Bioeduca: Journal of Biology Education
http://journal.walisongo.ac.id/index.php/bioeduca
ISSN 2714-8009 (*print*), 2715-7490 *(online)*

Volume 5, Nomor 1, Tahun 2023
Matter. 52 – 65

The Effect of Search, Solve, Create, Share (SSCS) Learning Model on Scientific Reasoning Ability

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Article Information
Submit: 23 – 03 – 2023
Received: 02 – 05 – 2023
Published: 11 – 05 – 2023

ABSTRACT

Tujuan penelitian ini adalah untuk mengetahui pengaruh model pembelajaran Search, Solve, Create, and Share (SSCS) terhadap kemampuan penalaran ilmiah siswa pada materi sistem gerak manusia. Metode yang digunakan dalam penelitian ini adalah eksperimen semu. Penelitian ini menggunakan dua kelas eksperimen dengan model SSCS dan satu kelas kontrol dengan model konvensional. Data diperoleh melalui teknik observasi, angket respon siswa, dan tes kemampuan penalaran ilmiah. Hasil penelitian menyatakan bahwa model SSCS berpengaruh terhadap kemampuan penalaran ilmiah siswa. Hasil uji hipotesis menyatakan bahwa H0 ditolak dan Ha diterima. Hal ini berdasarkan hasil pengujian hipotesis dengan menggunakan uji Mann-Whitney yang diperoleh nilai Asymp. Sig. (2-tailed) 0,000 < 0,05. Melalui penelitian ini terungkap bahwa model pembelajaran SSCS berpengaruh terhadap kemampuan penalaran ilmiah siswa.

Keywords: Model SSCS; Kemampuan Penalaran Ilmiah; Kuasi eksperimen

Publisher
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ABSTRACT

The purpose of this study was to determine the effect of the Search, Solve, Create, and Share (SSCS) learning model on students' scientific reasoning abilities in the material of the human movement system. The method used in this research is quasi-experimental. This study used two experimental classes with the SSCS model and a control class with the conventional model. Data were obtained through observation techniques, student response questionnaires, and scientific reasoning ability tests. The results of the study stated that the SSCS model had an effect on students' scientific reasoning abilities. The results of the hypothesis test stated that H_0 was rejected and H_a was accepted. This is based on the results of hypothesis testing using the Mann-Whitney test which obtains an Asymp value. Sig. (2-tailed) 0,000 < 0,05. Through this research, it was revealed that the SSCS learning model had an effect on students' scientific reasoning abilities.

Keywords: *SSCS model; quasi-experimental; scientific reasoning ability.*

INTRODUCTION

Facing the challenges of globalization students are required to have scientific reasoning abilities. This demand is stated in Permendikbud No. 21 of 2016 concerning content standards for primary and secondary education. A student needs to have the skills of reasoning, creative, productive, effective, critical, scientific independence (Anjani, 2020). Scientific reasoning ability is defined as the ability to draw conclusions based on existing evidence (‘Aini, 2018). This makes scientific reasoning abilities a thinking ability that must be possessed as a provision for students to face global challenges. Scientific reasoning includes a scientific process consisting of finding problems, making hypotheses, making assumptions or predictions, problems and solutions, making experiments, controlling variables and conducting data analysis. (Anjani 2020). Scientific reasoning skills must be trained because these abilities form the basis of other abilities, such as the ability to think critically and the ability to solve problems (Handayani, 2020). Lawson stated that there are 6 aspects of scientific reasoning in his test. These aspects are: (1) Conservation reasoning; (2) Proportional reasoning; (3) Control of variables; (4) Probability reasoning; (5) Correlation reasoning; and (6) Hypothetical-deductive reasoning (‘Aini, 2018).

Facts in the field show that students' scientific reasoning abilities are still low and need to be developed. These results are based on Handayani's research (2020) which states that the scientific reasoning of class XI students at SMA Negeri Sukabumi City for the 2019/2020 academic year is classified as lacking so that it needs to be trained and developed a learning model that can train students' scientific reasoning. Another study from Mandella (2021) also states that the scientific reasoning of students of SMA Negeri Sukabumi Regency for the 2020/2021 academic year class X is in the poor category. Purwana (2016) states that scientific reasoning can be developed and trained by applying unconventional learning models. One of the preferred models for cultivating students' scientific reasoning abilities is the Search, Solve, Create, Share (SSCS) learning model. This model is an unconventional model that makes students more actively involved in learning and not only focused on the teacher's explanation, so that students' abilities will be better trained.

