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Applying of Search, Solve, Create, and Share (SSCS) Learning Model to Improve Students' Mathematical Quantitative Reasoning

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ABSTRACT
The purpose of this study was to determine whether the application of the search, solve, create, and share (SSCS) learning model can improve students' quantitative mathematical reasoning. This study was a pre-experimental research with one group pretest-posttest design. The population in this study were all grade VIII students at a state junior high school in Lamongan city in the academic year 2019/2010, while the sample was selected using simple random sampling, which was grade VIII A students. Data from pretest and posttest results was analyzed using paired sample t test after fulfilling the requirements of the normality test and homogeneity test. Based on the results of hypothesis testing using SPSS, a probability (sig.) of 0,000 was obtained, which means that H0 was rejected and Ha was accepted, as well as when manual calculations are obtained tcount = 21.358 and ttable = 2.03951 so that tcount> ttable which means that there was a difference in the average value of students' quantitative mathematical reasoning before and after learning the SSCS model. The application of the search, solve, create, and share (SSCS) learning model could improve quantitative mathematical reasoning of students. This research was expected to provide new experiences and insights in teaching mathematics to students.

Keywords: *Learning Model, Model Search, Solve, Create, and Share (SSCS), Quantitative Reasoning*

1. INTRODUCTION

Mathematics is a universal science that underlies the development of modern technology, has an important role in various disciplines and advances human thinking, because mathematics has a strong and clear structure and linkages between its concepts that enable students to think rationally [1]. In everyday life, maths lessons have an important role to play in facing competition that continues to grow rapidly and changes every time. The rapid development in the field of information and communication technology today is based on the development of mathematics in number theory, algebra, analysis, probability theory, and discrete mathematics [2]. However, mathematics is still regarded as a subject that is uncertain and pointless, difficult, and boring. This assumption affects students 'interest in learning in mathematics so that it affects students' mathematics learning outcomes. The results of the TIMSS (Trends in International Mathematics and Science Study) ranking of Indonesian students in implementing scientific steps are in position 36 out of 49 countries. This is in line with the results of the PISA (Program for International Student Assessment) survey in 2015 which focused on reading literacy, mathematics, and science studies which stated that Indonesia was ranked 69 out of 76 countries. In 2018, the average score for the Computer-Based National Examination (UNBK) for SMP had decreased, the increase in scores was only in English lessons, while Indonesian and mathematics lessons had decreased. The average mathematics subject has decreased very drastically, namely in 2017 the average mathematics score was 48.63%, while in 2018 it decreased to 44.38% ".

In implementing the mathematics learning process, the mathematical competencies that teachers must pay attention to include: connections, reasoning, communication, problem solving, and representations [3]. Mathematics has three functions, as a tool for understanding or conveying information, mindset in understanding an understanding as well as in reasoning a relationship between these meanings and science [4]. From this description, it can be stated that one of the skills students must have in mathematics is the ability to

reason. Because if students have good reasoning skills, solving the questions will be easier. The results of learning mathematics in terms of reasoning were not satisfying because students did not use logical reasoning in solving mathematical problems [5]. Indonesian students are good at solving rote questions, but they are still lacking when applying and reasoning. Assessments carried out in schools, both daily tests, midterm tests, and school exams, have not been able to train students' reasoning skills. This causes students to become accustomed to solving math problems by memorizing rather than reasoning, so that when facing exams with questions that have a higher level of difficulty or are not present in students' memorization, students will feel confused and feel that the questions are difficult. Reasoning is needed in studying mathematics [4]. In studying or understanding mathematics, reasoning is needed and vice versa mathematical reasoning abilities can be understood and studied in learning mathematics [6]. Reasoning and mathematics are two things that are interrelated.

One type of reasoning is quantitative reasoning. Quantitative reasoning is an ability developed in mathematics learning that is used to analyze quantitative information and can be used to determine skills and procedures that can be applied to certain problems to arrive at a solution [3]. Quantitative reasoning, both in general and for assessment purposes, is focused on solving problems. This includes six abilities; (1) Comprehension in reading information in various forms; (2) Interpretation of information and draw a conclusion; (3) solving problems with arithmetic, algebra, geometry, and statistical methods; (4) estimate answers and check their validity; (5) Express solving problems based on quantitative information; and (6) scoping based on mathematical or statistical methods [7]. Quantitative reasoning requires the use of mathematical content for assessment purposes and to solve problems more generally.

