The Effect of SSCS Learning Model on Reflective Thinking Skills and Problem Solving Ability

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Abstract: This study aims to determine the effect of the application of the Search, Solve, Create, and Share (SSCS) learning model to the mathematical reflective thinking skills and the students' mathematical problem-solving abilities. This research is a type of Quasi-Experimental Design research with a 2x2 factorial research design. Data collection techniques in this study in the form of documentation and tests at Private school in Bandar Lampung with 28 students of experiment classes and 28 students of control classes. Data analysis techniques used are the normality test and homogeneity test. Testing the hypothesis in this study using the Multivariate Analysis of Variance (MANOVA) test. Based on the results of the study, The calculation of the MANOVA test, it was concluded that there was an influence on the application of the SSCS learning model to students' mathematical reflective thinking skills. The application of the SSCS learning model to the mathematical reflective thinking ability has an influence percentage of 91.9%. The application of the SSCS learning model to mathematical reflective thinking skills and mathematical problem solving abilities has a relatively high level of effectiveness.

Keywords: *SSCS learning model, mathematical reflective thinking ability, mathematical problem solving ability.*

Introduction

Mathematical reflective thinking ability makes it easier for students to deal with and solve problems in mathematics (Fuady, 2017). Reflective thinking in the process of learning mathematics can support students in choosing a design settlement and can facilitate students in concluding the problem correctly (Betne, 2019). The ability of reflective thinking is related to the ability to review, and monitor the process of finding solutions when solving problems (Putri & Mampouw, 2018; Bard, 2016).

Students need to develop reflective thinking skills in the learning process because good mathematical reflective thinking skills will be proportional to their problem-solving abilities (Nuriana et al., 2018). Reflection in mathematics can hone students' problem-solving skills systematically and conceptually (Tisngati, 2015).

Problem-solving abilities are useful in developing the potential of knowledge and skills in solving students' problems that will later be faced in the educational environment or in the community (Zahroh et al., 2018). Through problem-solving abilities, students are expected to find mathematical concepts learned and understand the use of these concepts in solving problems (Aristianti et al., 2018; Ilyyana & Rochmad, 2018). Problem solving abilities enable students to solve everyday problems, learn about rational science, be skilled in applying mathematics and have confidence in solving mathematical problems (Mufida et al., 2018). The conclusion is that reflective thinking ability and problem-

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solving in mathematics learning need to be mastered and honed to support the learning process of students (Abdurrahman et al., 2019).

Educators as one of the important components in a learning process need to improve their quality of learning in class. Accuracy in the selection of learning models plays an important role in efforts to improve the reflective thinking abilities and problem-solving abilities of students (Yasin et al., 2020). The cooperative learning model that can be used as an alternative to improve reflective thinking skills and students' problem-solving abilities is the SSCS learning model (Diani et al., 2019).

This SSCS learning model refers to the four steps of problem-solving in which the sequence starts in investigating the problem (search), planning problem-solving (solve), constructing problem-solving (create), and the last is communicating the solution obtained (share). Several studies of the SSCS learning model have been conducted previously by several researchers and obtained the results that the SSCS model is effective for improving mathematical disposition abilities, conceptual mathematical understanding (Rakhmi et al., 2018), mathematical reasoning abilities (Eka & Martin, 2018), learning achievement (Raehanah et al., 2016), and the mathematical critical thinking ability of students (Milama et al., 2017).

Based on these results, researchers are interested in conducting research with the aim of seeing the effect of the SSCS learning model on mathematical reflective thinking abilities (Habibi et al., 2019) and students' mathematical problem-solving abilities. The study aims in this research in an effort to improve the reflective thinking and problem-solving abilities of students intentionally uses the SSCS learning model in the experimental class for the renewal of previous research. SSCS learning models have researched a lot, but have never been applied to the ability of reflective thinking and problem-solving abilities of students.