The SSCS model is one of the many models in learning that can be applied by a teacher to support students in learning. The SSCS model is a model based on problem solving that can make students become active in discussions throughout the learning process. The concept of problem solving by giving examples and trying to solve a given problem will make students remember the material longer than what is explained orally (Fatiyah, 2017). The SSCS learning model was developed for the first time in 1988 by Pizzini. This model was introduced by Pizzini to help students learn about science and how it applies to everyday life. This model will be able to provide a broad space for students to gain an understanding of science by trying to find a solution to a problem (Devi dan Budianto, 2019).

Research conducted by Fatiyah (2017) regarding the SSCS model, shows that the SSCS model has an influence on students' higher-order thinking skills. The application of the SSCS model can also increase student learning activities and outcomes (Fatiya, 2019). Other research from Amalia and Budianto (2019) shows that the SSCS model has an effect on student learning outcomes. This research encourages further research on the SSCS model. Based on the description of the problem, a study was carried out on the effect of the SSCS learning model on students' scientific reasoning abilities in the material of the human movement system. This research was conducted to improve scientific reasoning, especially in the material of the human movement system. This material is very related to the daily life of students who are always engaged in carrying out learning activities and other activities. It is hoped that this model can be used as a strategy to be applied in classroom learning activities to foster students' scientific reasoning abilities.

METHODE

This study uses a quantitative approach with quasi-experimental research methods. The design in this study used a pretest posttest control group design. The population used was class XI IPA MA NU Ibtidaul Falah, totaling 79 students. Two classes were selected as samples, namely XI IPA 2 (experimental class) and XI IPA 1 (control class) with a total of 48 students. The selection of the sample was determined through the cluster random sampling technique.

Data collection was obtained using observation techniques, student response questionnaires to the application of the SSCS model, and tests of scientific reasoning abilities. Observation techniques are applied to obtain data on student learning activities when learning activities take place using the SSCS model. This technique is supported by a questionnaire to see student responses or responses to the application of the SSCS model.

Table 1. The Percentage of Student Response Categories

Percentage Score (%)	Category
81 – 100 %	Very good
61 – 80 %	Good
41 – 60 %	Enough
21 – 40 %	Less
0 – 20 %	Very less

(Source: Hermawan, 2020)

The test is in the form of multiple choice tests according to indicators of scientific reasoning ability from The Lawson's Classroom Test Of Scientific Reasoning (LCTSR) which has been developed. The test is used after expert validity is carried out which states that the test can be used after several revisions have been made. The categories of scientific reasoning ability scale are as follows:

Table 2. Category of Scientific Reasoning Ability

Persentage (%)	Category
81 – 100 %	Very high
61 – 80 %	High
41 – 60 %	Medium
21 – 40 %	Low
0 – 20 %	Very low

(Source: ‘Aini 2020)

Data analysis was carried out using descriptive analysis techniques and inferential statistical analysis. Previously, the normality test was carried out using the Kolmogorov Smirnov test and the homogeneity test using the Levene test. Then a hypothesis test was carried out using a non-parametric test, namely the Mann-Whitney test. The test was carried out because in the posttest normality test the control class obtained a significance value of 0,33 so that < 0,05 it can be concluded that the data is not normally distributed.

RESULTS AND DISCUSSION

Implementation of the Search, Solve, Create, and Share Learning Model (SSCS)

Based on the calculation of the percentage of learning activities using the SSCS model as a whole, a percentage value of 83.33% is categorized as very good. The search syntax has a percentage value of 66.66 %, the solve and create syntax has a percentage value of 83.33 % and the share syntax has a percentage value of 100 %.