One of the efforts to improve students' ability, understanding and quantitative reasoning, namely by choosing a learning model that is fun and not boring for students is the selection of the right learning model by the teacher, because in learning there is interaction between teacher and students. This is in accordance with Law No. 20 of 2003 concerning the National Education System article 1 verse 20 which states that learning is a feedback / interaction process that occurs between students and teachers, as well as learning resources in the learning environment. The choice of learning model is very important in the teaching and learning process in the classroom. A good learning model is one that is able to increase student activity during the learning process, so that students are able to develop the information obtained. Therefore, a teacher has an important role in choosing the right learning model so that it can develop students' reasoning competencies. One of the learning models that are deemed suitable for improving mathematical quantitative reasoning is the SSCS model learning (search, solve, create, and share).

According to the results of the Laboratory Network Program (1994) report, there are several things that can be achieved in the NCTM standard in the SSCS model, namely: (1) problems in mathematics can be proposed; (2) learners' experiences and insights can be built; (3) ability in mathematical thinking can be developed to ensure the validity of certain depictions, make predictions, solve student problems / answers; (4) posing problems and various tasks that challenge students to be directly involved; (5) students' insights and skills are always being developed; (6) build students' interest in making connections / connections and create an orderly framework based on developed mathematical ideas; (7) useful in formulating problems and mathematical reasoning; (8) introduces the development of all competences of students in solving math problems. Based on these eight things, one approach to learning mathematics can develop students' quantitative mathematical reasoning abilities. Previous research found that the SSCS model of learning was able to increase students' reasoning abilities and improve their learning outcomes [8]. Students who are taught with the SSCS model approach, had higher logical thinking abilities than students who are taught with conventional learning one of the topics or material studied in mathematics class VIII is the Two-Variable Linear Equation System (SPLDV).

Based on the reasons above, this study was aimed to apply Search, Solve, Create, and Share (SSCS) learning model to improve Mathematical Quantitative Reasoning of students.

2. METHOD

This research was a pre-experimental research used one group pretest-posttest design. The population in this study were all grade VIII students at SMP Negeri Laren Lamongan in the 2019/2010 academic year, while the sample in the study was class VIII A students. The sampling technique used was simple random sampling.

The research instrument consisted of a validation sheet consisting of a learning device validation sheet, namely a Learning Device Plan (RPP) validation sheet, a Student Worksheet (LKS) validation sheet, and a mathematical quantitative reasoning ability test validation sheet (pretest and posttest). Researchers analyzed the data from the pretest and posttest results using paired sample t test after fulfilling the requirements of the normality test and homogeneity test. The following are the data processing steps using the Statistical Package for Social Sciences (SPSS) 24 for Windows in this study:

2.1. Normaly Test

The normality test used is Shapiro-Wilk with criteria [9]: (1) If the significance value> 0.05, the data is normally distributed, (2). If the significance value <0.05, the data is not normally distributed.

2.2. Homogeneity Test

The homogeneity test of the pretest and posttest data results used Levene test with the decision criteria of following [9]: (1) If the significance value <0.05 means that the data is not homogeneous, (2) If the significance value> 0.05 means that the data is declared homogeneous.

2.3. Hypothesis Testing

Hypothesis testing using paired sample t test with a significance level of 0.05 with the decision-making criteria as follows [9]: (1) Accept H_o if the probability value (sig.)> 0.05, (2) Reject H_o if the probability value (sig.) <0.05.

Apart from using the SPSS program, hypothesis testing was also calculated manually, with the following criteria: (1) If $t_{count} < t_{table}$, then H_0 is accepted and H_a is rejected, (2) If $t_{count} > t_{table}$, then H_0 is rejected and H_a is accepted.

With the statistical hypothesis made to determine the effect of applying the SSCS model on students' quantitative mathematical reasoning as follows:

H_o : there is no difference in the mean value before and after learning mathematics with the SSCS model

H_a : there is a difference in the average score before and after learning mathematics with the SSCS model

3. RESULTS AND DISCUSSION

3.1. Analysis of Learning Device Validation Results Data

The data analysis of the results of the validation of the learning tools consisted of the validation data of the Learning Device Plan (RPP), Student Worksheets (LKS), and the students' Mathematical Reasoning Test (pretest and posttest). The results of expert validation on learning devices after revision are presented in Table 1.

Table 1. Results of learning tool validation after revision

No	Device	Validation			Average	category
		1	2	3		
1.	RPP	3.31	4.00	4.00	3.77	Very good
2.	LKS	3.09	4.00	3.91	3.67	Very good
3.	Tes	3.43	4.00	4.00	3.81	Very good

Based on scores Table 1, it could be concluded that all learning instrument documents both RPP, LKS, and Tests meet the very good and valid categories which means they can be used for research.

