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The Effectiveness of Guided Inquiry with SETS vision to Improve Communication Skills and Understanding of Science Concepts

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Abstract

This research aims to analyze the effectiveness of the Guided Inquiry Model with SETS (Science, Environment, Technology, and Society) vision on communication skills and understanding the concept of science. This research design is quasi-experimental design. The data were obtained from a test and the experimental report assessment rubric. The analysis data was used quantitative analysis technique i.e effect size test, N-gain test, average difference test, and simple linear regression test. The result of the effect size value of the experimental class is 1.30 in the high category, while the control class is 0.59 in the moderate category. The mean score of the students' experimental reports was higher classically in the experimental class, namely 71 and 60 in the control class. The guided inquiry learning model with SETS vision is effective in improving students' understanding of science concepts. This is indicated by the average N-gain experiment 57.80> 39.70 N-control control and the average difference test results show the value of Asymp Sig. (2-tailed) of 0,000. (0.000 <0.05). Learning that familiarizes students with scientific thinking, finding concepts and connecting concepts with everyday life and communicating their thoughts both orally and in writing trains reasoning skills. This reasoning ability can develop communication skills in students and build understanding of concepts. This study concludes that learning the SETS Vision Guided Inquiry Model is effective in improving communication skills and understanding of science concepts.

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INTRODUCTION

Education is a way to improve the quality of human resources. National education aims to educate the nation's life by developing abilities and construct the character of students. The quality of education must always be enhanced in an order to establish quality human capital, as is the goal of national education. The quality of education in Indonesia is still low. This is caused by many factors, including the low quality of human resources (HR) which leads to the low quality of education. In terms of scientific literacy, the latest study of Trends in International Mathematics and Science Study (PISA) in 2018 shows that students in Indonesia have not shown satisfactory achievement. Especially for the context of science, Indonesia ranks 62 out of 70 countries with a score of 397, still below the international average score of 500. Efforts to improve the quality of education include improving the learning process in the curriculum.

Sciences is one of the compulsory subjects included in the 2013 Curriculum. Appendix to the Regulation of the Minister of Education Number 57 Article 5 Paragraph 2 of 2014 concerning the basic concepts of science subjects aims to develop student attitudes, knowledge competencies, and competency skills. As a basis for and strengthening of abilities in the life of the community, nation, and state. Science learning is related to the understanding of nature and is not limited to knowledge mastery in the form of facts, concepts, and principles, but also the discovery process. Natural science learning in elementary school is often seen as a complex subject. Some students think that science is an abstract and frightening subject. Science learning is not abstract and terrifying learning. Science learning is what we do every day. That is similar to Wahyuni (2016) and Gumilar (2019) which state that science is learning that closely related to natural phenomena in everyday life. In its application, science learning skills help students solve problems in the form of theories, concepts, laws, and facts as well as conveying observations, conclusions, based on the results of the analysis orally and in writing.

One of the science skill is communication skills. In the learning process, students need to have communication skills, especially in the activities of observation and clarification as well as related to the process of conveying information or data, either in writing or orally. According to Haryanti (2018), communication itself is a basic principle of a learning process. Furthermore, Wilhalminah (2017) and Khan (2017) argues that communication skills are indispensable in achieving learning success. Students with appropriate communication skills would be able to convey different aspects of the learning material both orally and in writing.

However, in reality, the results of observations that have been made at Primary School 2 Brabo Tanggungharjo, Grobogan in grade IV, the learning carried out by the teacher is dominated by explaining, taking notes, and working on questions and learning has not shown a link between the subject matter and the use of the surrounding environment, technology and society as a learning resource. Such a learning process restricts students' ability to express themselves, they rarely provide input on what the teacher or their friends have said. Besides, the teacher's attention to students' written communication skills is still lack. This is because teachers are not giving or presenting questions that test students' written communication skills. Teacher rarely invite students to do experimental activities, teachers does not guide students in making experimental designs, so that students difficult to understand the material in the learning. Based on general test data collection in science learning class IV in the 2018/2019 academic year, there are still students who get score below the predetermined minimum completeness criteria, namely 70. These conditions have not shown satisfactory results, the reality in the field shows a lack of understanding of students of the material presented by the teacher.