Table 3. The Percentage of Achievement of The SSCS Model Syntax

Syntax	Percentage	Category
Stage *Search*	66,66 %	Good
Stage *Solve*	83,33 %	Very Good
Stage *Create*	83,33 %	Very Good
Stage *Share*	100 %	Very Good

These results are supported by a student response questionnaire to the SSCS model. Student response to the implementation of the SSCS model in the experimental class, most students gave a good response with a percentage of 92.86% and a very good response with a percentage of 7.14%.

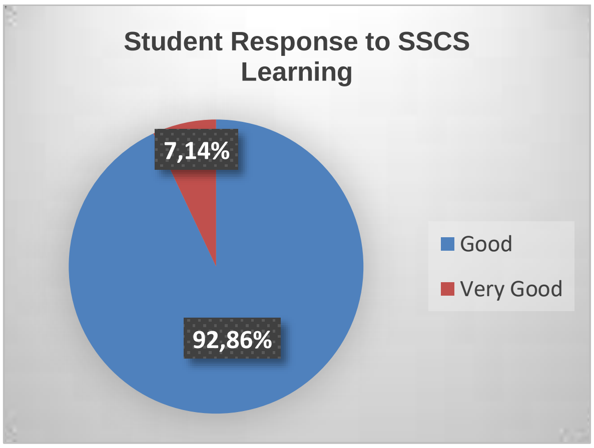

Figure 1. Student Responses to the Application of the SSCS Model

The first stage in this research is search. The implementation of this syntax obtains a percentage value of 66.6% which is in the good category. At this stage students carry out understanding and recognition of the problems that have been given. Thus students will conduct a search for a problem so as to be able to create ideas in the form of thoughts about what they just found out and what they did not know before. As the opinion of Mardhiyana and Sejati (2016) that this process will further enhance student activity which makes students not only memorize or work on questions, but can encourage students to use their thinking skills in solving a problem. So that later it is hoped that students will get used to dealing with something they consider new.

The second stage is the solve phase. The implementation of this syntax obtains a percentage value of 83.33% which is included in the very good category. In this phase, students carry out planning for solving problems given by originating from their previous thoughts. Planning is defined as a process and way of reasoning in making decisions that can help achieve the expected goals (Nasution, 2017). Alyana (2020) says that the ability to plan for solving problems is an initial ability that students need to have. This ability will require students to have experience and choose strategies for what they should do with problems they are familiar with. Planning will be able to make students know about something to be achieved and how to achieve it (Rusniati dan Ahsanul Haq, 2014).

The next stage is the create phase. The implementation of this syntax obtains a percentage value of 83.33% which is included in the very good category. At this stage students pour answers and make conclusions in the form of solving problems in groups. This activity will make students active in discussing in groups, answering questions and making conclusions. This activity will improve students' thinking skills which lead to problem solving (Luthfiyah, 2021). Through discussion in small groups will be able to provide flexibility for students to communicate, express opinions between friends in a group. Students will be encouraged to use their abilities and knowledge to share opinions while respecting one another (Ermi, 2015). Exchanging opinions will make it easier to answer questions and draw conclusions. As Khosim stated that answering questions is part of speaking ability (Khosim, 2016).

The last phase is the share phase. The implementation of this syntax obtains a percentage value of 100% which is categorized as very good. In this phase students communicate the results of their group discussions to other groups in front of the class alternately. This stage can train students' mental and communication skills. Communication is really needed by students to convey something to others so that later students are expected to get used to communicating well with friends and other people (Sari, 2020). At this stage students convey their group's opinions to other groups so as to create class discussions. The creation of discussions will make students become actively involved in learning. As Sya'bani (2017) argues, discussions will result in data interaction from one group to another so that the information conveyed can be deepened.

The success of the SSCS model in this study can be seen from the several indicators used in student questionnaire responses. Indicators of the application of the learning model get a good response, because the use of this model can make students actively involved in learning and not just listen to lectures in a monotone so that it can stimulate students' reasoning abilities. Student questionnaire indicators about the benefits of the SSCS learning model received good responses. This is because by implementing this learning model, it makes students use their thinking, reasoning and opinion skills more. These benefits can be obtained by students through each stage of the SSCS model. From this learning model can increase students' curiosity in finding information that they do not know.