Methodology

Research Design

This type of research used in this study is quasi-experimental (Quasi-experimental Design), which in this study consisted of two classes, namely the experimental class and the control class. The study will use the SSCS learning model in the experimental class and conventional learning model in the control class. The research design that will be used is Posttest-Pretest Control Group Design. The following is the research design:
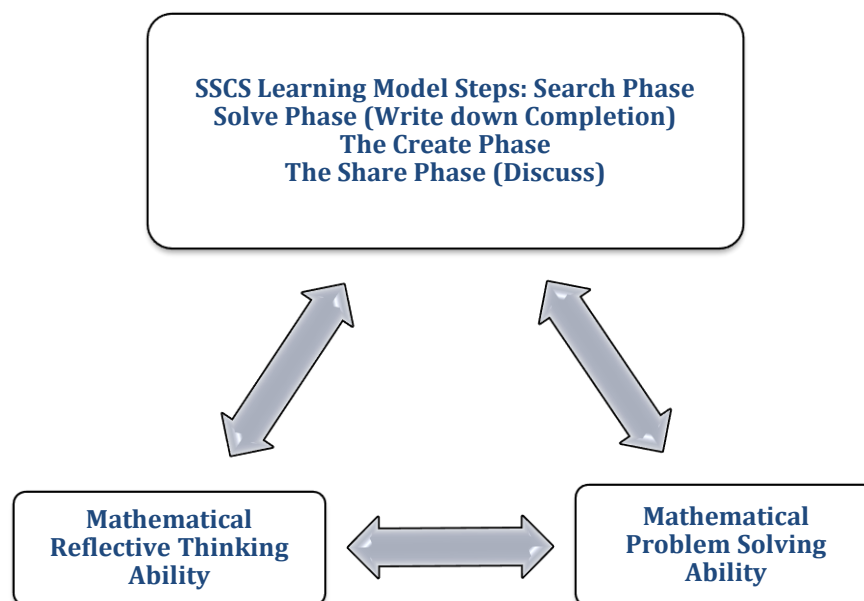