Seeking alternative suitable learning models is one way it can be done to improve student communication skills and maximize

student active engagement in learning to increase student comprehension of concepts. The learning model must emphasize the knowledge-seeking process, not the knowledge transfer process. Students act as learning subjects who must be actively involved. One alternative learning model that can be used is the guided inquiry learning model. According to Putra (2016) Aristianti (2018), guided inquiry provides opportunities for students to develop scientific communication. Students become active during the learning process. Students learn by searching for and finding the information and answers to a phenomenon or problem in question so that students can understand learning well. This is following the research results of Husnaeni (2019) and Ristanto (2017) which show that the application of guided inquiry learning can increase student activity and understanding of student concepts.

The guided inquiry model will collaborate with the SETS vision so that learning is more contextual and students can connect the concepts they have learned with phenomena in everyday life. The vision of SETS is used as a perspective that views that the concept of science is not independent but always relates to the environment, technology, and society in an integrated manner (Prasasti, 2018). The results of the Gobel (2019) study of the implementation of the guided inquiry learning model with the SETS vision are effective in increasing understanding of concepts and science process skills. This increase occurs because this learning process requires students to be directly involved in the learning process and learning activities that focus on the core concepts and processes so as to encourage and foster a deep understanding of the material. This research is applied to high school students, while this research will be applied in elementary schools and the variables analyzed in this study are communication skills and students' conceptual understanding through the implementation of guided inquiry models with SETS vision. Based on the description above, this research was conducted as an effort to determine the effectiveness of the Guided Inquiry Learning Model with SETS vision to improve student communication skills and students' understanding of science concepts.

The purpose of this study was to analyze the effectiveness of the Guided Inquiry Learning Model with SETS vision to improve students 'communication skills and students' understanding of science concepts.

METHODS

The type of this research is quantitative research. This research design used a quasi-experimental design model nonequivalent control group design. The sampling technique used in this study was cluster random sampling. The cluster random sampling technique used was two-stage cluster random sampling. Schools that match these criteria are class IV Primary School 2 Brabo as the experimental class as many as 36 children and Primary School 2 Brabo as the control class as many as 27 children. So that the total sample is 63 children. The data collection technique used a test and report assessment rubric. The data analysis technique used in this research is the prerequisite test which includes the normality test using Kolmogorov-Smirnov and the homogeneity test using One-Way Anava test as well as the hypothesis testing including the effect size test, the N-gain test, and the average difference test.

RESULTS AND DISCUSSION

The results will be presented in the form of analysis prerequisite test data and research data. The prerequisite analysis test in this research was the normality and homogeneity test of the data. The data that was tested for normality and homogeneity was the data on the students' posttest scores.

The normality test is used to determine whether the research data is normally distributed or not. The results of the normality test in this study include the normality test in the control class and the experimental class. Analysis of processing normality test data using the Kolmogorov-Smirnov technique. The results of the normality test are presented in Table 1.

Table 1. Normality Test for Experiment and Control Class

Class	Statistic	Asymp.Sig.(2tailed)
Eksperiment	.158	.084
Control	.126	.162

Table 1 shows that the normality test significance values are 0.084 and 0.162. The assumption of normality is fulfilled because the Kolmogorov value is greater than 0.05 and it can be concluded that the data tested is normally distributed.

The calculation of the homogeneity test was carried out using the One-Way Anava test.Variable variance is the same if the significance (sig.)> Of the specified alpha level is 0.05. The results of the homogeneity test in this study in the control and experimental classes on the variable communication skills and students' understanding of science concepts. The results of the homogeneity test are summarized in Table 2 and Table 3.

Table 2. The Results of the Communication Skills Variable Homogeneity Test

Score Levene Statistic	df1	df2	Sig.
.007	1	61	. 932

Table 3. The Results of the Concept Understanding Variable Homogeneity Test

Score Levene Statistic	df1	df2	Sig.
.692	1	61	.482

Based on Table 2 and Table 3, it is known that the significance value of the homogeneity test on the communication skills and science concept understanding variable is 0.932 and 0.409. The assumption of the homogeneity test is fulfilled because the significance value is greater than 0.05, and it can be concluded that the data being tested is said to have homogeneous variance.

Guided Inquiry Learning Model with SETS Vision is Effective for Improving Communication Skills

The effectiveness of the guided inquiry learning model with SETS vision on students' communication skills was analyzed using the effect size test. The results of the effect size test calculation are presented in Table 4.