Questionnaire indicators about student activity during learning with the SSCS model also received good responses. This is because students become the main actors in learning and are not teacher-centered. Students will be more thorough in understanding something because the syntax of the model used is the search stage to recognize, understand, or think about ideas using their reasoning in dealing with a problem. Students also become accustomed to working in small groups because of the solve and create syntax to make plans and answer solutions to a problem in teamwork, giving rise to an attitude of cooperation and not individualism. Students can also practice speaking skills in the small group discussions. After students are used to discussing with small groups, students can then communicate with other larger groups because of the share syntax so that students can convey the results of their thoughts to other students. This stage can also make students accustomed to speaking and create a confident attitude in themselves. This is in accordance with Fatiya research (2019) which shows the results of applying the SSCS model received a very good response with a percentage of 93.93% and received a good response with a percentage of 6.06%.

This research agrees with Jusman's research (2021) regarding the use of the SSCS model to improve students' critical thinking skills which explains that this model can improve students' critical thinking skills, and student and teacher activities. Thus, these results indicate that there is a good response from students. These results are also in line with Rosawati's research (2016) which also used the SSCS model which showed that 86.67% of students stated that they understood more about chemical bonding material after using this learning model, which means that this model is very good for use in learning. Therefore, it can be interpreted that the results of students' responses to the SSCS learning model to improve or develop scientific reasoning abilities in human motion system material show good results for use in learning. Even so, there were still some limitations as it seemed that students were still having difficulty following the learning model at the initial meeting.

Student’s Scientific Reasoning Ability on Human Movement System Material

Students' scientific reasoning abilities can be seen from the results of the pretest and posttest scores given to the experimental and control classes. These results can be seen in the following table:

Table 4. Result of Scientific Reasoning Ability

Class		Pretest	Posttest
Experiment	XI IPA 2	39,64	71,42
Control	XI IPA 1	41	48,75

Based on these results, students' scientific reasoning abilities in the experimental class had a pretest score of 39.64, which means it was categorized as low, while the posttest score was 71.42, which means high. In the control class, it has a pretest score of 41 which is in the sufficient category, while the posttest value is 48.75, which means it is in the sufficient category. Based on this acquisition, there was a difference in scientific reasoning abilities in the control and experimental classes. This can be seen from the explanation of the data above that the ability of scientific reasoning in the experimental class has increased after applying the SSCS model. This was also experienced in the control class which experienced an increase in scientific reasoning abilities, but the scientific reasoning abilities in the experimental class were higher than the control class. Even so, there are still limitations such as the lack of maximum results of students' reasoning abilities which can be caused by the application of models that are not optimal either.

Table 5. Comparison of Scientific Reasoning Ability Indicators

Indicator	Experiment	Control
	Average	Average
Conservation Reasoning	71,42	55
Proportional Reasoning	71,42	45
Control of Variables	69,04	41,66
Probability Reasoning	73,21	56,25
Correlation Reasoning	70	35
Hypothetical-deductive Reasoning	73,80	66,66

Based on the table above it can be seen the value of scientific reasoning ability for each indicator. The greatest value is found in deductive hypothesis reasoning with a value of 73.80 in the experimental class and with a value of 66.66 in the control class. The reasoning abilities of students in the experimental class, such as the ability to identify, solve problems and express opinions, are much better trained than the control class. This happened because learning activities in the control class only led to student books using the lecture method without any problems related to learning material. This is in line with Rimadani (2017) that scientific reasoning abilities can be increased by learning activities that involve active students in understanding a concept, because understanding a concept has a relationship with scientific reasoning.

The indicator of scientific reasoning ability for conservation reasoning obtained a score of 71.42 in the experimental class higher than the control class which received a value of 55. This difference occurred because in the indicator of conservation reasoning the experimental class students were trained at the stage of identifying and understanding problems related to types of bones in daily life -day.

This is in line with the syntax of the experimental class learning model at the search stage which at this stage aims to identify problems. According to Firdaus (2021) students' conservation reasoning will look good if they have the ability to identify and understand certain properties of objects that do not change. Yossyana (2018) also said that students' conservation reasoning will increase if students are used to imagining something assigned in their daily activities or based on their experiences.

