59 in the less effective category. It is known that the analysis of the F value, in the application of SETS learning has a simultaneous and significant effect on critical thinking and problem-solving skills, with a significance value of less than 0.05. Therefore, the F value is significant. The SETS learning method in social studies learning has a significant effect on critical thinking skills, evidenced by the critical thinking ability variable with

an F value of 191.886 and a significance value of 0.000 or less than 0.05, indicating that the F value of the critical thinking ability variable is significant. The application of the SETS learning method has a significant impact related to problem-solving skills. This is stated through the dependent variable of skills in solving social problems which the magnitude of the F value is 40.700 then the significance of 0.000 <0.05, indicating the F value of the dependent variable problem-solving ability is significant.

ACKNOWLEDGMENTS

Thank you to the Principals of SMPN 1, 4, and 5 Curug, Tangerang, Banten for allowing the exploration. Teachers and students who voluntarily attended each class. The researcher would like to thank the promoters for their guidance during this research process, hopefully the results obtained will be useful for the development of social studies learning in the world of education.

REFERENCES

Amilyana, Aziza Syaila., Tjandra Kirana M. Sjaifullah Noer, Raharjo. 2021. *A Teaching Material Based on Science, Environment, Technology, and Society to Improve Student's Critical Thinking Skills: Synchronous and Asynchronous Learning During Covid-19 Pandemic. IJORER: International Journal of Recent Educational Research,* Vol. 2, No. 4, 372-391. DOI: https://doi.org/10.46245/ijorer.v2i4.109.https://journal.ia-education.com/index.php/ijorer/article/view/109

Aprianingtyas M, & Sumadi. (2016). *The Influence of SETS (Science, Environment, Technology, and Society) Learning Model on Physics Learning Achievement. Scientific Journal of Physics Education-COMPTON*, 3(2), 1–8. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/ https://core.ac.uk/download/pdf/230375077.pdf.

Anisa, A. R., Ipungkarti, A. A., & Saffanah, K. N. (2021). The impact of the lack of literacy and low critical thinking skills in education in Indonesia. In *Current Research in Education: Conference Series Journal* (Vol. 1, No. 1, pp. 1-12).

Ariyana, Yoki., Ari Pudjiastuti, Reisky Bestary, Zamroni, 2018. Learning Oriented to High-Level Thinking Skills. Directorate General of Teachers and Education Personnel, Ministry of Education and Culture

Asminah, S, (2021). *Motivation and Learning Outcomes of Biology in Grade X IPA 1 Students of SMA Negeri 3 Pontianak by Applying the SETS Learning Model. Journal of Learning and Character Education* Volume 1 Nomor 1. https://jurnal.pendikar.untan.ac.id/index.php/jp2k/article/viewFile/15/15.

Astuti, Heny Yuliana, Sunyoto Eko Nugroho, Budi Astuti. 2022. *Effectiveness of Digital Heat Teaching Materials Based on Science, Environment, Technology, Society (SETS) to Improve Science Literacy of Junior High School Students, (JISE*) 11 (2). http://journal.unnes.ac.id/sju/index.php/jise.

Azizah, N., & Astuti, B. (2020). Development of physics teaching materials based on I-SETS (Islamic, Science, Environment, Technology, Society) complemented by local wisdom and character content. Development of physics teaching materials based on I-SETS (Islamic, Science, Environment, Technology, Society) complemented by local wisdom and character content. *UPEJ Unnes Physics Education Journal*, *9*(2), 164-177. https://journal.unnes.ac.id/sju/upej/article/view/41924. Diunduh 22-8-2023

Cahyono, B. (2016). Correlation of Problem Solving and Critical Thinking Indicators. Phenomenon: Journal of Education MIPA, 5 (1), 15–24.

