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Research Article

Search, Solve, Create, and Share (SSCS) Learning Model: The Impact on the Students' Creative Problem-Solving Ability on the Concept of Substance Pressure

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Abstract

This study aimed to determine the effectiveness of the Search, Solve, Create, and Share (SSCS) learning model and its impact on the students' creative problem-solving ability. The study was conducted on eighth-grade students of Junior High School 24 (SMPN 24) Bandar Lampung, Indonesia, on the Substances Pressure subject matter. This is quasi-experimental with non-equivalent control group design. The independent sample t-test showed that the SSCS model influences the students' creative problem-solving ability, of which the experimental class is higher than the control class. Furthermore, the results of the effect size obtained the d value of 2.39, indicating the SSCS learning model is effective for the students' creative problem-solving ability which belongs to the high category.

Keywords: *SSCS learning model, creative problem-solving ability, the concept of substance pressure*

Model Pembelajaran *Search, Solve, Create, and Share (SSCS)*: Pengaruh Kemampuan Kreatifitas Pemecahan Masalah Siswa pada Konsep Tekanan Zat

Abstrak

Penelitian ini bertujuan untuk mengetahui efektivitas model pembelajaran Search, Solve, Create, and Share (SSCS), dampaknya terhadap kemampuan creative problem solving peserta didik. Penelitian dilakukan terhadap peserta didik kelas VIII SMP N 24 Bandar Lampung pada materi tekanan zat. Jenis penelitian adalah kuasi eksperimen dengan desain none equivalent control group design. Uji independent sample t-test menunjukkan bahwa model SSCS berpengaruh terhadap kemampuan creative problem solving peserta didik. Kemampuan creative problem solving peserta didik kelas eksperimen lebih tinggi dibandingkan kelas kontrol. Selanjutnya, hasil effect size diperoleh nilai d sebesar 2,39. Hasil ini menunjukkan bahwa model pembelajaran SSCS efektif terhadap kemampuan creative problem solving peserta didik, dengan kategori tinggi.

Kata Kunci: *model pembelajaran SSCS, kemampuan creative problem solving, konsep tekanan zat*

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I. INTRODUCTION

The advancement of the world nowadays gives impacts on the policies in science education [1]. Therefore, forming student's literacy towards science is a priority for most developed and developing countries including Indonesia as science education plays important role in the sustainability of education [2]. In junior high school education in Indonesia, science is one of the subjects that must be given, known as Integrated Science. Integrated science learning in Indonesia's secondary education system includes a combination of biology, physics, and chemistry [3-5].

Physics is a part of science in which it describes both physical and theoretical phenomena [6, 7] and explains why these phenomena occur [8]. Moreover, physics does not only study the knowledge, facts, concepts, or principles, but it also emphasizes the discovery process [9].

The discovery process in Physics learning enables the students to gain a good understanding of various abilities to recognize and solve problems and to possess a scientific attitude [10]. Through Physics learning, students will discover various phenomena that contain problems that need to be solved [11]. Furthermore, through Physics learning, students are expected to use and implement the concept of science that has been studied [12], for example in problem-solving of which thinking skills are needed. Thinking ability requires training to be able to have it, integrated with other abilities [4]. Physics learning can be a place to foster students' thinking abilities [13, 14]. In general, the problem is divided into three levels, namely simple problem, complicated problem and complex problem [15]. A problem is categorized as a simple problem if it only contains a few elements that are relatively easy to solve. Complicated problems are almost the same as simple problems, but it requires comparison of involved elements, which are likely interrelated [16]. A problem is said to be complex if it cannot be solved based on a routine problem-solving process; it requires certain strategy to create new relationships with various related concepts [15]. So that solving complex problems requires creativity, a thought process called creative problem-solving.

Creative problem-solving is a process, method, or system to approach problems imaginatively and produce effective actions [17]. Creative Problem-Solving (CPS) is the ability that emphasizes various alternative ideas and to look for various possible actions at each step of the problem-solving process [16]. Creative problem-solving abilities contain some aspects that can facilitate the achievement of problem-solving goals [18].