The proportional reasoning indicator obtained a score of 71.42 in the experimental class higher than the control class which received a value of 45. This difference occurred because in the proportional reasoning indicator students in the experimental class were trained to compare and interpret the relationship of a situation being described in the problem. This is in line with the syntax of the experimental class learning model in the solve and create stages where at that stage students can plan problem solving such as connecting or comparing things according to questions which will later lead to the create stage to answer the problem. According to Anwar (2019) students' ability to connect something that is being observed can lead to problem solving.

The variable controlling indicator obtained a value of 69.04 in the experimental class higher than the control class which obtained a value of 41.66. This difference occurs because in the variable controlling indicator students in the experimental class are trained to focus on something that is being faced and observed. In this case students must focus their minds on the problems given. This is in line with the syntax of the experimental class learning model at the search stage, at which stage students identify problems. This stage is the initial stage before going to the next stage so that students must focus their minds on dealing with a problem. Riinawati (2021) says that by focusing students' minds they will be able to absorb and understand information correctly, so as to increase student achievement in learning.

The probabilistic reasoning indicator scored 73.21 in the experimental class, which was higher than the control class, which scored 56.25. This difference occurs because in probabilistic reasoning indicators experimental class students are trained to make conclusions on the information provided. This is in line with the syntax of the experimental class learning model at the create stage, at which stage students solve problems and then draw conclusions. At the beginning of making conclusions students are still confused so guidance and direction from the teacher is needed. This is in line with Ariyanti (2021) who says that the teacher's role is very important in guiding and directing students. Guidance and direction is expected to increase students' interest in reading and understanding the material provided.

The correlation reasoning indicator obtained a score of 70 in the experimental class higher than the control class which received a value of 35. This difference occurred because in the correlation reasoning indicator students in the experimental class were trained to identify the mutual relations of something that happened. Among them students can find out about osteoporosis and related matters ranging from causes to ways of prevention. This is in line with the syntax of the experimental class learning model at the search stage where at that stage students identify and understand the problems given. According to Meutia (2018) a reciprocal relationship will be able to show the relationship between a problem being faced with the causes and factors that influence it.

The hypothesis-deductive reasoning indicator scored 73.80 in the experimental class, which was higher than the control class, which scored 66.66. This difference occurs because in the hypothesis-deductive reasoning indicators the experimental class students are trained to make answers or solutions based on theories during learning of a problem. Students determine answers in groups so that a discussion process arises. Having discussions makes it easier for students to find answers. This is in line with the syntax of the experimental class learning model at the share stage where at that stage students communicate the results of their thoughts to their friends which can be seen from the discussion process. According to Putriyanti and Fensi (2017) discussions will encourage students to be involved in learning with their friends. The process of studying with friends will certainly make the atmosphere more enjoyable and will increase students' interest in a particular topic, so that student learning outcomes will also increase.

The Effect of The Search, Solve, Create, and Share (SSCS) Learning Model on Students' Scientific Reasoning Ability

The hypothesis test was carried out using a non-parametric test using the Mann-Whitney test. The results of the data hypothesis test in scientific reasoning ability research can be found in table 6 below:

Table 6. Results of The Scientific Reasoning Ability Hypothesis Test

Test Statistics[a]

	Result
Mann-Whitney U	27.000
Wilcoxon W	237.000
Z	-5.323
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Class

Based on the information in table 6 it is known that Asymp. Sig. (2-tailed) denotes a value of 0.000. This value is <0.05, which means that Ha is accepted and H0 is rejected, which means that there is a difference in the mean results of students' scientific reasoning abilities in the experimental class and the control class. Thus, the SSCS model influences students' scientific reasoning abilities. This influence can be seen through the syntax and indicators. However, every syntax of this model cannot improve all indicators of scientific reasoning.