Ennis, R.H. (2011). The nature of critical thinking: An outline of critical thinking dispositions. The Sixth International Conference on Thinking, 1–8

Gathong. S dan S. Chamrat, 2019. *The Implementation of Science, Technology and Society Environment (SETS)-based Learning for Developing Pre-Service General Science Teachers' Understanding of the Nature of Science by Empirical Evidence (JPII Vol. 8, No. (3).* https://journal.unnes.ac.id/nju/index.php/jpii/article/view/19442

Hardianti, Mya., Agus Suprijono, Nuansa Bayu Segara, Wiwik Sri Utami. 2022. *Development of Mindmap-AnalysisDiscussion (MAD) Learning Model for Students' Critical Thinking Skills in Social Studies Lessons. Dialectics of Social Studies Education*, Volume 2 (3). 1 – 12. https://ejournal.unesa.ac.id/index.php/PENIPS/article/view/48997

Hidayatulloh Rohmat, Suyono, dan Utiya Azizahh. 2020. *Analysis of high school students' problem solving skills on the topic of reaction rate. JPPS (Jurnal Penelitian Pendidikan Sains)* Vol 10, No 01. https://journal.unesa.ac.id/index.php/jpps .

Indraswati, Dyah., Dina Anika Marhayani, Deni Sutisna, Arif Widodo, Mohammad Archi Maulyda. 2020. *Critical Thinking Dan Problem_Solving in Social Studies Learning to Answer the Challenges of the 21st Century*. (SOSIAL HORIZON: Jurnal Pendidikan Sosial Vol. 7 No. 1, https://Www.Researchgate.Net/Publication/345962153_Critical_Thinking_Dan_Problem_Solving_Dalam_Pembelajaran_IPS_Untuk_Menjawab_Tantangan_Abad_21

Indrahadi, Deri., Junaidi. (2017). *Efforts to Improve Students' Critical Thinking Skills Through the Application of Problem-Based Learning Strategies in Sociology Learning for Class XI IPS2 at SMA Negeri 1 Pariaman. Jurnal Socius: Journalof Sociology Researchand Education* Vol. 4, No.1. DOI: 10.24036/scs.v4il.14. http://socius.ppj.unp.ac.id/index.php/socius/article/view/14/7

Khoirunnisaa, Purwanto, Syamsul Bachri, Budi Handoyo. 2022. *Science, Environment, Technology, Society (SETS) learning model integrated with Google Earth to improve problem-solving skills of high school students*. Jurnal Integrasi dan Harmoni Inovatif Ilmu-Ilmu Sosial (JIHI3S), 2(7), 2022, 633-645ISSN: 2797-0132(online). DOI:10.17977/um063v2i72022p633-645. http://journal3.um.ac.id/index.php/fis/article/view/2307/1646.

Lestari, S Syafril, Sri Latifah, E Engkizar, D Damri, Zainal Asril, Nova Erlina Yaumas. 2021. Hybrid learning on problem-solving abilities in physics learning A literature review. Journal of Physics: Conference Series 1796 (2021) 012021 IOP Publishing) doi:10.1088/1742-6596/1796/1/012021. https://iopscience.iop.org/article/10.1088/1742-6596/1796/1/012021/pdf.

Marliani, N., Hasanuddin, H., & Nurmaliah, C. (2017). *The Influence of the Science, Technology, Society, Environment (STSE) Learning Model on Critical Thinking Skills and Student Learning Outcomes on Environmental Pollution Material at Mas Jeumala 'Amal. Jurnal EduBio Tropika*, *5*(1). https://jurnal.usk.ac.id/JET/article/view/7146.

Oktaviani, P., Hartono, H., & Marwoto, P. (2017). *Development of Interactive Multimedia with SETS Vision as a Problem Based Learning (PBL) Model Aid Tool in Science Learning in Junior High Schools to Improve Students' Critical Thinking and Social Skills. PSEJ (Pancasakti Science Education Journal)*, *2*(2), 125-137.