Some aspects of the creative problem-solving abilities consist of six indicators as follows:

1) Objective finding, identifying the situations that present challenges, opportunities, or problems about something you want to do or related to

the expected goals.

2) Fact-finding, recording all key facts related to the desired situation or goal. The aim is to have all the knowledge related to the situation so that the key issues can be identified and determined.
3) Problem finding, identifying the collected data related to the situation in the form of facts, then determining what issues are to be achieved in more specific terms, turning the problems into a resolvable forms or cases.
4) Idea finding, trying to answer a statement about the subject matter with a variety of different solutions or ideas.
5) Solution finding, choosing the best solution after evaluating a list of ideas which are in accordance with the standard or certain criteria or parameters.
6) Acceptance finding, developing action plans from the best ideas or solutions and considering plans that support the answers [17].

Some aspects of the creative of creative problem-solving in Physics learning are used to find ideas as the best and optimum problem-solving solutions. The creative aspects of creative problem-solving focus on facing new challenges as opportunities in dealing with unknown or ambiguous situations and managing productive tensions caused by the gap between goals and reality [19].

To develop students' creative problem-solving ability, educators play a role in regulating physics learning activities. So that educators should develop learning designs using appropriate models, strategies, and media which are able to develop and accommodate students' creative problem-solving ability.

The ideal science learning process is using an experimental method so that the pattern of students' interactions and materials is formed in the form of direct experience [20]. For this reason, a learning model that utilizes experimental methods is needed to help the students to understand the nature of actual Physics concepts.

The pre-research was conducted by researchers at Junior High School 24 Bandar Lampung (public secondary school) in Indonesia and found various problems in Physics learning. Based on observations of the learning process conducted in the classroom, the involvement of students in the problem discovery process was considered still low. Learning model applied in the classroom was direct learning models as it is found in the conventional learning model.

The problem that arises when direct learning is applied is that the learning process becomes one-way communication so that the students only master the learning materials as limited as the ones presented by the teacher [21]. As the consequence, students' creative ability in solving problems are low, having not been optimally explored due to ineffective instructional strategies applied in the classroom.

An alternative that can be done to overcome the students' low creative ability to solve problems is to choose an effective learning model which exposes students with prompts or critical questions that may encourage the students actively involved in solving problem, especially the complex problem ones, to hone their ability in creative problem-solving ability, more specifically in the area of Physics learning.

One learning model that can be used is Search, Solve, Create, and Share (SSCS) learning model. This model was first introduced by Pizzini [22]. SSCS learning model is one of the learning models that utilize problem-solving approaches [23, 24]. There are four learning stages of the SSCS model, namely the searching, solving, creating, and sharing [25].

In searching stage, students are encouraged to have brainstorm in order to identify and formulate research questions or problems in given issues in science. In solving stage, the students are led to produce and implement certain plans in relation to the solutions they propose. Furthermore, in the creating stage, the students are encouraged to create a product, in the form of a solution, to the given problem based on the allegations that have been chosen in the soling stage. At the end, sharing session, students are provided opportunity to communicate and deliver their ideas to the teacher and peers in their own groups and other groups for the findings and solutions to the problems they have [26]. This SSCS model has the advantage of being able to provide opportunities for the students to practice and hone problem-solving abilities [22].

Based on the results of previous studies related to the implementation of SSCS learning model, it is found that the SSCS learning model has positive impact on learning activities. Learning activities utilizing the SSCS model on problem-solving applied to the experimental class may significantly improve the concept mastery of the students compared to the control class [23]. Furthermore, SSCS model influences students' learning outcomes [27] and students' creative thinking abilities [5]. Based on the previous relevant studies, there is not research focusing on the implementation of SSCS model on students' creative problem-solving ability. The previous research related to creative problem-solving ability shows that the achievement and improvement of mathematical creative problem-solving abilities of students who learn through Challenge Based Learning (CBL) approach are better than students who learn with a scientific approach [28]. The students' mathematical creative problem-solving ability through Situation Based Learning (SBL) model also increases by an average of 0.29. It is better than using conventional learning with the average of 0.14 for a range of 0-1 [29].

