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Understanding of Science Concepts Through SETS Guided Discovery Approach Using Two-Tier Test Toward 4th Elementary School

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***Abstract*-This study aims to determine and analyze students' understanding of concepts using the SETS Guided Discovery model by using the Two-Tier Test. This study uses an experimental research design. Samples were taken by purposive sampling technique, obtained Payak Elementary School as an experimental class and Eggplant Elementary School as a control class. Research data obtained from tests and observations. Data analysis used t-test analysis with PASW Statistics 18 software. The results showed an increase in students' understanding of concepts after the guided discovery of learning conducted by SETS approach on theme 3 sub themes 1 with the t test sig <0.05. Analysis using a two-tier test resulted in a level of understanding of students' concepts, namely understanding of the concept 66.67%, misunderstanding of type 1 concepts 12.22%, misunderstanding of type 2 concepts 8.51%, and not understanding the concept of 12.60%. Students who understand the concept have six indicators of good understanding, namely interpreting (interpreting), giving examples (exemplifying), classifying (classifying), attracting inference (inferring), comparing (comparing) and explaining (explaning). The lowest indicator of concept understanding is interpreting and the highest competitor is explaining.**

Keywords: adjacent sets, concept understanding, guided discovery, two-tier tests

I. INTRODUCTION

Science is a learning related to finding out about nature systematically so that science is not only mastery of a collection of facts, concepts or principles but also a process of discovery and experimentation and responding to situations in a scientific attitude. Research conducted by Tursinawati (2014) also states that in the learning process science can bring about scientific attitudes that can be used to analyze his thoughts in making choices and drawing conclusions well.

To overcome these problems, learning efforts based on cognitive theory are needed in which there are two theories of learning that support each other, namely the theory of constructivism learning and the theory of learning Bruner's discovery. The learning strategy developed by Bruner emphasizes the ability of students to find things through a structured and well-organized research process (Divine, 2012: 30). One model that can be used to overcome the above problem is the guided discovery model.

This model does not require students to fully listen to the material taught by the teacher, but students are demanded as if to be a creative and innovative inventor to find something, so students can explore their abilities without being limited by staying under the guidance of the teacher to achieve learning goals which is expected. With this model, students are expected to be able to play an active and directly involved role so students can find something they don't know through guidance from the teacher. In line with the research conducted by Septiasih (2016) an increase in the percentage of the use of the steps of the guided discovery of the results obtained showed that the problem solving skills and student learning outcomes in each cycle increased, Farida (2015) The results showed that the activeness of students in active or very active categories with scores above 17 and the average learning outcomes of both classes achieve a classical completeness of 91.94%, students and teachers give good or excellent responses to guided inquiry learning with flow cards, Garuma (2012) Results research shows that there are significant differences in student achievement after being taught with guided discoveries, demonstrations and traditional methods, Udo (2010) results shown indicate that students teaching using guided discovery methods have an average score of 22.10; which is taught by using student-centered demonstrations, 17.83.

In presenting science material, teachers should link learning with the environment, technology and society in everyday life. The goal is that students learn from the environment so that students are easy in understanding and mastering the material. One approach to learning that links the environment, technology and society in daily life is SETS approached with science (Science), environment (Environment), technology (Technology) and society (Society). According to Pedretti et al (2008) the main purpose of SETS is to help students realize the importance of scientific developments in everyday life and foster a sense of community. In line with research conducted by Hasanah (2013) The results of research and discussion can be concluded that: (1) there are

differences in cognitive learning outcomes between students who learn to use education

II. METHODS

Design of this study used an experimental research to determine the effectiveness of the SETS Guided Learning learning model approaching students' understanding of concepts by using the Two-Tier Test in class IV Elementary School theme 3 sub themes 1 learning 1, 2 and 3.

In sampling in this study using purposive sampling technique. So obtained Payak Elementary School as an experimental class and Eggplant Elementary School 1 as a control class. The experimental class numbered 27 students while the control class totaled 30 students. Preliminary data from experimental and control class students were obtained from odd semester midterms (UTS) grades in the 2019/2020 school year science subjects.

The data of this study were obtained from tests and observations. The prerequisite test for the study is the normality test and homogeneity test. Data analysis in this study used t-test analysis using PASW Statistics 18 software.

III. RESULTS AND DISCUSSION

Before the two classes are given different learning, it is necessary to test whether the two data have the same characteristics or not use the normality test, homogeneity test and average similarity test.

Preliminary data analysis

Normality test to determine whether the initial data obtained by students is normally distributed or not in the experimental class and the control class can be seen in Table 1.