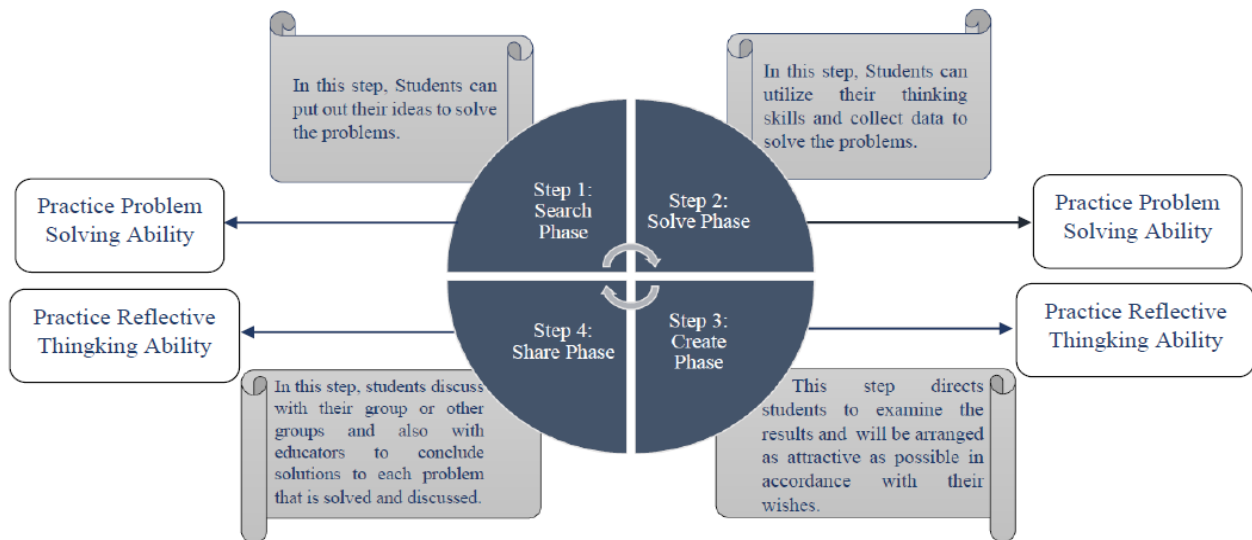*Figure 1. Experimental Research Design*

Figure 2. SSCS Learning Model Steps

Based on Figure 1, this study aimsto determine the effect of applying the SSCS learning model to students 'mathematical reflective thinking abilities and students' mathematical problem solving abilities (Hartati et al., 2019). Based on Figure 2, the SSCS learning model have 4 steps, namely the Search phase, the Solve phase (writing down completion), the Create phase, (creating completion) and the Share phase (discussing). Through each step in the SSCS learning model it is expected to be able to practice mathematical reflective thinking abilities and mathematical problem solving abilities. Seach Phase and Solve Phase will be used to practice mathematical problem solving abilities, then Create Phase and Share Phase will be used to practice mathematical reflective thinking abilities.

The ability to think reflective mathematically is influenced by students' self-confidence, because students who have a high level of self-confidence can form beliefs in themselves about the ability to never give up in facing the given problems. In addition, the relationship between mathematical abilities and one's attitude in dealing with problems is also influenced by learning factors that require students to be active in thinking and interacting, so as to improve mathematical abilities that are expected learning objectives.

Participants

Data collection techniques in this study in the form of documentation and tests at Private school in Bandar Lampung with 28 student of experiment classes and 28 students of control classes.

Data Collection

Data collection techniques in this study used documentation and test techniques. The research instrument used the mathematical reflective thinking ability test instrument and the mathematical problem solving ability test instrument. Before testing the hypothesis, the prerequisite test is performed on the results of the mathematical reflective thinking ability and the mathematical problem solving ability of the students in eachtreatmentclass.

Data Analysis

The prerequisite tests used were Kolmogorov Smirnov normality test and homogeneity test with a significance level of 5%. If the test results are normally distributed and come from the same or homogeneous variance regions, then the Statistical Hypothesis Testing can be continued using the Multivariate Analysis of Variance (MANOVA) test. Effectiveness test (Effect Size) in this study uses the formula Effect Size Cohen's d (Hake, 2002):

$$d = \frac{M_A - M_B}{SD_{Polled}}$$

$$SD_{Polled} = \sqrt{\frac{SD_A^2 + SD_B^2}{2}}$$

Information:

d: Effect Size

M_A: Average N-Gain for Experiment Class

M_B: Average N-Gain Comparison Class

SD_{Polled}: Polled standard deviation

SD_A: Experiment Class standard deviation

SD_B: Control class deviation standard

The interpretation table for Effect Size values can be seen in Table 1 below:

Table 1.Interpretation of Effect Size

Cohen, s Standard	Effect Size	Percentage (%)
High	$0.8 ≤ d < 2.1$	$79.0 ≤ d < 98$
Normally	$0.5 ≤ d < 0.8$	$69.0 ≤ d < 79.0$
Low	$0 ≤ d < 0.5$	$50.0 ≤ d < 69.0$

Based on Table 1, it can be seen that the interpretation of the Effect Size values are of three categories, namely low, medium and high Effect Size. The category of low Effect Size starts from 0-0.4 with a percentage of 50% -66%, then the Effect Size is starting from 0.5-0.7 with a percentage of 69% -76% and a high Effect Size is valued from 0.8-2 with a percentage of 79% -97.7%.