The difference between this study and previous research is that the application of the SSCS model as an independent variable which is believed to be effective on the students' creative problem-solving ability on Physics learning, especially on Substances Pressure subject matter. Based on the rationale elaborated above, the researchers consider it is important to carry out this research to examine the effectiveness of SSCS learning model.

II. METHOD

This is a quantitative research through experimental method in the form of quasi-experimental with non-equivalent control group design. The populations of this study were all eighth-grade students of public junior high school in Bandar Lampung consisting of 232 students. The sample consisted of two classes chosen through purposive sampling technique, namely sampling with special considerations so that they are eligible to be research sample [30]. The research flowchart is presented in Figure 1.

Data were collected through tests and observations. Test instruments were in the form 10 essay questions that had been adjusted with the indicators of creative problem-solving. These questions were used to determine the students' creative problem-solving abilities. The examples of the questions used are presented in Figure 2.

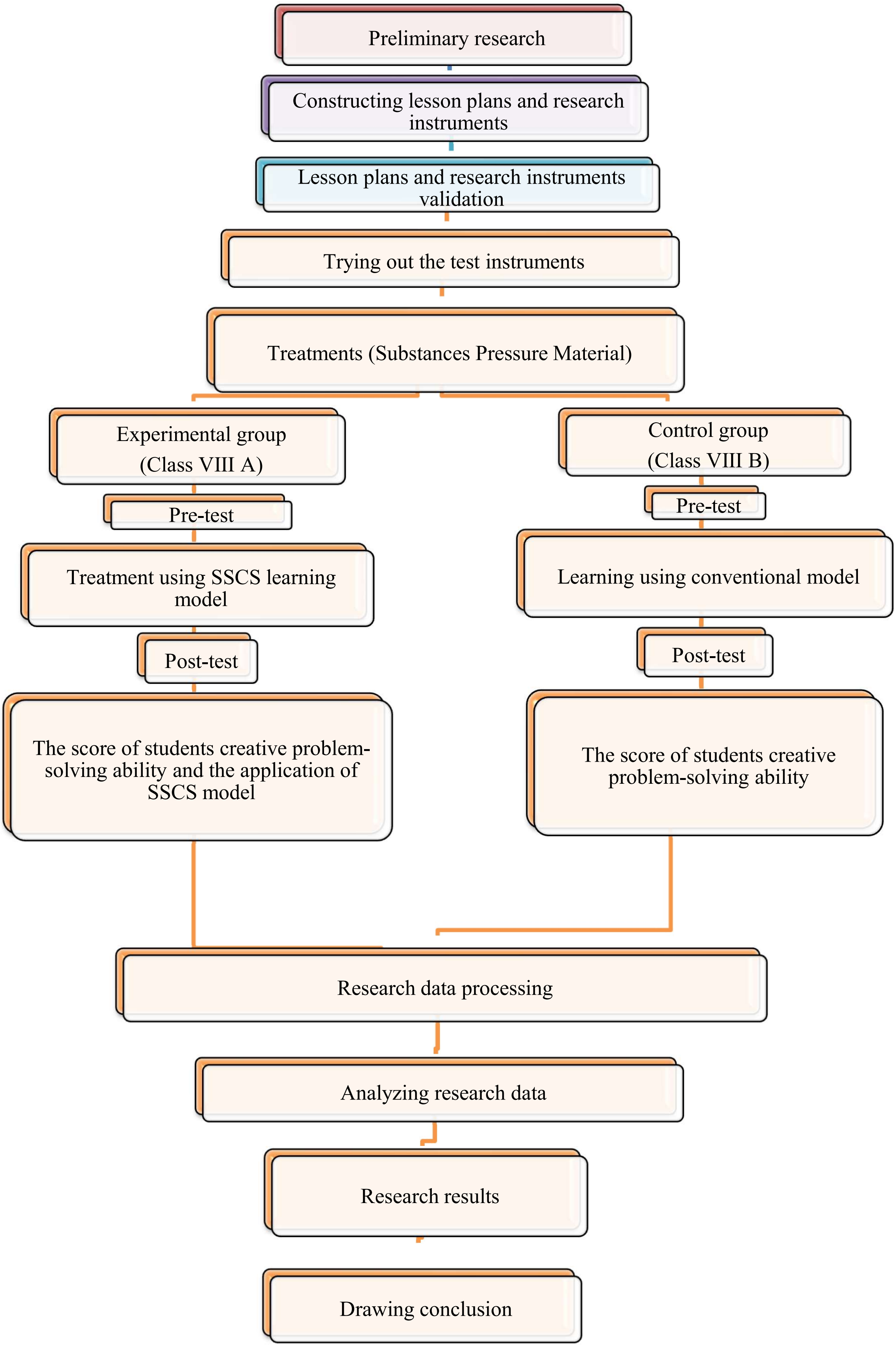

Figure 1. Research Flowchart

Four objects with different shapes but having the same mass are placed on the floor. The smallest pressure on the floor is caused by which objects? Include the reason!

Figure 2. Questions for Objective Finding Indicators

Next, an observation sheet was used to determine the implementation of the SSCS learning model. This observation sheet was made using a Likert scale. Before being used in the study, both instruments were validated by experts. For the test questions, after being validated by the experts, they were tested to determine the level of validity, reliability, differentiating factors, and the level of difficulty.

The data analysis technique in this study begins with the N-Gain test with the normalized gain formula as follows:

