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The Effect of Nyerayo Based SETS Learning on Student's Scientific Literacy

Mahlianurrahman[1], I Wayan Lasmawan[2], I Made Candiasa[3], I Wayan Suastra[4]

[1-4]Universitas Pendidikan Ganesha, Singaraja, Indonesia

Abstract

This study aims to describe the effect of the Nyerayo-based Science, Environment, Technology, and Society learning model on the scientific literacy skills of elementary school students in East Kluet District, South Aceh Regency. Learning Scıence, Environment, Technology, Society (SETS) has an important role in improving the scientific literacy and cooperation skills of Elementary School students. This research includes research that uses a quasi-experimental method with *nonequivalent control group design*. The population in this study amounted to 182 fifth grade elementary school students and the sample of this study consisted of 17 male students and 37 female students with a total of 54 students. The research data was obtained through multiple choice test instruments on scientific literacy skills. The data obtained were analyzed using an independent sample t test. The results of this study indicate that *Nyerayo -based Science, Environment, Technology, and Society* learning has a significant effect on students' scientific literacy skills based on a significance value of 0.00 < 0.05.

Keywords: SETS Learning; Scientific Literacy; Nyerayo.

Introduction

Qualified teachers will continue to strive to facilitate students to have scientific literacy skills, so that students can solve various problems (Slavinec, 2019; Altan, 2019; Leong, 2018; Astutik, 2020) and are able to generate new ideas (Bergner, 2016). An important component in implementing innovative learning is the teacher (Hero, 2020). Teachers have an important role to facilitate students so that students' scientific literacy skills can improve.

Forming students' scientific literacy skills can be done through the application of innovative and creative learning. Teacher creativity is needed in carrying out learning (Siew, 2020). Creative teachers will continue to strive to develop the learning process so that students are able to solve various problems and obstacles. It is very important for teachers to make efforts to overcome problems and obstacles faced by students during the learning process (Knutsson; 2018). The innovation of each learning activity in elementary schools needs to be varied and adapted to the characteristics of students. The achievement of learning objectives is very dependent on the selection of learning models that will be applied by teachers in learning.

The application of *Scıence, Environment, Technology, and Society* (SETS) learning serves as a support for innovative and creative learning processes. SETS learning is the concern of many parties because through SETS learning it can improve the quality of education (Qiao, 2020; Bakhtiar, 2020; Wieselmann, 2020). SETS learning includes learning that is recommended to integrate the material being studied by students with aspects of science, environment, technology, and society (Todd, 2019; Sagala, 2019; Kanadlı, 2019; Pimvichai, 2019; National Science Board, 2020; Levin, 2020). Technology in SETS learning functions as a problem-solving tool and as a tool for deliv ering learning materials (Yang, 2020; Changtong, 2020).

SETS learning refers to learning that facilitates students to understand problems, offer and provide solutions based on the data obtained and make decisions according to the solutions SETS (Yager, 1996). Science and technology greatly affect human activities, therefore it is very important that learning in elementary schools can be integrated with science, technology, society, and the environment (Cansiz, 2019).

SETS learning includes learning that can improve learning outcomes (Lertcharoenrit, 2020) and can affect the quality of students (Lertcharoenrit, 2020; Changtong, 2020). SETS learning will lead students to design and create new products and systems (Cetin, 2020; Pimvichai, 2019; Smith, 2020). SETS learning is very useful in developing critical thinking skills (Kartikasari, 2018), students' scientific literacy skills (Senturk, 2018; Retno, 2018; Walton, 2019). Students who take SETS learning will have motivation and interest in learning (Walton, 2019; Rahman, 2021) and can create meaningful learning experiences (Lowery, 2019).

Corresponding Author: rahmanklut@gmail.com

https://orcid.org/0000-0002-8961-2446

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Source of support: The results of this study indicate that *Nyerayo -based Science, Environment, Technology, and Society* learning has a significant effect on students' scientific literacy skills based on a significance value of 0.00 < 0.05

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Teachers play an important role in creating student learning experiences (Kerrigan, 2019). Elementary school teachers are expected to be able to apply SETS learning to Natural Science learning (Seyhan, 2021; Perdana, 2021), so that students' scientific literacy can increase. Problems faced by students in learning will encourage students to be involved in finding solutions. This shows that SETS learning is increasingly feasible to be applied in elementary schools (Kristiyanto, 2020; Nisa, 2021).

SETS learning has five principles, namely a) contains science content; b) siding with the students; c) the material is presented in an attractive manner; d) students learn from problems; and e) prioritizing cooperation (Firdaus, 2019; Chanapimuk, 2018). In addition, SETS learning has differences with other learning, especially at the stage of identifying problems, offering solutions, and making decisions (Seyhan, 2021; Pimvichai, 2019).

SETS learning directs students to be able to complete tasks related to science, environment, technology, and society (Karmokar, 2018). SETS learning is not subject-based, but leads to integrated learning in each SETS component (Mustadi, 2020). The application of SETS learning is very important to do. With the application of SETS learning, students are able to improve their understanding (Destini, 2022) and direct students to understand the causes and effects of problems (Setyasto, 2019).