Findings / Results

The results in this study came from tests of reflective thinking ability and problem solving abilities of students who have been tested in the experimental class (the class applying the SSCS learning model) and the control class (The class applying the conventional learning model). The following is a description of the results of the reflective thinking ability test data and problem solving abilities that have been obtained:

Table 2. Data Description of Mathematical Reflective Thinking Ability Test Results

Value	X_{max}	X_{min}	Central Tendency Size			Size of Group Variance		
			$\overline{X}$	M_e	M_o	R	S	S^2
Experiment Class								
Pre-Test	60,52	21,05	33,64	31,57	23,68	39,47	11,06	122,27
Post-Test	100	73,68	85,9	84,21	81,57	26,32	7,17	51,42
Control class								
Pre-Test	57,89	18,42	30,16	26,31	21,05	39,47	10,63	113,08
Post-Test	86,84	63,15	75,46	76,31	76,31	23,69	6,36	40,56

Based on Table 2, it can be seen that the experimental class applying the SSCS learning model has better pre-test reflective thinking abilities than the control class. This can be seen from the average value ($\overline{X}$) amounted to 33.64, the mode value (M_o) amounted to 23.68 and has a range of 39.47. It will produce a large enough variance value of 122.27.

Based on Table 2, it can be seen that the experimental class applying the SSCS learning model has a better post-test reflective thinking ability than the control class. This can be seen from the average value ($\overline{X}$) of 85.9, the value that often appears (M_o) ie 81.57 and has a variance value of 51.42. It will produce a large enough range of 26.32 when compared to the range in the control class. These results indicate that the difference between the highest and lowest values in the SSCS learning model is quite high. The conclusion is that in applying the SSCS learning model there are still students who have low reflective thinking skills.

Table 3. Description of Test Data for Mathematical Problem Solving Ability

Value	X_{max}	X_{min}	Central Tendency Size			Size of Group Variance		
			$\overline{X}$	M_e	M_o	R	S	S^2
Experiment Class								
Pre-Test	56,25	21,87	33,66	34,75	21,87	34,38	10,2	104,04
Post-Test	100	72	85,82	84,37	81,25	28	7,59	57,57
Control class								
Pre-Test	50	18,75	30,02	28,12	21,87	31,25	9,14	83,45
Post-Test	87,5	59,37	73,66	73,5	68,75	28,13	7,57	57,27

Based on Table 3, it can be seen that the experimental class applying the SSCS learning model has better pre-test results of problem solving skills than the control class. This can be seen from the average value ($\overline{X}$) amounted to 33.66, the value that often appears (M_o) which is 21.87, but produces a large variance value of 104.04 and the largest range is 34.38. The conclusion is that the experimental class pre-test results look quite good when compared with the results of the control class pre-test.

Based on Table 3, it can be seen that the experimental class applying the SSCS learning model has better post-test results of problem solving skills than the control class. This can be seen from the average value ($\overline{X}$) of 85.82, the mode value (M_o) amounted to 81.25 and produced a large enough variance value of 57.57. The result of the range in the experimental class is quite low at 28. These results indicate that the difference between the highest and lowest value in the experimental class is low.

After obtaining the test data for reflective thinking ability and problem solving ability in the experimental class and the control class (Yasin et al., 2019), then the results of the pre-test and post-test in the experimental class will be searched for the N-Gain value by finding the difference between the post-test and pre-test values later divided the maximum score in the pre-test score less. N-Gain is used to see an increase between the results of the post-test scores with the pre-test scores of reflective thinking abilities and students' problem solving abilities (Hartinah et al., 2019). The following is a description of the data on the results of N-Gain's reflective thinking abilities and problem solving abilities that have been obtained:

Table 4. Description of N-Gain Data Mathematical Reflective Thinking Ability

Category	X_{max}	X_{min}	Central Tendency Size			Size of Group Variance		
			$\overline{X}$	M_e	M_o	R	S	S^2
Experiment Class	100	59,99	79,4	78,55	77,78	40,01	11,48	131,84
Control Class	80,77	42,86	64,37	65,47	66,66	44,91	9,45	89,37

Based on Table 4, it can be seen that the experimental class class that applies the SSCS learning model has an n-gain value of reflective thinking ability that is better than the control class. This can be seen from the average value ($\overline{X}$) equal to 79.4, the mode value (M_o) amounted to 77.78 and the range of 40.01. However, the experimental class produced a large variance value of 131.84. The conclusion is that the application of the SSCS learning model in the experimental class has better n-gain compared to the n-gain control class.

