Application of SSCS model (Search, Solve, Create and Share) for improving learning outcomes: the subject of optic geometric

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Abstract. This study proposes to determine the significant difference between the average N-gain of the experimental class students and the N-gain average of the control class students on the topic of geometry optics. Samples were students of class X of Public High School 1 Kabangka namely X₂ class of 30 students as an experimental class learning model SSCS (Search, Solve, Create, and Share) and class X₁ as many as 31 students as the control class with the direct learning model and the instrument of this research is test result of learning. The data were analyzed statistically showed the result of post-test of experimental class students on the subject matter of optical geometry that is obtained the average value of 81,667 while in the control class got the average value of 75,806. There is no difference between a mean score of pre-test of experiment class student with a mean value of pre-test of control class student on the topic of optical geometry at α = 0.05. The average post-test grade of the experimental class is significantly better than the mean post-test of the control class students on the subject matter of optical geometry at α = 0.05.

1. Introduction

Physics is a topic trained at the high school education level or madrasah aliyah in Indonesia. Physical science is (1) the process of receiving information through the experiential method; (2) information obtained through inquiries that organize logically and systematically; and (3) a blending of critical thinking processes that produce credible and valid information [1, 2]. The lack of student activities in the learning process makes a decrease of student understanding of the material was a study, while the purposes in physics learning are students must be directly involved in the learning process [3]. In physics learning students are exacted not only to listen, record, and remember from the subject matter delivered on the teacher, but more emphasis on the understanding of students to be ready to solve the problems people suffer and then communicate the arrangements — this learning process discussing an issue, answering questions and applying concepts to solve problems [4, 5].
Therefore, an outstanding teaching and learning process needs to have attempted so that students who come to study at school can understand the fundamentals of each subject matter. One of the physics subject matter contained in class X is geometry optics. The application of geometric optical material found in everyday life, but in reality, students still feel difficulties. According to the teacher, geometry optics is a material that considers quite difficult for students to understand because it requires a deep understanding so that a relevant learning model is needed so that the matter is easily explained by students [6].

To improve students' perception of the learning process in geometric optics material, we need SSCS learning models (search, solve, create and share). SSCS learning model is a learning model that practices a problem-solving approach that indicates the use of scientific methods or thinks systematically, logically, regularly and thoroughly [7, 8]. The plan means to N-gain cognitive abilities and skills, to solve rational, easy and complete problems [9]. The steps that want to SSCS learning model involve: (1) search (exploring to the issue); (2) solve (sketching study); (3) Create (designing an output); and (4) Share [10]. The SSCS model specifically for teaching science to the basic concepts so that a problem can be represented in comprehensive by students, in explaining it is necessary to identify and provide definitions with students and then that students learn the ability of problem-solving skills and scientific concepts thoroughly [11, 12].

Student learning outcomes of class X Public High School 1 Kabangka for geometric optics material in the even semester of 2015/2016 school year spread in 4 classes is quite low. Class X1 has an average value of 71.91, class X2 has an average value of 71.92, class X3 has an average value of 71.4, and class X4 has an average value of 72.84, or still many have not fulfilled the minimal completeness criteria from school for geometric optics material that is equal to 75. The average daily score of students in the article is only 45% complete, and 55% have not been entirely from 99 students (Source: Documents for Daily Tests of Students of Public High School 1 Kabangka).

Based on the description, so that researchers are interested in researching with the theme of the application of the SSCS learning model to improve student learning outcomes. The goal of the study is to recognize the significance of student learning outcomes taught using the SSCS learning model.

2. Materials and Method

2.1. Place and time of research
This research is experimental research — the study conducted at SMAN 1 Kabangka. Research time is under the problems taken, namely regarding the geometry optics material studied in the even semester, the 2016/2017 school year. The population in this research were all students of class X at X public high school 1 Kabangka in the 2016/2017 school year which was spread from class X1 to X4 with a total of 117 people. The research sample consisted of 2 classes, namely X1 control class (31 students) and X2 as experiments (30 students).

