

Comparison between the Application of Science Technology Society Model and Discovery Learning Model on the Student Knowledge Competence in Class XI of SMAN 12 Padang

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Abstract – In the 21st century, the learning that integrated of science and technology in education is needed. A kind of learning model that integrated of science and technology is the Science Technology Society models. In SMAN 12 Padang, the teachers are used Discovery Learning models in the learning process, especially biology teacher. It is impacted to the learning process where students' knowledge competence is still below the minimum learning mastery standard. In order to overcome this problem, using the right model is a must. This research aimed to compare student knowledge competencies in applying two models, the Science Technology Society (STS) model and the Discovery Learning (DL) model. This is a quasi-experimental research design where Randomized Control Group Posted Only as the design. The population in this study were students of class XI IPA of SMAN 12 Padang in the academic year 2019/2020. The sample is determined by purposive sampling technique. The instrument was a multiple choice question sheet. The data was analyzed by some techniques are normality test, homogeneity test, and hypothesis testing with t-test using SPSS application. The results showed that there was a significant difference in knowledge competence between experimental class 1 and experimental class 2, where the value of knowledge which applied the STS model was higher than the DL model.

Keywords – Science Technology Society, Discovery Learning, Student Knowledge Competence.

I. INTRODUCTION

The 21st century is an era that requires intense competition in various fields for life. This 21st-century competition is no longer local or national, but up to global coverage. At present and in the future, the population of a country has very high mobility. They can move from one country to another very easy to get a decent living. As it is today, we can see many foreign nationals working in Indonesia. The nation's human resources must be able to compete with foreign nationals in looking for work. Based on

the Global Competitiveness Index 4.0, Indonesia's competitiveness in 2017-2018 is ranked 45th out of 140 countries (Schwab, 2018). The data shows that the competitiveness of Indonesian human resources globally is still low.

Indonesian human resources can have high global competitiveness if they have the competencies or abilities demanded in the 21st Century. According to Greenstein (2012: 7), superior human resources in the 21st century are human resources that have several competencies which

include (1) thinking ability includes critical thinking, problem-solving, creativity, and metacognitive; (2) communication and collaboration skills; (3) the ability to create and renew; (4) information and communication technology literacy; (5) contextual learning ability; and (6) media information and literacy skills. The mastery of science and technology (science and technology) is an important key in the 21st century (Wati, 2014: 23).

Efforts to improve the competitiveness of human resources in Indonesia are inseparable from the existing education system. Education is very influential in preparing and producing human resources that can compete globally. According to Rusman (2012: 18), 21st-century learning requires students and teachers to be able to utilize and use technological sophistication. Education needed in the 21st century is education that can integrate science and technology in learning to develop the skills demanded in the 21st century.

Indonesia has integrated science and technology into the current curriculum, namely the 2013 curriculum. Some basic competencies contained in the 2013 curriculum especially in Biology subjects require students to not only be able to understand science but also be able to solve problems that occur in the social environment by using technology. Based on an interview with one of the Biology 12 Padang High School Biology teachers on August 15, 2019, learning that integrates technology has not yet been carried out in the learning process in the classroom. In fact, 77.8% of students at the school like the learning process that integrates technology in it. This is because the current generation is very closely related to the use of technology. Science learning with technology is liked by students and can increase enthusiasm in learning (Kinde, 2007: 46). Besides, students also like and will be excited if learning is done by raising issues that are developing or solving problems. As many as 96.3% of students stated that they would be excited if the learning process connected science and the use of technology in solving problems or issues that occur in life. Conversely, as many as 59% of students said the teacher applied to learn that was less interesting.

Researchers also observed the achievement of students' learning competencies in Biology. Based on data values from the Daily Assessment (PH) of students of class XI IPA of SMAN 12 Padang, it is known that the competency of students' knowledge is still below the Minimum Mastery Criteria (KKM), which is 78.

One of the efforts that teachers can make in achieving basic competencies demands to do the learning process that

applies the right learning model. Based on the results of an interview with one of the teachers at SMAN 12 Padang, the learning model that is currently and commonly applied is discovery learning. The model discovery learning applied has not yet seen the process of linking concepts with technology in problem-solving or responding to issues in life. Learning models that integrate technology in learning include Science Technology Society (STS).

The STS learning model emphasizes concepts and connects concepts with technology in problem-solving or responding to issues that occur in life. According to Poedjiadi (2005: 126), the STS model has five syntaxes: invitation, concept formation, concept application, concept stabilization, and evaluation. The STS learning model is believed to be the right learning model because it can create a conducive climate in learning that can increase student activity so that learning outcomes increase (Wati, 2014: 22). The results of interviews with Biology teachers at SMAN 12 Padang stated that the STS learning model has never been applied in learning. Research conducted by Wati (2014) shows that the STS learning model can improve Biology learning outcomes in grade X students of SMAN 3 Boyolali. Research conducted by Muhajir and Rahaeti (2015) also revealed that the STS model was better in improving the learning achievement of knowledge domains of students in natural science lessons in MTs Negeri Cikembar than the CTL model.

Material characteristics that can be applied with the STS learning model are material that can raise issues or problems that occur in life and respond to these issues by connecting concepts and application of technology (Poedjiadi, 2005: 123). The material of the respiratory system and excretion system in humans requires students to be able to solve problems such as system disturbances by the application of concepts and linking with the use of technology.

Based on the problems that have been described, researchers conducted a study entitled "Comparison between the Application of Science Technology Society Model and Discovery Learning Model on the Student Knowledge Competence in Class XI of SMAN 12 Padang".