Based on the findings in the field, it shows that students are rarely facilitated by SETS learning and teachers are accustomed to implementing lecture learning, so that it has an impact on students' low scientific literacy. The teacher has never applied learning according to the characteristics of students based on local wisdom, so students have difficulty in identifying problems.

Previously, there had been no research specifically on SETS learning based on local wisdom, especially nyerayo. The local wisdom of *nyerayo* is very much embedded in the life of the people of South Aceh, because nyerayo provides an opportunity for the local community to complete a job that is done together without any coercion from other parties but is initiative to help and is done in a happy state. *Nyerayo is* a tradition or resam found in the Kluet community, South Aceh Regency which is not regulated in the *qanun* and does not conflict with custom but has character values, one of which is the character of cooperation . The character values attached to *nyerayo* are very suitable to be applied in the learning process.

Nyerayo is oriented towards work that is difficult to do alone, but work that requires the help of others and needs to be completed together. The local wisdom of *nyerayo* encourages students to strengthen cohesiveness and cooperation. It is hoped that elementary school teachers can be moved to choose nyerayo-based SETS learning as an effort and effort and can be the basis for teachers in improving students' scientific literacy. Therefore, this research was conducted to answer how the influence of the application of nyerayo-based SETS learning on students' scientific literacy.

Method

This research was carried out at a State Elementary School in South Aceh District, precisely in East Kluet District. This study used a *nonequivalent control group design*. The details are described in table 1.

Referring to the research design that the experimental class applied nyerayo-based SETS learning. Meanwhile, in the control class, expository learning was applied. The students' initial ability data was obtained from the pretest results, while the students' scientific literacy skills data was obtained from the posttest. The population of this research is 182 elementary school students who uphold nyerayo values. Determination of 54 students as research samples through *random sampling technique*. The test instrument in this study aims to obtain data on students' science skills.

The data that has been obtained were analyzed using descriptive statistical techniques to determine the descriptive data of students' scientific literacy. Research hypotheses were analyzed using independent sample t test assisted by IBM SPSS Statistics 19.0. Normality and homogeneity tests are prerequisite tests before hypothesis testing is carried out. Indicators of scientific literacy in this study are students' skills in explaining every phenomenon that students find in everyday life scientifically and decision-making skills through scientific experiments.

Findings

The sample in this study came from two public schools, namely, SD Negeri 1 Paya Dapur and SD Negeri Kampung Alai. The two elementary schools are located in East Kluet District, South Aceh Regency. After the implementation of nyerayo-based SETS learning in the experimental class and expository learning in the control class, students were given a posttest to determine the students' scientific literacy skills. The posttest data of students' scientific literacy skills were analyzed using descriptive statistical tests and inferential statistical tests. The analysis was carried out using descriptive statistical tests to determine the average posttest results of scientific literacy skills. While the inferential analysis serves to determine the effect of the application of nyerayo-based SETS learning on elementary school students. The further explanation regarding the results of the posttest descriptive analysis of students' scientific literacy skills is presented in Table 2 and 3.

Table 1: Research design

Class	*Pretest Pelaksanaan*	*Treatment Learning*	*Posttest Implementation*
Experiment	Y1 _	X 1	Y1 _
Control	Y2 _	X 2	Y2 _

The comparison of the average scientific literacy pretest scores of students in the experimental class and the control class can be seen in the figure 1.

Based on the Figure 1, it shows that the scientific literacy pretest score of the experimental class students is 62.32. While the scientific literacy pretest score of students in the control class was 61.34. The comparison of the average posttest scores of students' scientific literacy in the experimental class and the control class can be seen in the figure 2.

Based on the figure 2, it shows that the posttest score of scientific literacy of experimental class students is 88.57. Meanwhile, the posttest score of students' scientific literacy in the control class was 71.53. The data showed that students in the experimental class had an increase in the average score of science literacy skills that was higher than the average score of science literacy skills of control class students.

In the next step, an inferential test was conducted to obtain data on students' scientific literacy, so that the effect of applying the nyerayo-based SETS learning model on students' scientific literacy skills could be known. To perform the inferential test, a normality prerequisite test was first performed to determine if the student's science skill data were normally distributed. The results of the normality prerequisite test showed that the data on students' science skills were normally distributed with the value of Sig. 0.200. Then the next stage is the Levene's Test of Equality homogeneity test to find out that the students' scientific literacy data is homogeneous. Based on the results of the homogeneity test, it showed that the students' scientific literacy data was homogeneous with a significance value of 0.631.

After the prerequisite test is completed, the next step is the independent sample t test . The results of the analysis carried out using the independent sample t test obtained the results in Figure 4.

Based on the results of the data analysis presented in table 4, it shows that the significance value of 0.000 < 0.05. It can be concluded that the application of nyerayo - based SETS learning has an effect on students ' scientific literacy skills.