$$g = \frac{posttest\ sco \quad pretest\ score}{maxim \quad sco \quad pretest\ score} \qquad (1)$$

The calculation results were interpreted using normalized gain classification according to Meltzer in Table 1 [31].

Table 1. Classification of Gain

Normalized gain value	Interpretation
g > 0.7	High
0.3 < g < 0.7	Medium
g < 0.3	Low

The next data analyses were the normality test, the homogeneity test, and the hypothetical test using PASW 18.00. Lastly, to test the effectiveness of the SSCS learning model on the creative problem-solving ability the effect size formula was used [32].

$$d = \frac{M_A - M_B}{[(Sd^2A + Sd^2B)/2]^{1/2}} \qquad (2)$$

Description:
d: effect size
M_A: average gain of the experimental class
M_B: average gain of the control class
Sd_A: standard deviation of experimental class
Sd_B: standard deviation of the control class

The criteria for the size of the effect size are classified in Table 2.

Table 2. Effect Size Category

Effect Size	Category
$d < 0.2$	Low
$0.2 < d < 0.8$	Medium
$d > 0.8$	High

Data on observations of the implementation of the SSCS learning model were analyzed using the following formula [33]:

$$Score = \frac{Observer's\ total\ score}{Maximum\ score}\ x\ 100\% \qquad (3)$$

The values obtained are presented in Table 3.

Table 3. Criteria of Interpretation Value

Percentage	Category
81-100	Very high
61-80	High
41-60	Adequate
21-40	Low
0-20	Very low

III. RESULTS AND DISCUSSION

N-Gain

The results of N-Gain tests based on the pre-test and post-test were used to identify the increase in the students' creative problem-solving ability between the control and experimental classes. The results are presented in Table 4.

Table 4 Shows the increase in the students' creative problem-solving abilities. The increase in the experimental class was higher than the control class. Figure 2 presents the students' creative problem-solving scores for each aspect of the experimental class and control class in detail.

Table 4. Results of N-Gain tests

Classes	N	Average of pre-test	Average of post-test	N –Gain	Classifications
Experimental	34	34.26	81.03	0.71	High
Control	33	34.47	60	0.39	Medium