Table 1. Initial Data Normality Test

Group	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Experiment	.157	27	.086	.961	27	.398
Control	.150	30	.083	.935	30	.067

Based on the normality test with PASW statistical software 18 using the Kolmogorov-Smirnov test, it was found that the significance values for the experimental class and the control class 0.086 and 0.083> 5% (α = 0.05) then HO was accepted. This shows that the initial data of students' abilities from the experimental class and the control class were normally distributed.

Homogeneity test is performed to find out the initial data of the experimental class and the control class having the same variance can be seen in table 2.

Table 2. Initial Data Homogeneity Test

		Levene Statistic	df1	df2	Sig.
Score UTS	Based on Mean	2.580	1	55	.114

Based on homogeneity test with PASW statistical software 18 using the statistical levene test, it was found that the significance value for the experimental class and the control class was 0.114> 5% (α = 0.05), then HO was accepted. This shows that both the experimental class and the control class have the same (homogeneous) variance.

The average similarity test is used to find out whether both classes have the same average ability or not. To analyze the average similarity in this study using an independent sample t-test with PASW statistical software 18 can be seen in table 3.

Table 3. Average similarity test

	Levene's Test for Equality of Variance		**t-test for Equality of Means**						
	F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.2.580	.114	-1.050	55	.298	-2.88148	2.74470	-8.38199	2.61903
Equal variances not assumed			-1.042	51.474	.303	-2.88148	2.76772	-8.43668	2.67371

Based on the average similarity test using independent sample t-test with statistical software PASW 18 with a level of 5%, the significance values of 0.298 and 0.303 were obtained, the HO was accepted. This shows that the initial average ability of the experimental class students is the same as the initial average ability of the control class.

Final data analysis

The final data obtained in this study uses a diagnostic test in the form of a two-tier test to determine the level of understanding of science concepts of elementary school students on the theme of 3 subthemes 1. This test is carried out in 2 stages, namely before the learning (pretest) and after the learning (posttest) . The results of the pretest in the control class and the experimental class can be seen in Figure 1.

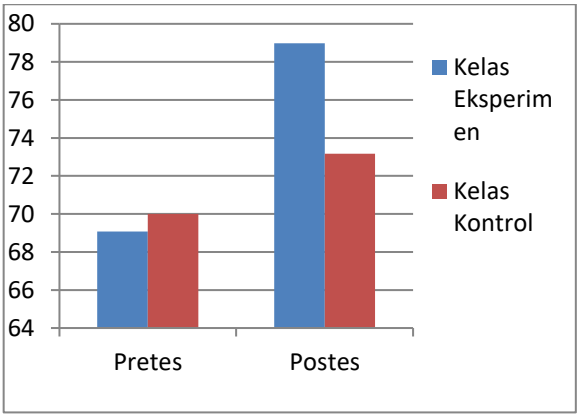

Figure 1. Final Data Average

Based on Figure 1 shows that the average pretest value of the control class is higher than the average pretest class value of the experimental class. However, the average post-test score of the control class is lower than the experimental class. This is influenced by differences in learning treatments from the two classes. The experimental class students used guided discovery learning models while the control class students used expository learning.

Table 4. Final Data Normality Test

	Group	**Kolmogorov-Smirnov**			**Shapiro-Wilk**		
		Statistic	**Df**	**Sig.**	**Statistic**	**Df**	**Sig.**
Pretest	Eksperiment	.164	27	.060	.932	27	.077
	Control	.132	30	.195	.962	30	.356
Postest	Eksperiment	.162	27	.068	.945	27	.164
	Control	.134	30	.180	.943	30	.108

Based on the normality test with PASW statistical software 18 using the Kolmogorov-Smirnov test, it was found that the significance value of the pretest for the experimental class and the control class were 0.060 and 0.195> 5% (α = 0.05) then HO was accepted. This shows that the students' pretest scores from the experimental class and the control class are normally distributed.

Homogeneity test is performed to determine the final data of the experimental class and the control class having the same variance can be seen in table 5.

Table 5 Uji Homogeneity of Final Data

	Levene Statistic	df1	df2	Sig.
Pretest	.237	1	55	.629
Postest	2.012	1	55	.162

Based on homogeneity test with PASW statistical software 18 using the statistical levene test, it was found that the significance value was 0.629 and 0.162> 5% (α = 0.05), then HO was accepted. This shows that both the experimental class and the control class have the same (homogeneous) variance.

