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Increasing Science Process Skills and Scientific Attitudes Through the Application of Search, Solve, Create, and Share Learning Models to Static Fluid Materials

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***Abstract*—The purposes of this study was to determine the improvement of science process skills and scientific attitudes towards the search solve create and share learning model. The method used in this study was an experimental pretest-posttest control group design with random sampling technique. Data collection was carried out through pretest and posttest. The data analysis of the ability of science process skills and scientific attitudes was carried out by comparing the results of the pretest, posttest and significantly tested by means of two different tests. The results showed that the science process skills in the two-difference test on the average pretest for the experimental class and control class obtained $t_{count}<t_{table}$, namely 0.933 <1.68, while the students' scientific attitudes was obtained 0.745 <1.68. The students' pretest ability towards the science process skill score and the scientific attitudes score was not significantly different between the experimental class and the control class. The conclusion from the results of this study is that the SSCS learning model can improve students' scientific process skills and scientific attitudes.**

Keywords*—search solve create share, *science process skills, scientific attitude

I. INTRODUCTION

Scientific learning must include emphasis on hypotheses, natural manipulation, and data-based reasoning. The importance of teaching science process skills in scientific education, teachers must recognize the virtues of these skills along with personal, intellectual, and social development [1]. Science process skills can help students to study the nature of science better and contribute positive mental growth so that students can actively learn [2].

Attitude in learning is essential. That attitudes comes from within the studentswhen they expressed their feeling of an object indicated of likes or dislikes. The attitudes is a feeling accompanied by a tendency to act toward an object. The scientific attitudes is a tendency of a person to act by expressing feelings or thoughts [3]. Both positive and negative scientific attitudes in the study of physics profoundly influence the results of learning physics [4]. Some studies between the relationship of the science process skills and the student's scientific attitudes have been performed, which is a significant positive relationship between student knowledge between science process skills and scientific attitudes toward the study of physics [5]. When students understand the science process skills can enhance a positive scientific attitudes toward science [6].

Based on the observations and interviews on February 12, 2019th at SMAN 9 Banda Aceh received data: (1) when a teacher gives a different evaluation of the example given, the students cannot solve problems with a higher level of understanding. The student thought that learning physics was merely memorizing abstract formulas and calculations. At can be expected to be one of the factors of students' lack of understanding; (2) students have not fully developed the science process skills as well as group discussions; (3) students rarely experiment at school, because they only have one science lab. Science process skills serve as an essential way for teachers to learn about teaching science. Therefore, teachers must have strong conceptual understanding and be able to perform the science process skills well if they must be teaching them effectively in class [7].

The previous descriptions suggest that students are not accustomed to carrying out the scientific process meticulously. The student has not fully grasped the physics problem that is usually presented in questions. This leads to the low grades that students obtain. The national exam data obtained in the last three years ago for a physics score at SMA 9 Banda Aceh is relatively low, with details of 2017 was 24.72, 2018 was 32.77, and 2019 was 35.87 [8].

There are many learning models to solve or solve problems with science process skills and scientific attitudes, one of the learning models commonly used for character building scientific attitudes and improving students' science process skills is the Search, Solve, Create and Share (SSCS) learning model.This learning model refers to the four stages of problem solving, which is (1) the search stage aims to involve students understanding the problem given by digging out known and unknown information. At this stage, students observe, create small questions, and analyze the available information to form a collection of ideas, (2) the solving stage is aimed at implementing a plan to solve the problem and forming a hypothesis. Students select methods to solve problems, collect data and analyze, and solve it, (3) level createes aims at creating products or creating formulas of problem solutions based on previously selected guesswork. The students presenta report on how to solve the problem in front of the other students, (4) the share stage aims to present the results to teachers and other students. The student also conveys their mind through interactions, receiving and processing feedback reflected on the answer of the problem [9].

Based on the description of the above problems, the authors conducted research using the SSCS learning model in the teaching and learning process, which could improve science process skills and students' scientific attitudes in physics, especially on static fluid material.

II. Research Methods

A. Research Approach

This research uses a quantitative approach to the type of applied research. The research method used was an experimental method using a pretest-posttest control group design.