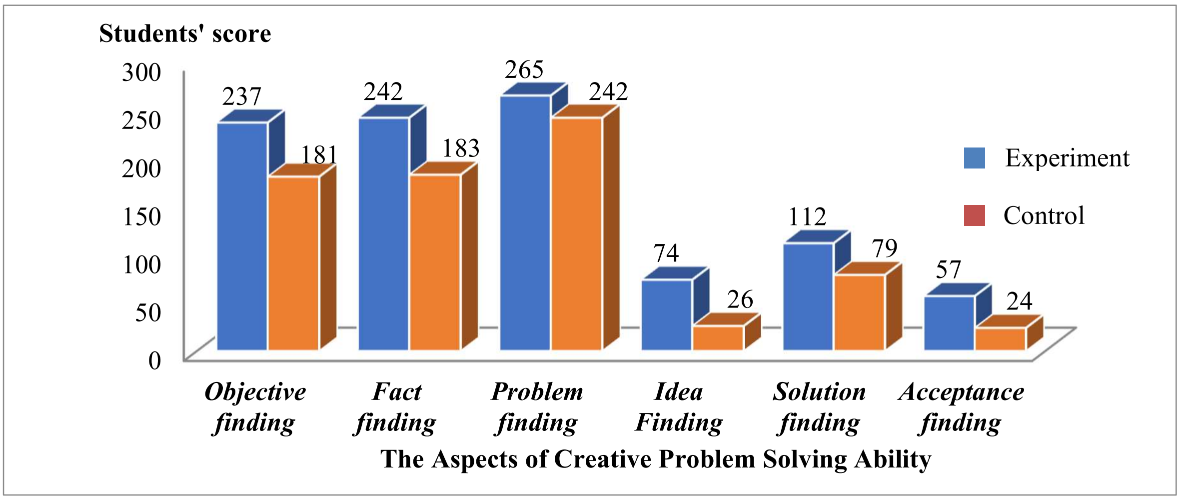

Figure 3. Graph of the Students' Creative Problem-Solving Scores for Each Aspect

Normality Test

The normality test was conducted to determine whether the sample was normally distributed by using the one sample Kolmogorov-Smirnov test on the PASW 18.00 program with a significant level of 5 % or 0.05.

Table 5 shows the significant value of normality test results on the pre-test and post-test of the experimental class and control class > 0.05, so it can be concluded that the data in the experimental class and control class were normally distributed.

Homogeneity Test

Homogeneity test was done to find out whether the experimental class and control class have the same variance or not, and the results can be seen in Table 6.

Table 6 shows the significant value of the homogeneity test results on the data of pre-test and post-test > 0.05, which means the data in the experimental class and the control class were the same or homogeneous.

Table 5. Normality Test Result on the Creative Problem Solving Ability

Group		Significant	Conclusion
Experiments	Before(pre-test)	0.632	Normal
	After(post-test)	0.563	Normal
Control	Before(pre-test)	0.881	Normal
	After(post-test)	0.564	Normal

Table 6. Test Results Homogeneity test on the Creative Problem Solving Ability

Data	F	Significant	Criteria
Pre-test	0.585	0.447	Homogeneous
Post-test	0.178	0.675	Homogeneous

Hypothetical Test

The hypothetical test was conducted to find out whether there were differences in the creative problem-solving abilities in Physics learning between the experimental class and the control class.

The results of the hypothetical in Table 7 show the students' creative problem-solving abilities after treatment (post-test) obtained *t* value of 8.746 with the significance level of 0.000 < 0.05 so that H_0 was rejected and Ha was accepted. Thus, there are differences in creative problem-solving abilities between the experimental class and the control class. The average score of students' creative problem-solving ability through the SSCS learning model in the experimental class was higher than the control class. So it can be concluded that the SSCS learning model affected the students' creative problem-solving ability.

Table 7. Hypothetical Test Results on the Creative Problem Solving Ability

Data	T	Significant	Conclusion
Creative Problem Solving Ability before Treatment(pre-test)	-0.070	0.945	No difference
Creative Problem Solving Ability after Treatment (Post-test)	8.746	0.000	Difference

Effect Size

The effect size was used to determine the success rate of research [34]. In this study, the effect size was used to determine the effectiveness of SSCS learning model and its impact on the students' creative problem-solving ability.

Table 8 shows the effect size (*d*) results of 2.3 > 0.8. It means the implementation of the SSCS learning model is believed to be effective on the students' creative problem-solving ability in Physics learning which belongs to the high category.

Results of Observation

In addition to the tests, observation was conducted by referring to the observation sheets which were utilized as a research instrument to measure the feasibility of SSCS learning model in Physics learning on the concept of Substance Pressure subject matter.

Table 9 shows the implementation of the SSCS learning models in the experimental class was in the very good category. This result also shows that the students' creative problem-solving ability is influenced by the application of the SSCS learning model.