3.2. Analysis of Students' Quantitative Mathematical Reasoning Tests

Before being given the search, solve, create and share (SSCS) model learning, students were given a pretest. The results of the pretest was used to determine the group in learning, in addition to the pretest data, daily test data is also used on the material before the two-variable linear equation system (SPLDV) obtained from the teaching teacher at the school. The pretest and daily test results data were averaged to divide students into heterogeneous groups. Each student was divided into five groups consisting of differences in gender and differences in ability, namely students with high, medium, and low abilities. Learning material Two-variable linear equation system (SPLDV) with the search, solve, create, and share (SSCS) model will be given four times. After learning the SSCS model is complete, students was given posttest consisting of 3 SPLDV description questions. The results of research in class VIII A using the SSCS model of learning obtained the following (Table 2).

Table 2. Results of the Mathematics Pretest and Posttest

		Pretest	Postest
N	Valid	32	32
	Missing	0	0
Mean		52.88	80.56
Median		49.00	81.00
Mode		45	73
Std. Deviation		13.457	7.708
Variance		181.081	59.415
Minimum		28	61
Maximum		75	93
Sum		1692	2578

Table 3 . Normality Test Results

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.147	32	.076	.938	32	.067
Posttest	.096	32	.200*	.966	32	.388

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the output in Table 3, it was known that the sig. value for the pretest of 0.067 and the sig. value for the posttest of 0.388. Thus, it could be concluded that the test result data both pretest and posttest were normally distributed.

Table 4. Homogeneity Test Results

	Levene Statistic	df1	df2	Sig.
Pretest	1.170	1	30	.288
Posttest	.606	1	30	.442

Display equations should be flush left and numbered consecutively, with equation numbers in parentheses and flush right. First, use the equation editor to create the equation. Then, select the equation, and set the "Equation" Style. Press the tab key and type the equation number in parentheses.

Based on the output in Table 4, sig. value of pretest results was 0.288 and posttest was 0.442. Thus, it could be concluded that both the pretest and posttest results are homogeneous.

Based on the results of the normality test and homogeneity test using SPSS stated that both the pretest and posttest results were both normally distributed and homogeneous, the next step was to test the hypothesis using paired sample t test (paired sample t test) (Table 5).

Table 5. Hypothesis Test Results

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pretest - Posttest	-27.688	7.328	1.295	-30.330	-25.045	-21.372	31	.000

Based on the results of calculations using SPSS in the Table 5, tcount for the students' quantitative mathematical reasoning test is -21,372 with a probability (sig.) Of 0,000. Because the probability (sig.) 0.0000 <0.05, H0 was rejected and Ha was accepted, which means that the application of the SSCS learning model improves students' quantitative mathematical reasoning abilities.

The calculation manually uses the following statistics:

$$\bar{X} = 52{,}88$$

$$\bar{Y} = 80{,}56$$
$$S_x{}^2 = 181{,}081$$
$$S_y{}^2 = 59{,}415$$
$$S_x = 13{,}457$$
$$S_y = 7{,}708$$

- Calculating the correlation value (r)

$$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[n(\sum X^2) - (\sum X)^2][n(\sum Y^2) - (\sum Y)^2]}}$$

$$= \frac{32(139207) - (1692)(2578)}{\sqrt{[32(95078) - (1692)^2][32(209532) - (2578)^2]}}$$

$$= \frac{4454624 - 4361976}{\sqrt{[3042496 - 2862864][6705024 - 6646084]}}$$

$$= \frac{92648}{\sqrt{[179632][58940]}} = \frac{92648}{\sqrt{10587510080}}$$
$$= \frac{92648}{102895{,}6271}$$

$$= 0{,}900$$

- Calculating the value t_{cc}

$$t_{hitung} = \frac{\bar{X} - \bar{Y}}{\sqrt{\frac{S_x{}^2}{n_x} + \frac{S_y{}^2}{n_y} - 2r\left(\frac{S_x}{\sqrt{n_x}}\right)\left(\frac{S_y}{\sqrt{n_y}}\right)}}$$

$$= \frac{52{,}88 - 80{,}56}{\sqrt{\frac{181{,}081}{32} + \frac{59{,}415}{32} - 2(0{,}900)\left(\frac{13{,}457}{\sqrt{32}}\right)\left(\frac{7{,}708}{\sqrt{32}}\right)}}$$

$$= \frac{-27{,}68}{\sqrt{5{,}659 + 1{,}857 - (1{,}800)(2{,}379)(1{,}363)}}$$

$$= \frac{-27{,}68}{\sqrt{7{,}516 - 5{,}837}} = \frac{-27{,}68}{\sqrt{1{,}679}} = \frac{-27{,}68}{1{,}296}$$

$$= 21{,}358$$

- Calculating the value t_{tabel}

$$db = n - 1 = 32 - 1$$

$$db = 31$$

$$t_{\left(\frac{\alpha}{2};db\right)} = t_{\left(\frac{0.05}{2};31\right)} = 2{,}03951$$