B. Population and Sample

The population in this study were all students of class XI MIA SMAN 9 Banda Aceh, which consisted of four classes that took the MIA program in the odd semester of the 2019/2020 school year with 130 students. The sample was selected by random sampling by randomizing the entire class XI MIA by giving a pretest to all MIA classes.

C. Research Instruments

The instrument used in this study was an objective test consisting of 14 questionsand a scientific attitudes questionnaire consisting of 26 statements, which is had 14 positive statements and 12 negative statements that had been validated and tested.

D. Data Collection

Data collection was carried out at the pretest and posttest. The pretest is carried out before the learning process takes place with the aim of knowing the students' initial abilities. Posttest are carried out at the end of the learning process. The improvement of students' science process skills was measured using 14 multiple choice test questions based on the indicators that had been developed,meanwhile students' scientific attitudes were observed with a questionnaire using a Likert scale, namely SA (strongly agree), A (agree), D (doubt), DA (disagree), and SDA (strongly disagree).

E. Data Analysis

Student pretest and posttest data were analyzed by giving a score of 7 on the questions of science process skills for each test that was answered correctly with the highest score of 98, while the scientific attitudes was analyzed using the percentage test. The pretest scores, posttest science process skills and scientific attitudes in the N-gain analysis, normality, homogeneity, and finally the average difference test is carried out in each class.

III. Results and Discussion

Results and discussion related to science process skills and students' scientific attitudes. Data from these two variables were collected using test and non-test instruments. The results of the students' answers were calculated so that each student obtained science process skills and scientific attitudes which were analyzed as follows.

A. Analysis of Science Process Skills

There are two science process skills: basic and consecrated science process skills [10]. In this study, researchers pick up only a few indicators that match the SSCS 'learning model, that is (1) observation, (2) classification, (3) prediction, and (4) collecting and processing data. The necessity of a student's science process skills is measured by problems shared in the beginning and end activities of learning. SSCS teaching models for improving science process skills, then the average different test can be done. More clearly can be seen at table 1.

TABLE I. DIFFERENT TEST OF THE AVERAGE SCIENCE PROCESS SKILLSIN THE EXPERIMENTAL CLASS AND THE CONTROL CLASS

Data source	Class	Score Average	Normality* $L_{count}<L_{table}$	Homogeneity ** $F_{count}<F_{table}$	Significance *** $t_{count}<t_{table}$
Pretest	Experiment Class	34.30	(0.135) <(0.161) (Normal)	(1.01) <(1.84) (Homogeneous)	(0.93) <(1.68) (Not Significantly Different)
	Control Class	32.20	(0.131)<(0.161) (Normal)		

*) *Lilliefors test* (normal, $L_{count}<L_{table}$ = 0.05) α ; **) F test (homogeneous, $F_{count}<F_{table}$= 0.05) α; ***) t test (significant, $t_{count}<t_{table}$= 0.05) α

Normal test results obtained based on table 1 show that $L_{count}<L_{table}$ is normal distributed data. After normal distributed data is then carried out the homogenity test to see the experimental class data and the control class have homogeneous data variance. The results of the t-test on the pretest of the experimental class and the control class obtained $t_{count}<t_{table}$, then that is 0.93 <1.68. This proves that the pretest t-test does not differ significantly between the experimental class and the control class. In the experimental class, students are much more active in learning because students really enjoy the applied learning and make students more enthusiastic about learning static fluid material. The SSCS learning model provides students the opportunity to explore ideas independently, requires students to be able to write solutions with systematic completion steps and requires students to actively discuss during the learning process [11].

The science process skills analysis of each indicator was done in experiment and control classes. Low N-gain criteria, moderate and high on each function will be calculated to compare the results between experiment class and control class. The results of science process skills indicator analysis of experiment and control classes are presented at table 2.

TABLE II. THE RESULTS OF THE N-GAIN ANALYSIS OF SCIENCE PROCESS SKILLS INDICATORS IN THE EXPERIMENTAL AND CONTROL CLASSES

No	Indicators of Science Process Skills	N-gain percentage	
		Experiment Class	*Control Class*
1.	Observation	67	55
2.	Classification	100	97
3.	Prediction	80	52
4.	Collecting and processing data	74	65

Based on table 2, it can be concluded that the highest N-gain score in which rate classifications are obtained 100% in experiment classes and 97% in high-category control classes. The lowest N-gain score on the experiment class an observational indicator is acquired 67%, whereas in the control class a predictive indicator is acquired 52% in low category. In the control class, teachermore active and gives information for students, so the students have less active role in locating information.