First, the search syntax can improve scientific reasoning indicators of conservation reasoning, variable control, and correlation reasoning. Through the search syntax students identify problems which affect the indicators of conservation reasoning, namely identifying and finding problems. The syntax also influences the variable controlling indicators where on these indicators students must focus their minds on identifying problems. This syntax also influences correlation reasoning indicators, namely students must identify reciprocal relationships, so that through the search syntax students can identify problems as well as find reciprocal relationships. Second, the solve syntax can improve scientific reasoning on proportional reasoning indicators, namely students can compare and interpret the relationship of a situation that is being described in the problem. Through the solve syntax students can plan problem solving such as connecting or comparing something according to the problem. Third, the syntax create can improve scientific reasoning on probabilistic reasoning indicators, namely students can make conclusions based on the information provided, so that through the syntax create students can find answers as well as make conclusions. Fourth, the share syntax can improve scientific reasoning on the hypothesis-deductive reasoning indicator, namely students answer questions based on theory during learning, so that through the share syntax, students are involved in the discussion process which through the discussion process will make it easier for students to find answers. This is because the SSCS learning model focuses more on students who are actively involved in finding problems and finding solutions during learning.

This is in line with Wibowo (2016) which states that the SSCS model will make students the center of learning while the teacher only provides a few examples or directions which will be developed by students to seek knowledge and solve their own problems. So students will do more activities during learning with the direction of the teacher, both individually and in groups. Meilindawati (2021) said that students' activeness in learning activities will make students hone their abilities more. The results of Erlistiani research (2020) show that using the SSCS model can develop students' skills in critical thinking. This is known from the activities of students who become more active in exchanging opinions in discussions so that they can train students' critical thinking skills and the ability to make conclusions. This is in line with Sari (2019) that the use of the SSCS model can develop students' mathematical problem solving skills, so it can be interpreted that the SSCS model can develop students' scientific reasoning abilities. As according to Handayani (2020) who says that scientific reasoning abilities are the basic abilities of critical thinking skills and problem solving. These results are comparable to the implementation of experimental class learning that applies problem solving so that it can develop its scientific reasoning abilities. As shown by the test results of students in the experimental class better than the control class.

CONCLUSIONS AND SUGGESTIONS

Implementation of learning activities with the SSCS model goes well according to the syntax which consists of search, solve, create and share stages. This can be seen from the observation sheet of the implementation of the syntax of learning activities using the SSCS model as a whole obtaining a percentage value of 83,33% which is categorized as very good. The use of this learning model also obtained positive responses or responses from students, namely as many as 92,86% of students responded well and as many as 7,14% of students responded very well. Therefore, this model can be an option or alternative to be applied by teachers in learning activities. Meanwhile, differences in scientific reasoning abilities were found in the experimental and control classes. Scientific reasoning ability in the experimental class before treatment obtained a value of 39,64 which was included in the less category and after being given treatment obtained a value of 71,42 which means a good category. In the control class before treatment got a value of 41 which was included in the sufficient category and after being given treatment got a value of 48,75 which was included in the sufficient category. On the other hand, the use of the SSCS model has a significant effect on students' scientific reasoning abilities. This is based on hypothesis testing with the Mann-Whitney test which obtains an Asymp value. Sig. (2-tailed) 0,000. This value is $< 0,05$ so that H_a is accepted and H_0 is rejected which means that there is a difference between the control and experimental classes. The conclusion is that there is an influence of the Search, Create, Solve, and Share (SSCS) learning model on students' scientific reasoning abilities in the matter of human movement systems at MA NU Ibtidaul Falah.

Based on the research that has been carried out, several suggestions have been found, namely: first, for teachers, it is hoped that teachers will always develop learning methods for each learning material so that later the most suitable model can be found to be applied in different materials and further train students' abilities. Second, for students, it is hoped that they will be more focused and concentrated in participating in learning activities and be more active so that their inner abilities can be honed and can develop optimally. Third, for researchers, it is necessary to carry out further research on other learning models to develop students' scientific reasoning abilities.

ACKNOWLEDGMENT

Thank you to the supervising lecturers who have been willing to spend their time, energy and thoughts. Acknowledgments are also expressed to the head of MA NU Ibtidaul Falah who has granted research permission and to the biology subject teacher who assisted in the research process. Not to forget, to the students of MA NU Ibtidaul Falah who have been the subjects of the research.

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