II. METHODOLOGY

The type of this research is a quasi-experimental research design with Randomized Control Group Posttest Only Design. In this study, students were divided into two classes, namely the experimental class 1 and the experimental class 2. The experimental class 1 was treated by applying the learning model Science Technology Society while the experimental

class 2 applied the learning model commonly used in the school namely Discovery Learning. After that, both the experimental class 1 and experimental class 2 were given a posttest. The instrument used was a knowledge test question sheet in the form of multiple-choice questions. Data analysis with normality test, homogeneity test, and hypothesis testing using SPSS application.

III. RESULTS AND DISCUSSION

1. Results

The results of measuring knowledge competency can be seen in Table 1.

Table 1. Results of Measurement of Knowledge Competence

Class	Average Value of Knowledge
Experiment 1(STS)	80.39
Experiment 2 (DL)	76.00

Table 1. shows a summary of knowledge competencies where the experimental class 1 obtained an average value of 80.39 while the experimental class 2 obtained an average value of 76.00. It can be seen that the results of the knowledge competency of the experimental class 1 are better than the experimental class 2. The analysis prerequisite test will then be conducted which includes a normality test, a homogeneity test, and a t-test between the knowledge competency of students applying the STS model and students applying the DL model and the results can be seen in Table 2.

Table 2. Result of Knowledge Competency Prerequisite Analysis Test

Parameter	Class		Information
	Experiment 1 (STS)	Experiment 2 (DL)	
Average	80.39	76.00	Experiment 1 > Experiment 2
Normality Test	Sig = 0.60 $\alpha = 0.05$	Sig = 0.883 $\alpha = 0.05$	Normal Distributed
Homogeneity Test	Sig = 0.469 $\alpha = 0.05$		Homogeneous Variance

Hypothesis Test (t test)	Sig = 0.043 $\alpha = 0.05$	STS better than DL
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Table 2. shows the average value of the knowledge competency of the experimental class 1 and experimental class 2 along with the values of normality test, homogeneity test, and t-test. With an average value of the knowledge competency of the experimental class 1 higher than the experimental class 2 as well as homogeneous data and normal distribution, while the significance value < 0.05 , it can be concluded that the knowledge competency of students who learn using the STS learning model is better than the DL learning model.

2. Discussion

Based on the results of the research described above, it shows that the knowledge competency of students who apply the STS (Science Technology Society) model is higher than the knowledge competency of students who apply the DL (Discovery Learning) model. Students who learn with the STS model get a knowledge value of 80.39. While students who study with the DL model get a knowledge value of 76.00.

The STS model consists of five syntaxes, namely invitation, concept formation, concept application, concept stabilization, and evaluation. (Poedjiadi, 2005: 126). The STS model has syntaxes that can guide students directly to form concepts and strengthen the concepts that they have formed. This is in line with Smarabawa, et al (2013) which states that the second syntax of the STS learning models, namely the concept formation stage, allows students to form understanding concepts by answering questions to LKPD during group discussions. Besides, the fourth syntax of the STS models, namely the concept strengthening stage can help students to solidify the concepts that have been formed. Amilda, et al (2017: 54) revealed that concepts emphasized at the end of learning will last longer than those that are not established or emphasized. The application of the syntaxes of the STS model makes students more interested in learning science. This is in line with Devi and Aznam research (2018: 6) which says that students are more interested in learning science after learning by applying the stages of the STS model.

The DL learning model consists of six syntaxes, namely stimulation, problem identification, data collection, data processing, verification, and generalization (Kurniasih et al, 2014: 68). The DL model has more syntax and requires a long time in finding or constructing concepts, so students have difficulty in finding concepts. As explained by Kemendikbud

(2013) that the DL model is not efficient for teaching large numbers of students because it takes a long time to help them find theories or solve problems. This is in line with the research of Permatasari, et al (2018: 62) which states that the DL model provides broad opportunities for students in finding and formulating concepts with very limited guidance or without being guided by the teacher so that it takes a long time to find and understand the concepts on the material. Waslina, et al (2019: 44) also suggested that students learning with the DL model had difficulty in searching and conducting investigations as well as analyzing their findings systematically, critically, and logically.

The issues raised in learning are also the differentiator of these two models. In the STS model, precisely the invitation syntax, the problem is expressed or explored by students so as to allow students to think first about the problem or issue in the material. Amilda et al (2017: 53) states that the first stage of the STS model requires students to think creatively to bring up the issue expressed and analyze its relevance to the material being taught. While the first stage of the DL model, precisely the stimulus syntax, the problem is not explored by students but is given directly by the teacher. Cahyo (2013: 249) states that the initial stage of the DL learning model is to provide stimulation, where the teacher raises a problem or instructs students to read the problem that the teacher has prepared. This causes the DL model to not provide an opportunity for students to think in advance about problems related to the material to be solved. As explained by Kemendikud (2013), the DL model does not provide learners opportunities to think that students will find because they have been chosen by the teacher.

The STS model was developed from the approach *Science Technology Society* where there are elements of science, technology, and society. The technology element is seen in the third stage, which is the application of concepts. The existence of this technological element gives a good influence on students' learning competencies. This is in line with Muhajir and Rohaeti statement (2015: 10) that the existence of elements or technological issues in the STS model can influence in increasing science literacy and science learning achievement of students. While the DL model does not require the presence of technological elements in the application of the syntax.

Differences in the design of STS and DL learning models that have been discussed cause differences in the value of the knowledge competency of the sample class students. The STS learning model is better at increasing the learning competence of students in the realm of knowledge.

IV. CONCLUSION

Based on the results of research that has been done, it can be concluded that there is a difference between the application of the STS learning model and the application of the DL learning model to the knowledge competence of students, where the knowledge competency of students applying the STS model is higher than the knowledge competency of students applying the DL model.

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