Because tcount = 21.358 > ttable then H0 was rejected, and Ha was accepted, which means that there was difference in the average value of students' quantitative mathematical reasoning before and after giving treatment in the form of learning mathematics models search, solve, create, and share (SSCS).

In mathematical quantitative reasoning, there are six indicators, but in this study only four indicators were assessed including: (1) Reading and understanding information, (2) Interpreting quantitative information and drawing conclusions, (3) Solving problems, and (4) Inform quantitative information. The percentage of the pretest and posttest mathematical reasoning indicators from 32 students is presented in Table 6.

Table 6. Percentage of Quantitative Reasoning Indicators

Problem Number	Assessed Quantitative Reasoning Indicators							
	Pretest				*Posttest*			
1	8 %	6 %	7 %	7 %	7 %	00 %	1%	4 %
2	4 %	5 %	0 %	6 %	5 %	00 %	0 %	8 %
3	5 %	8 %	9 %	0 %	3 %	4 %	4 %	8 %
Average	59 %	66 %	45 %	44 %	85 %	91 %	75 %	73 %

Indicator Description:

1 = Read and understand information

2 = Interpret quantitative information and draw conclusions

3 = Troubleshoot

4 = Informing quantitative information

The average percentage score of each indicator per item after being given the search, solve, create and share (SSCS) model learning had increased. Reading and understanding information increased by 26%, interpreting quantitative information and drawing conclusions by 25%, solving problems by 30%, and informing quantitative information by 29%.

To determine student learning completeness, the data used was posttest results. Students were said to complete program if the posttest score reached minimum completeness criteria (KKM), of at least 71. Of the 32 students of class VIIIA, 29 students had completed and 3 students had not completed. Classical learning completeness was calculated as follows:

$$KK = \frac{\sum S \geq 71}{N} \times 100\%$$

$$= \frac{29}{32} \times 100\%$$

$$= 91\%$$

Thus, students' mastery of classical learning was 91%. Classical learning completeness data was said to be completed if minimum of 85% of students able to achieve the minimum KKM score. Based on the results of the calculations above, the class VIIIA students were classically declared complete in the material of the two-variable linear equation system (SPLDV) by learning to search, solve, create, and share (SSCS). The pretest and posttest data analysis are presented in Table 7.

Table 7. Pretest and Posttest of Quantitative Reasoning Ability Tests

		Pretest	Postest
N	Valid	32	32
	Missing	0	0
Mean		52.88	80.56
Median		49.00	81.00
Mode		45	73
Std. Deviation		13.457	7.708
Variance		181.081	59.415
Minimum		28	61
Maximum		75	93
Sum		1692	2578

Based on both pretest and posttest, all students took quantitative reasoning test. At the pretest the lowest score was 28 and the highest score was 75, while in the postest the lowest score was 61 and the highest score was 93. Students with strong quantitative reasoning in solving math problems were more focused and thorough than students with low quantitative reasoning.

4. CONCLUSION

Figures From the results of the research and discussion above, it could be concluded that the SSCS model learning could improve students' quantitative mathematical reasoning, from 32 students of class VIIIA SMPN 1 Laren, at the pretest the lowest score was 28 and the highest score was 61, while after learning the SSCS model the lowest posttest score was equal to 75 and the highest score is 93.Based on statistical test, significant difference was found in the average value of students' quantitative mathematical reasoning scores before and after learning the SSCS model. Of the 32 students, 29 students were able to complete mathematics learning material on the two-variable linear equation system (SPLDV), and 91% completed classically. In mathematical quantitative reasoning, there are six indicators, but in this study four indicators are assessed, namely: (1) Reading and understanding information increased by 26%, (2) Interpreting quantitative information and drawing conclusions increased by 25%, (3) Solving problems increased 30%, and (4) Informing quantitative information increased by 29%. From the results of this study, it was hoped that the Search, solve, create, and share (SSCS) learning model can be used and developed in mathematics learning.

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