Table 4. Effect Size Test Results in the Experiment and Control Class

Class	Mean	Df	effect size score	Category
Eksperiment	11.33	8.70	1.30	High
Control	6.96	11.84	0.59	Moderate

The obtained value of the effect size in the experimental and control classes is briefly presented in Figure 1.

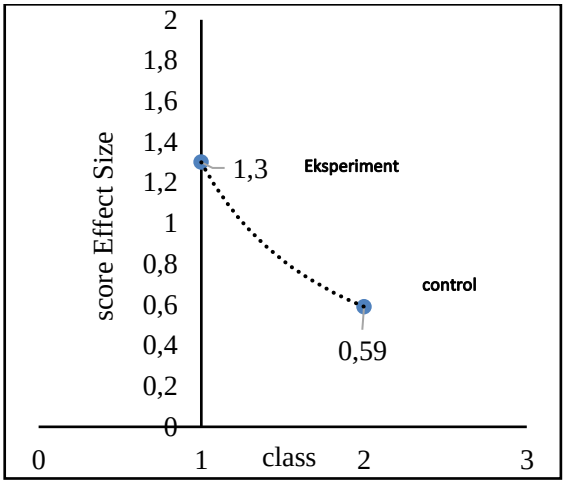

Figure 1. Score Effect Size for Experiment and Control Class

According to Table 4 and Figure 1 shows that the effect size value in the experimental class is 1.30 following the criteria according to Cohen (2011) this value is around> 1.00 with the "high" category while the control class has an effect size value in the amount of 0.59, the value is around of 0.51–1.00 with the "medium" category. The results of these calculations indicate that the scale of the experimental class is better than the control class. In the process of

learning science communication skills can help students build their understanding of the concepts, and students can analyze the problem. In this case, students are challenged to think about solving problems and communicate the results of these thoughts in writing. The process requires reasoning. Reasoning abilities are able to develop communication skills in students. Guided inquiry learning with the SETS vision provides broad opportunities for students to actively practice and familiarize themselves with problems and connect the concepts learned with phenomena in their lives.

The indicators measured in communication skills refer to the indicators stated by Ross (1983) and Yusefni (2016) which have been modified, namely (1) changing the form of presentation (2) explaining the results of the experiment (3) using a comprehensive representation to state the concept of science (4) mention the results in written form and prepare (5) submit a systematic report. Retrieval of data used in this study using an essay test that contains indicators of written communication skills as the main data source and reports on the results of student experiments after learning as supporting data. The indicators of communication skills described in the description questions are indicators one to four. Problem communication skills are broken down into 9 items. Students' written communication skills on the indicators of conveying reports systematically are based on reports of student experimental results. At each meeting, there were three meetings, the students carried out simple experiments in the experimental and control classes. The results of the student experiment report scores are presented in Table 5 and Figure 2.

Table 5. The results of the recapitulation of the average score for the assessment of the student's experimental results report

Class	Meeting			Mean	Mean %
	1	2	3		
Eksperiment	55	77	81	71	71%
Control	58	60	63	60	60%

Based on the results of the recapitulation in Table 5, the average value of the experimental reports in it is relatively high in the control class, with a classical average value of 71 in the experimental class and 60 in the control class. There is an average difference of 11 units. This is because guided inquiry elaborated with SETS trains students' reasoning skills and abilities. According to Usmeldi (2017) and Ghofur (2018), SETS learning has advantages, namely forming students who have reasoning abilities. This reasoning ability can develop communication skills in students. Furthermore, Trihastuti's research (2019) and Hudha (2017) states that experimental activities are better able to develop thinking skills for students. Making it easier for students to prepare a written paper such as a report. Indriwati (2018) and Auliasari (2019) compiling a practicum report is a communication skill to convey her findings to others in writing.

Communication is an important part of learning. In the learning process, communication skills can help students build understanding concepts, and students can analyze problems (Rohid, 2019). In this case, students are challenged to think about solving problems and communicating the results of these thoughts in writing.

Margunasaya (2019) explains that in guided inquiry learning, students are guided to be able to use or communicate the ideas, concepts, and skills they have learned to find new knowledge. Research conducted by Pramesti (2020) guided inquiry effectively improves students' scientific communication skills. Guided inquiry elaborated with SETS learning is more contextual and students can connect the concepts learned with phenomena in their lives.