Table 5. Description of N-Gain Data Mathematical Problem Solving Ability

Category	X_{max}	X_{min}	Central Tendency Size			Size of Group Variance		
			$\overline{X}$	M_e	M_o	R	S	S^2
Experiment Class	100	50,22	77,69	75	92	40,78	12,49	156
Control Class	80,76	34,99	61,89	63,9	52	45,77	11,65	135,72

Based on Table 5, it can be seen that the experimental classes applying the SSCS learning model have better n-gain problem solving abilities than the control class. This can be seen from the average value ($\overline{X}$) amounted to 77.69, the mode value (M_o) amounted to 92, the range value was 40.78 and produced a considerable variance value of 156. The conclusion was that the application of the SSCS learning model in the experimental class had better n-gain compared to the n-gain of the control class. After data from each variable is collected, it will then be used to test the research hypothesis (Irwandani et al., 2019).

After the n-gain research data is obtained, then the n-gain data obtained will be analyzed. Data analysis is a method used to strengthen the results of testing hypotheses or final conclusions in research (Umam & Sommanawat, 2019). The

n-gain data from the experimental class will be analyzed using Data Normality Test, Homogeneity Test, and Hypothesis Test. If the analyzed data are normally distributed, then the parametric statistical techniques can be used, whereas if the analyzed data are not normally distributed, then non-parametric statistical techniques can be used (Casella & Berger, 2002).

The first step will be to analyze the data in the form of the Kolmogorov Smirnov normality test on the results of n-gain reflective thinking abilities and students' problem solving abilities. The decision of the test in the Kolmogorov Smirnov normality test is when the value $p - value > a = 0,05$, then the data is normally distributed. Here are the results of the n-gain normality test calculation of reflective thinking ability and problem solving ability:

Table 6. N-Gain Normality Test Results Mathematical Reflective Thinking Ability

Category	$p - $ Value	$a = 0,05$	Decision
Experiment Class	0,200	0,05	Normal Distributed
Control Class	0,200	0,05	Normal Distributed

Based on Table 6, the results of the normality-gain test calculation on the participant's reflective thinking ability were assessed at a significance level $a = 0,05$ produce value $p - Value > a = 0,05$. The conclusion is that the data obtained from the experimental class and the control class come from populations that are normally distributed.

Table 7. N-Gain Normality Test Results Mathematical Problem Solving Ability

Category	$p - $ value	$a = 0,05$	Decision
Experiment Class	0,200	0,05	Normal Distributed
Control Class	0,200	0,05	Normal Distributed

Based on Table 7, the results of the N-gain normality test calculations on the problem solving ability of students at a significance level $a = 0,05$ produce value $p - Value > a = 0,05$. The conclusion is that the data obtained from the experimental class and the control class come from populations that are normally distributed.

The next step will be to analyze the data in the form of homogeneity tests of reflective thinking ability and students' problem solving abilities in the three experimental classes. Here are the results of n-gain homogeneity calculation on reflective thinking ability and problem solving ability.

Table 8. Results of the Homogeneity Test of N-Gain Mathematical Reflective Thinking Ability and Mathematical ProblemSolving

Statistics	N-Gain Reflective Thinking	N-Gain Troubleshooting
p- value	0,261	0,714
Homogeneity	p-Value>0,05	
Conclusion	Homogeneous	

Based on Table 8, the N-gain data on mathematical reflective thinking ability and mathematical problem-solving are said to be homogeneous because they fit the criteria in which $p - Value > \alpha = 0,05$. The data in this study are known to come from normal distribution populations and the same (homogeneous) population variance, then hypothesis testing will proceed.