The effect of the application of nyerayo-based SETS learning on students' scientific literacy is in accordance with the increase in students' skills in explaining phenomena scientifically and students' skills in making decisions through scientific experiments. This is of course because SETS learning includes appropriate learning to be applied in elementary schools. SETS learning provides an opportunity for teachers to apply learning that is integrated with science, environment, technology, and society in solving problems (Son, 2017; Farda, 2016) and being able to explain phenomena that occur scientifically. Through science students can solve various environmental problems and social problems faced by society. The use of technology is very important for teachers to learn so that the problem solving process in learning through the use of technology can run well.

The development of technology is very rapid (Chang, 2019), so that the learning process by applying technology as a means of learning has been accepted by many people (Al-Taweel, 2021). Technology is very much needed in learning (Irwansyah, 2018), because technology can solve problems in learning (Yukselturk, 2018; Zhao, 2018). The use of technology makes

Table 2: Pretest Data for Experimental Class and Control Class

Descriptive statistics	*Experiment Class*	*Control Class*
N	28	26
Average	62.32	61.34
Maximum Score	80.00	75.00
Minimum Score	50.00	50.00
Standard Deviation	6.73	5.92

Table 3: Posttest Data for Experiment Class and Control Class

Descriptive statistics	*Experiment Class*	*Control Class*
N	28	26
Average	88.57	71.53
Maximum Score	100	90.00
Minimum Score	70.00	60.00
Standard Deviation	8.69	9.02

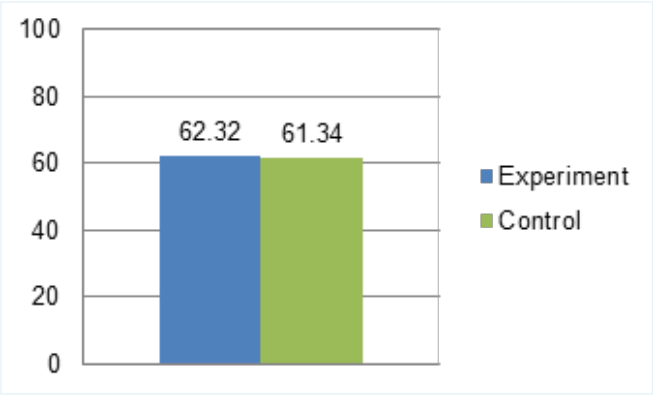

Fig. 1: Comparison of the average pretest

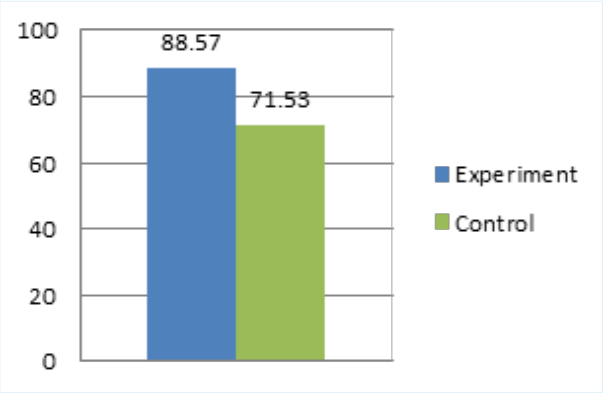

Fig. 2: Comparison of Posttest Average

Table 4: Independent Sample t-test

Skills	*t*	*df*	*Sig.*
Science Literacy	6,822	50,490	0.000

learning more innovative (Ghani, 2019) and provides a more flexible space in carrying out learning (Ramadhani, 2019). However, there are still those who prefer to apply the expository learning model because the teacher is not confident enough to implement the nyerayo-based SETS learning (Kang, 2019).

SETS learning based on nyerayo makes students more enthusiastic to learn (Ekowati, 2018) and students' scientific process skills can develop (Nurkaenah, 2019; Chowdhury, 2016; Rahayuni; 2016). Local wisdom really needs to be integrated in the learning process so that students' character can develop (Parwati, 2018). Local wisdom can be used as a learning resource for students (Uge, 2019). If local wisdom is applied in learning, it will certainly have an impact on the community (Laila, 2021). The learning process that applies SETS learning based on nyerayo shows that every student has the same opportunity to complete group work and students look very happy and without feeling forced to complete group assignments. The same opportunities that students get in completing group assignments have an impact on the attitude of togetherness and concern for students.

Work done together is more likely to be completed quickly when compared to work done alone. Completion of work through Nyerayo is done sincerely and without any element of coercion but comes from the initiative of students and is carried out with feelings of joy.

Conclusion

The results of data analysis show that the nyerayo-based SETS model has a significant influence on the science literacy skills of elementary school students. SETS learning provides opportunities for students to link the components of science, environment, technology, society and local wisdom in solving various problems faced by students. The nyerayo-based SETS learning facilitates students to explore the local wisdom of the local community, so that students' ability to offer appropriate solutions and students' ability to solve problems together increases. This research has a contribution to learning that integrates science, environment, technology, society, and local wisdom.

Suggestion

Suggestions from researchers so that in the future nyerayo-based SETS learning can be used as an option in implementing learning so that students' scientific literacy skills can improve.

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