1. Guided Inquiry Learning Model with SETS Vision is Effective to Improve Understanding of Science Concepts

The effectiveness of the guided inquiry model with SETS vision in improving students' understanding of science concepts was analyzed using the N-gain test and the mean difference

test. The results of the N-gain test are presented in Table 6.

Table 6. N-gain Score in the experimental and control classes

Class	*N-gain*	Category
Eksperiment	57.80	Medium
Control	39.70	Medium

Based on the data presented in Table 6, the average N-gain result shows that the increase in students' understanding of science concepts in classes taught using guided inquiry models with SETS vision is higher than classes taught with conventional learning models.

Susilo (2020) states that the science learning process is not only an effort to master a collection of knowledge in the form of facts, concepts, or principles but also a process of discovery. Therefore, science learning is directed to the inquiry, so that students will get a better understanding of science, and will be more interested in science if they are actively involved in "doing" science. Learning the guided inquiry learning model with SETS vision provides space for students to freely conduct their experiments in solving problems with the guidance of the teacher and find their concepts from the results of the experiment so that student motivation is awakened to actively explore their knowledge, become active, independent and skilled in solving problems and have more understanding of the concept. According to Astyana (2017), the implementation of the SETS vision makes students understand more about the lesson because it is associated with everyday life. After knowing the N-gain of the experimental class and the control class, the mean difference test was then tested to determine the effectiveness of guided inquiry learning models with SETS vision.

The processing average difference test is shown in Table 7.

Table 7. Different Test of Students' Average Understanding of Science Concepts

	N	*Mean*	*df*	*Sig.*	Results
Eksperiment	36	84.44	61	0.000	H_a Accepted
Control	27	70.26			

Based on Table 7, it is known that the significance value is smaller than 0.05, so it can be stated that the guided inquiry model with the SETS vision is effective in improving students' understanding of science concepts. The average score of students' understanding of science concepts in the experimental class was 84.44, higher than the average score in the control class of 70.26. From the data above, it can be concluded that the implementation of the guided inquiry model with the SETS vision can improve students' understanding of concepts. Students who get learning with inquiry as a whole show better mastery of science concepts, because with a lot of student involvement in learning, the higher the cognitive learning outcomes that affect the students' mastery of concepts. Guided inquiry learning with the SETS vision can provide flexibility for students to do their own practicum in solving problems with teacher guidance, find their own concepts from the results of the practicum, so as to motivate and encourage students to actively explore their own knowledge and have a better understanding of concepts (Gobel, 2019). The Guided Inquiry Model elaborated with SETS facilitates students to cashrry out investigations to gain knowledge related to the four elements, namely science, environment, technology, and society.

Nurhidayati (2019) explains that the SETS approach helps to master the concept of science in an integrative, contextual, and applicable way. Students can connect the concepts they have learned with phenomena in everyday life. The SETS vision is used as a point of view that views the concept of science as not independent, but always related to the environment, technology, and society. Fitria

(2016) each element of the SETS as a unit also influences each other in an integrated manner.

Research conducted by Fatwa (2018) confirms that students who get learning with an inquiry as a whole show better mastery of scientific concepts, because the more student involvement in learning, the higher the cognitive learning outcomes that affect students' mastery of concepts. In line with Alifah (2017) research, it shows that students are better able to understand scientific concepts by applying the guided inquiry model with SETS vision. Furthermore, Gobel (2019) guided inquiry with the SETS (Science, Environment, Technology, and Society) vision provides flexibility to students in finding their concepts and encourages students to actively explore their knowledge, be active, independent, and skilled at solving problems, and have a deeper understanding of concepts.

CONCLUSION

Learning Guided inquiry learning model with SETS vision is effective in improving communication skills and understanding concepts. Based on the effect size value of the experimental class of 1.30 with a high category, while the control class has an effect size of 0.59, with a moderate category. The average value of the experimental report on the experimental class was higher than the control class, with a classical mean score of 71 in the experimental class and 60 in the control class. The effectiveness of the learning model in improving students' understanding of science concepts can be seen from the average N-gain of the experiment 57.80> 39.70 N-gain control.

Learning that provides flexibility to instill the basics of scientific thinking and communicate thoughts both orally and in writing trains reasoning skills. This reasoning ability is able to develop students' communication skills. The application of the guided inquiry model with the SETS vision accustoms students to think critically in making hypotheses in solving problems, finding concepts and connecting concepts to everyday life. So that, understanding the concept through the application of this model is built.

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