Hypothesis testing in this study uses a parametric test that is the Multivariate Analysis of Variance (MANOVA) test. The first test conducted is the test of influence between subjects / variables (Test of Between-Subjects Effects). The results of the test of influence between subjects / variables (Test of Between-Subjects Effects) can be seen in the following table:

Table 9. Test of Between-Subjects Effects

The MANOVA Hypothesis	Ability	$p - Value$	Decision
Search, Solve, Create, and Share (SSCS) Learning Models	Reflective thinking	0,000	H_0 rejected
	Solution to problem	0,000	H_0 rejected

Based on Table 9, it can be seen that in the learning model row towards the mathematical reflective thinking ability, values are obtained $p - Value$ i.e. 0,000 with a significance number used is 0.05. This shows that $p - Value < 0,05$, so

H_0 rejected and H_1 accepted. The conclusion is that there is an effect of the application of the SSCS learning model to the ability of mathematical reflective thinking.

The interpretation in the learning model line towards the mathematical problem-solving ability is obtained value $p - Value$ i.e. 0,000with a significance number used is 0.05. This shows that $p - Value < 0,05$, so H_0 rejected and H_1 be accepted. The conclusion is that there is an effect of the application of the SSCS learning model to the ability to solve mathematical problems.

Next, a Multivariate test will be conducted to see the effect of the learning model on mathematical reflective thinking abilities and the ability to solve mathematical problems simultaneously (silmultan). The results of the Multivariate test can be seen in the following table:

Table 10. Multivariate Test

The MANOVA Hypothesis		$p - Value$	Decision
Search, Solve, Create, and Share (SSCS) Learning Models	Wilks' Lambda	0,000	H_0 rejected

Based on Table 10, it can be seen that the results of the analysis of the Wilks' Lambda Test in the learning model line of the mathematical reflective thinking ability and mathematical problem solving ability are obtained $p - Value$ i.e. 0,000 with a significance number used is 0.05. This shows $p - Value < 0,05$, so H_0 rejected and H_1 accepted. The conclusion is that there is an effect of the application of the SSCS learning model to the ability of mathematical reflective thinking and mathematical problem-solving abilities (Sumarni et al., 2019).

Then the effectiveness test (effect size) will be done using the effect size formula (Hake, 2002). Effectiveness test (effect size) aims to see the level of effectiveness of the application of learning models in all three classes of experiments on the ability of reflective thinking and problem solving abilities of students. The following table is the effectiveness test calculation (effect size) of SSCS learning models on reflective thinking skills and problem solving abilities of participants students:

Table 11. Effectiveness Test Results (Effect Size)

Ability Class		Effect Size	Category	Percentage
Search, Solve, Create, and Share (SSCS) Learning Models	Reflective thinking	1,43	High	91,9 %
	Solution to problem	1,31	High	90 %

Based on Table 11, the results of the calculation of the effectiveness test (effect size) show that the application of the SSCS learning model to students' mathematical reflective thinking abilities obtained an Effect Size value of 1.43 (high category) and has a percentage of 91.9%. Then the application of the SSCS learning model to the mathematical problem solving ability obtained an Effect Size value of 1.31 and has a percentage of 90%. Based on the results of the effectiveness test (effect size), it can be concluded that the application of the SSCS learning model to the mathematical reflective thinking ability and the ability to solve mathematical problems have a high level of effectiveness (Sriyakul et al., 2019).

Discussion

The results obtained by researchers have a relationship with the results of previous studies conducted by Schiwi Hikmatuz Zahroh, et.al, the results obtained that the SSCS learning model has an influence on problem-solving skills with a strong level of effectiveness, but the improvement of solving skills is still relatively low (Zahroh et al., 2018). Further research by Sri Retnosari and Detik Agustin, the results obtained that learning using the SSCS learning model can hone and improve the ability of mathematical disposition and student achievement (Retnowati & Agustin, 2018). Then research by Eka Senjayawati & Martin Bernard, the results obtained that learning using the SSCS learning model can improve students' mathematical reasoning abilities (Senjayawati & Bernard, 2018).