The students' creative problem-solving ability indicated by the N-Gain tests in this study is in accordance with the results of previous research which asserts that the implementation of the SSCS learning model influences students' creative thinking ability. Students' creative thinking ability in the experimental class has increased with a gain index of 0.44 [24].

Table 8. Analysis Results of Effect Size

Classes	Average Gain	Standard Deviation	Effect Size (*d*)	Category
Experimental	46.76	88.51	2.39	High
Control	25.53	69.44		

Table 9. Observation Results

Meetings	Observers' Total Score	Percentage	Category
1st	95	90.47 %	Very Good
2nd	94	89.52 %	Very Good
3rd	97	92.38 %	Very Good
Total	**286**	**90.79 %**	**Very Good**

According to the results, it is believed that the SSCS learning model is effective in improving the students' creative problem-solving ability as this learning model consists of four stages that are able to foster the students' creative problem-solving abilities, namely searching, solving the problems, creating solution, and sharing the idea or solution with the other members or peers.

During the implementation of the SSCS learning model, students play an active role in learning activities starting from observation phase to understand the presented problems as well as determining the problems, thinking actively to solve the problems, and making relevant solutions upon the problems by doing a practicum together with group member and communicating the results with other members and the classroom. Therefore, the learning activities by using the SSCS learning model puts the students as the center of activities (student-centered learning) while the teacher acts only as the facilitator of the classroom activities.

These results are supported by the similar findings of previous studies that in learning, the SSCS learning model could make the students think actively to solve the given problems, finding and proposing logical solutions to the problems by working together with their peers and classroom members [35].

Based on the results of the analysis from the gained scores of the creative problem-solving ability on 6 indicators, it can be seen that the lowest score was the acceptance finding in both the experimental and control classes. This lowest score occurred because in the experimental class, during the creation phase, the students in groups made a design or action plan as a solution to the given problems. However, when they were asked to work on questions related to the concept of the problem, they could not rewrite in detail the action plan for the problems. As they finished carrying out the task, the group of students was considered understood the concept [36]. In fact, some students actually could not write a draft solution to the problem individually.

These result findings are in line with the results of previous studies which stated that the weakest aspect of creative problem solving is the aspect of acceptance finding [28]. The results of other studies also found that the weakest aspects of creative problem-solving ability, particularly among secondary or senior high schools students, is on the aspect of acceptance finding [29]. The highest gained score of the students' creative problem-solving ability is in the aspect of problem finding. During the learning in the experimental class, students were directed to understand some phenomena related to the concept so that they could understand the application of the concept of mathematical equations directly. Therefore, students' mathematical problem-solving abilities are considered high.

The results of this aspect are likely different with previous findings which stated that the most important aspect of students' mathematical creative problem-solving ability is the fact-finding aspect [29]. Whereas in this study, the obtained scores on the fact-finding aspect are the second biggest after the aspect of problem finding. This difference in results can be caused by differences in learning model applied in improving students' creative problem-solving ability for each research.

In relation with the effectiveness of SSCS learning model on the students' creative problem-solving ability, it was measured by calculating the effect size. The calculation results of the effect size show the *d* value of 2.3 which belongs to the high category. Based on the description above, it can be concluded that the effectiveness of SSCS learning model on the students' creative problem-solving ability in physics learning is very high.

IV. CONCLUSION

Based on the elaboration from the tests and observation, it can be concluded that the implementation of the SSCS learning model is effective on the students' creative problem-solving ability in Physics learning. The effect size calculation results obtained *d* value of 2.3 which belongs to the high category. Therefore, it can be concluded that the SSCS learning model is effective to be applied to the students' creative problem-solving ability in advance Physics learning. Some suggestions related to the results namely the SSCS learning model could become the alternative solution for Physics teachers in order to improve the students' creative problem-solving ability in Physics learning. On the other hand, as the improvement on the students' creative problem-solving ability in this study is still low in the aspect of acceptance finding, it is expected to increase the meeting duration in order to obtain maximum results. In addition, further research is needed regarding the implementation of the SSCS learning model in Physics education, especially to discuss different subject matters.

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