In this study completeness in learning is seen from classical completeness by using the guided discovery model approaching SETS in science learning. Based on calculations obtained Zcalculate = 2.04. Price of Ztable with α = 5% chance (0.5 - α) = 1,706. Because Zcalculate> Ztable then Ho is rejected and Ha is accepted. This means that as many as more than 75% of all students who use guided discovery learning models with SETS have achieved classical completeness. After classical completeness is calculated it will be tested using an independent sample t-test. Based on calculations obtained 2,212> 1,672 then HO is rejected. So the average understanding of science concepts students using guided discovery learning with SETS approach is greater than the average expository learning. Completeness in experimental class learning is caused by several factors, one of which is using the guided discovery model, the goal in this model is to find new things according to theory with the correct steps. In accordance with the opinion of Chang (2012) that most students are correct in carrying out the procedures described to plan to complete step by step, but often without knowing the principles. Therefore by using the learning invention students are directed to the concepts in accordance with the theory.

In the implementation of guided learning learning results in active students in finding the right concepts during learning that takes place through discussion and presentation in front of the class through experiments that have been conducted. This is in line with research by Wewa (2015) and Setiawati et al. (2013) that the guided discovery model is able to increase student enthusiasm so that learning becomes active in learning. Thus guided discovery learning has a positive impact on ongoing learning so as to increase understanding of the concept of science by achieving classical completeness in accordance with research conducted by Diyono (2016) an increase in learning outcomes due to teachers doing guided discovery learning so that students more easily understand the material provided.

Understanding the concept of the experimental class has increased in the average mastery learning, can be seen by comparing the results of the pretest and posttest. This is due to using learning by using guided discovery learning models with SETS approach so that the average understanding of concepts in the experimental class is better than the control class using expository learning.

Increased understanding of the concept can be seen from the difference in the average increase in the difference in value before and after the implementation of the guided discovery learning approach SETS. This is in line with research conducted by Marsuki et al. (2014) and Sahara et al. (2016) that guided discovery learning can change students' understanding of concepts so that the average understanding of students has increased. Thus, understanding of students' concepts increases especially in Theme 3 Subtheme 1.

Improved understanding of the concept of the experimental class is better than the control class because the experimental class implements guided discovery learning while the control class uses expository learning. This is in line with research conducted by Wisnawati et al (2014) and Bahrudin (2013) that guided discovery learning can influence the understanding of concepts that can improve student learning outcomes. Thus guided discovery learning is more effectively used in learning. In accordance with research Rohmawati et al (2013) that by applying guided discovery learning is effective in improving understanding of concepts in the material.

Whereas in expository learning, students appear to be inclined and passive in learning that takes place because in active expository learning is a teacher so students do not get the opportunity to express the initial concepts they have. Expository learning is a form of teacher-oriented learning (teacher centered approach). This is because the teacher plays a very important role in ongoing learning. With expository learning the teacher conveys structured learning in the hope that the material being taught can be mastered well. The main focus in expository learning is the academic ability of students (academic achievement student). In accordance with research Emiliannur et al. (2012) & Widiawati et al. (2015) that the expository learning process is centered on the teacher and awkward students if they want to submit their individual opinions, here students are required to memorize the material being studied without prioritizing students understanding or not after learning. This is also in line with research by Vlassi (2013) that guided discovery learning dominates learning, students are also more active in conducting question and answer about the material being studied compared to traditional learning.

The percentage of understanding of concepts possessed by students after using the guided discovery model learning approached by SETS has increased. Students who understand the concept have increased classically, in the form of misunderstanding type 1 and type 2 concepts (KP-1 and KP-2) have decreased while in students who do not understand the concept (TM-1) decreased. It can be concluded that by using guided discovery learning approached by SETS has increased student understanding of concepts and is able to reduce misunderstanding of concepts and ignorance of student concepts. This is in line with research conducted by Annajmi (2016) and Laili (2019) increasing understanding of concepts

and decreasing understanding of concepts as a result of the models being taught namely guided discovery models.

The lowest indicator of understanding is interpreting. Students are not able to explain the picture contained in the given problem and it is difficult to choose an answer that matches the picture asked because students do not master the concepts in the interpreting category. This is in line with research conducted by Lisma et al. (2017) and Budi et al. (2018) that the lack of understanding of students' concepts is due to lack of participation to explain and not yet given the opportunity to present an event in the learning process. While the highest understanding indicator is explaining. Students are able to explain a concept based on what is presented.

IV. CONCLUSION

Based on the results of research and discussion, it can be concluded that guided discovery learning with SETS approach is effective in improving understanding of the concept of science in elementary school students. This is shown from the students' understanding of science concepts with SETS guided guided learning that has reached classical learning completeness, the average understanding of concepts and increased student understanding of concepts with SETS-guided guided discovery is better than expository learning and the quality of SETS-guided guided discovery is included in the category very good.

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