Purwanto, P., Bachri, S., & Handoyo, B. (2022). Science, Environment, Technology, Society (SETS) learning model integrated with Google Earth to improve problem-solving skills of high school students. Jurnal Integrasi dan Harmoni Inovatif Ilmu-Ilmu Sosial, 2(7), 633-645. https://journal3.um.ac.id/index.php/fis/article/view/2307

Purnamasari Irma, Setiawan Wahyu. 2019. Mathematical Problem-Solving Ability of Junior High School Students on SPLDV Material Reviewed from Initial Mathematical Ability. (Journal of Medives: *Journal of Mathematics Education Volume 3,* No. 2. DOI: https://doi.org/10.31331/medivesveteran.v3i2.771. https://e-journal.ivet.ac.id/index.php/matematika/article/view/771

Primary Schools. Social, Humanities, and Educational Studies (SHEs): Conference Series, 1(1), 742–750. doi.org/10.20961/shes. v1i1.23648.

Riwu, Rohm, Rafael, I Wayan Budiyasa, I Gusti Ayu Rai, 2018. *Application of SETS (Science, Environment, Technology, and Society) Learning Model Approach to Improve Students' Biology Learning Outcomes. Emasains: Jurnal Edukasi Matematika dan Sains,* Volume. VII, No. 2. https://ojs.mahadewa.ac.id/index.php/emasains/article/view/113.

Rosardi, Raras Gistha, 2013. Social Studies Learning with Problem Solving Strategies to Increase Student Independence and Awareness. Jurnal Socia, 10(1). https://journal.uny.ac.id/index.php/sosia/article/view/5339

Setiawati, Sulis dan Lapasau, Merry. 2021. *Quality of Elementary School Trial Tests on Indonesian Language Subjects in Terms of Material, Construction, and Language Aspects.* HORATORI | Jurnal Pendidikan Bahasa dan Sastra Indonesia | Vol. 5 No. 2. https://journal.unindra.ac.id/index.php/hortatori/article/view/855/772

Snyder, Julia J. dan Jason R Wiles. 2015. *Peer-Led Team Learning in Introductory Biology: Effects on Peer Leader Critical. Thinking Skills. (Jurnal plos* one 10(1). https://doi.org/10.1371/journal phone0115084. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0115084

Sudaryono, dkk. 2013. Development of Educational Research Instruments. Yogyakarta: Graha Ilmu.

Sudibyo, Tegas., (2016). *Application of SETS-based contextual learning methods in improving the participation and achievement of students in economics learning in class X2 of SMA Negeri Karangpandan. Jurnal Pendidikan Ilmu Sosial,* Vol 26, No.2. https://journals.ums.ac.id/index.php/jpis/article/view/3329/2176.

Sugiharti, R. E., & Sukowati, T. Z. (2020). The Science Environment Technology Society (SETS) Approach as an Alternative in Improving Science Learning Outcomes on Light Material in Elementary Schools*: Jurnal Pendidikan Guru Sekolah Dasar*, *8*(2), 10-15.

Triwidada, Andika., Khairuddin, M. Dirhamsyah. 2017. *Development and Implementation of SETS Vision Monopoly Media in the Field of Geography Study of Disaster Mitigation and Adaptation Material as an Innovation in Disaster Education*. *Jurnal Ilmu Kebencanaan (JIKA).* Volume 4, No. 3. https://jurnal.usk.ac.id/JIKA/article/view/13340/10206

Yulistiana Yulistiana, 2015. *Research on Learning Based on SETS (Science, Environment, Technology, and Society) Learning Model in Science Education, (Jurnal Ilmiah Pendidikan MIPA* 5(1). https://journal.lppmunindra.ac.id/index.php/Formatif/article/view/169/162.

Yasin, M., Garancang, S., & Hamzah, A. A. (2024). Data Collection Methods and Instruments (Qualitative and Quantitative). *Journal of International Multidisciplinary Research*, *2*(3), 161-173. https://journal.banjaresepacific.com/index.php/jimr/article/view/388/355