Based on research results obtained by researchers, the application of the SSCS learning model in the experimental class has a better influence on the ability of reflective thinking and problem-solving abilities of students compared to the control class applying conventional learning models (Latifah et al., 2019). This can occur because the SSCS learning model has different characteristics from conventional learning models, one of which is derived from the steps of the learning model (Munifah et al., 2019a). Learning models (SSCS and conventional learning models have different learning model steps.

The learning process in the Search, Solve, Create, and Share (SSCS) learning model begins with a pretest to see the students' initial abilities. Referring to the results of the pretest that has been obtained, there are still many students who have not mastered the ability of mathematical reflective thinking and mathematical problem-solving abilities. This can be seen from the low value of each indicator of mathematical reflective thinking ability and indicators of

mathematical problem-solving ability. Four indicators of reflective thinking ability that include describing, identifying, evaluating, and drawing conclusions are in fact there are still many students who have not mastered it. The value of each indicator of reflective thinking ability is still relatively low and is still below average. Four indicators of the problem-solving ability include understanding problems, planning solutions, implementing plans, and checking again, apparently there are still many students who have not mastered these indicators. The value of each indicator of problem-solving ability is still relatively low and still below average. Through the Search, Solve, Create, and Share (SSCS) learning model, students will be trained to master mathematical reflective thinking skills and mathematical problem-solving abilities.

The first step in the SSCS learning model is the search step. During this search step, students can put out their ideas in a list of what is known and what is asked in the matter of LKPD. This search step can train indicators of mathematical problem-solving abilities, namely understanding problems and planning solutions. The second step of the SSCS learning model is solving (Solve), in this step students can express their creative ideas, utilize their thinking skills (Munifah et al., 2019b) and collect data to solve the problems they face. This solving step can train indicators of mathematical problem-solving abilities, namely implementing plans and checking again. The third step of the SSCS learning model is the step of formulating a solution (Create), this step directs students to examine the possibilities that have been mentioned whether wrong or right (Pahrudin et al., 2019). The results that have been done will be arranged as attractive as possible in accordance with the wishes of the students. Steps to formulate a solution (Create) can train indicators of mathematical reflective thinking ability, namely describing and identifying. The final step of the SSCS learning model is the step of discussing (Share), in this step the researcher directs students to discuss with their group colleagues or other groups and also with educators to conclude solutions to each problem that is solved and discussed (Purnama et al., 2019). Submitting the results of the discussion in the SSCS learning model can be in the form of reports of results, media (Ramadhani et al., 2019), and others. Steps discuss (Share) can train indicators of mathematical reflective thinking ability that is evaluating and drawing conclusions.

Based on the description of the steps SSCS learning model and conventional learning models, it can be seen that each learning model has its own characteristics and strengths. However, the steps in the SSCS learning model are more effective in improving reflective thinking skills and students' problem-solving abilities compared to conventional learning model steps (Sagala et al., 2019). The application of the SSCS learning model also makes students more focused in the group discussion process, this is because the stages of group discussion in the learning model are very structured, starting from the search stage, the solving stage, the stage of formulating completion and the discussion stage. When students can follow all the stages well, the students will be able to understand and solve each mathematical problem well.

Conclusion

Based on the results of analysis and the discussion in this study, it can be concluded that there is an effect of the application of the Search, Solve, Create, and Share (SSCS) learning model on students' mathematical reflective thinking abilities. There is an effect of the application of the SSCS learning model to the students 'mathematical problem solving ability. There is an influence of the application of the SSCS learning model to the mathematical reflective thinking ability and the students' mathematical problem solving ability. The application of the SSCS learning model to the mathematical reflective thinking ability and the ability to solve mathematical problems have a high level of effectiveness.

Suggestion

The researcher expects the next researcher who wants to measure the ability of reflective thinking and problem solving abilities of students, should choose another learning model that is more effective than the learning model that has been studied by researchers. It aims to see the level of effectiveness of other learning models towards increasing reflective thinking abilities and students' problem solving abilities.

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