Every indicator indicates there is a difference between science process skillsthe student between the experiment class and the control class. The treated students who use application of SSCS learning models get high-valored average N-gainscores, while on the control class have a low-valoredN-gainscores. Then it may be concluded that a SSCS chastisement model can increase science process skills. The student who studied physics with the SSCS learning model had a higher grade score than the student who learned on a control class [12].

B. *Scientific Attitude Analysis*

The scientific attitudes indicator used in this study refers to an indicator according to anwar [13]. Students' scientific attitudes are measured by problems Shared in early and late learning activities. The SSCS learning model for improving scientific attitudes, thenthe average different test can be done. Can clearly be seen at table 3.

TABLE III. DIFFERENT TEST OF THE AVERAGE SCIENTIFIC ATTITUDE IN THE EXPERIMENTAL CLASS AND THE CONTROL CLASS

Data source	Class	Score Average	Normality* $L_{count}<L_{table}$	Homogeneity ** $F_{count}<F_{table}$	Significance *** $t_{count}<t_{table}$
Pretest	Experiment Class	71.20	(0.148)<(0.161) (Normal)	(1.34) <(1.84) (Homogeneous)	(0.75 <1.68) (Not Significantly Different)
	Control Class	70.63	(0.080)<(0.161) (Normal)		

*) *Lillie fors test* (normal, $L_{count}<L_{table}$, = 0.05) α ; **) F test (homogeneous, $F_{count}<F_{table}$, = 0.05) α ; **) = t test (significant, $t_{count}<t_{table}$, = 0.05) α

Based on table 3, that's normal distributed data and homogeneous. The results of the t-test on the pretest of the experimental class and the control class obtained $t_{count}<t_{table}$, then that is 0.75<1.68. This proves that the pretest t-test does not differ significantly between the experimental class and the control class. The increase in scientific attitudes experienced by students in the experimental class was due to the students being applied the SSCS learning model. Increasing scientific attitudes can take place if science teaching is presented by the teacher and increasing the role of the facilitator through practical science activities that carry out student science such as observation, testing, and research [14].

The scientific attitudes indicator analysis is done on experiment and control classes by giving a statement that matches the scientific attitudes indicator. The results of scientific attitudes indicator analysis of experiment and control classes are presented at table 4.

TABLE IV. THE RESULTS OF THE N-GAIN ANALYSISSCIENTIFIC ATTITUDE IN THE EXPERIMENTAL CLASS AND THE CONTROL CLASS

No	**Indicators of Science Process Skills**	**N-gain percentage**	
		Experiment Class	***Control Class***
1.	Curiosity	88	71
2.	Respect of data	84	75
3.	Critical thinking	93	67
4.	Invention and creativity	74	69
5.	Open minded and cooperation	76	65
6.	Perseverance	85	69

Based on table 4, it can be concluded that the highest *N-gain* score on the experiment class a critical thinking indicator is a acquired 93%, whereas in the control class respect of data indicator is acquired 75%. The lowest *N-gain* score on the experiment class an invention and creativityindicator is acquired 74%, whereas in the control class anopen minded and cooperation indicator is acquired 65%.

Based on the previous description, on each scoring indicator in the experiment class, it increases more than the control class score. This proves with SSCS learning models can improve students' scientific attitudes during teaching learning activities especially static fluid material. The difference in the scientific attitudes of an experiment class can improve students' critical thinking ability in learning and criticize the results of data analysis, this can help students in an inquiry into how knowledge of scientific attitudes is built, whereas in the student control class learn to get only information from teachers [15].

IV. CONCLUSION

Based on the results of research and data analysis, it can be concluded that the adoption of the SSCS learning model can improve students' science process skills and scientific attitudes on static fluid material at SMAN 9 Banda Aceh. The results showed that the science process skills in the two-difference test on the averages pretest for the experimental class and the control class obtained tcount<ttable, namely 0.93 <1.68, while the scientific attitudes of the students was obtained 0.745 <1.68. The students' pretest ability towards the science process skill score and the scientific attitudes score was not significantly different between the experimental class and the control class.

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