2.2. Research design
This study uses the pretest-posttest control group design [13].

| Experiment: | O₁ | X | O₂ |
|-------------|----|---|----|
| Control     | O₃ |   | O₄ |

Where,
O₁ = the initial test (pre-test) given in the experimental class using the SSCS model
O₂ = final test (post-test) given in the experimental class using the SSCS model
O₃ = the initial test (pre-test) given to the control class using a direct learning
O₄ = final test (post-test) given to the control class using a direct learning
X = giving treatment namely learning with the SSCS model (search, solve, create and share)
2.3. Research procedure
The compilation of learning tools in the study, the essence of learning tools in the study. Form of syllables, Lesson plans, and Student worksheets, make a grid - test instrument tests, compiled trial tests based on networks that have been prepared, try out the trial test instrument X class (which was previously taught geometric optics), analyzing the results of the experimental tests in the trial class, the distinguishing power of the questions, the issues and the reliability of the problems. Test in experimental and control classes, Conduct preliminary tests for experimental class and control class students, conduct learning with class X SSCS (experimental class) and carry out direct learning models in class X (control class), conduct final tests (posttest) for the class of student physics learning outcomes experiment and control class.

2.4. Data collection techniques and instrument analysis
The techniques used in this study are documentation techniques, test, and observation techniques while for instrument analysis using item validation test analysis, test reliability test, test differentiation test, level of difficulty of the item and analytical procedures using normality test and homogeneity test.

2.5. Research instrument
The study instrument used in this study is a test sheet and observation sheet. A test sheet is a test of learning outcomes in the form of multiple choice objective tests of 18 questions with scoring if correctly given a score of one and if incorrectly given a count zero. The measured learning outcomes are cognitive aspects namely remembering (C1), understanding (C2) applying (C3) and observation sheets in the form of teacher and student activities observed using observation sheets carried out during the learning process.

3. Result and Discussion

3.1. The results of the normality test and homogeneity test
The results of the normality test of physics learning outcomes of students who learn through direct learning models and SSCS learning models use the Kolmogorov-Smirnov test as shown in Table 1.

| Class      | Aspects tested | Kolmogorov-Smirnov | Asymp.Sig | α   | information |
|------------|----------------|--------------------|-----------|-----|-------------|
| Experiment | Pre-test       | 0.627              | 0.827     | 0.05| Normal      |
|            | Post-test      | 1.133              | 0.153     | 0.05| Normal      |
| Control    | Pre-test       | 0.907              | 0.383     | 0.05| Normal      |
|            | Post-test      | 0.755              | 0.619     | 0.05| Normal      |

Table 1 shows that the significant value for the pre-test experimental class is 0.827 greater than α = 0.05. Thus it can be concluded that the learning outcome data is normal to distribute Likewise in the post-test experimental class and the pre-test and post-test control class, significant value are more magnificent than α = 0.05, so can be concluded that the learning outcomes data are normal to distribute at α = 0.05.

The result of homogeneity variance of physics learning outcomes data of students learning through the SSCS learning model and direct learning model using the Levene Statistic test obtained significant values 0.211 greater than α = 0.05 so that can conclude that the two groups have the same variance. So, the physics learning outcomes of students learning through the SSCS learning model and the direct learning model are homogeneous at α = 0.05.
3.2. Description of student learning outcomes

Description of the data in this study in the form of data about the pre-test and post-test of student learning outcomes, both experimental class students and control grade students are present in Table 2.

Table 2. Data of physics learning outcomes of students in the experimental and control class

| Value | Experiment class | Control class |
|-------|------------------|---------------|
|       | Pre-test         | Post-test     | N-gain | Pre-test | Post-test | N-gain   |
| Average | 23.70 ± 11.29 | 81.67 ± 8.6 | 0.75 ± 0.12 | 20.61 ± 9.53 | 75.81 ± 11.3 | 0.69 ± 0.14 |
| Maximum | 50 | 94.44 | 0.93 | 38.889 | 94.44 | 0.93 |
| Minimum | 5.55 | 66.67 | 0.4 | 5.55 | 55.56 | 0.42 |

Student learning outcomes at pretest and posttest for the experimental and control class can be categorized as shown in Table 3.

Table 3. Categorization of student learning outcomes data for experimental and control class

| Value interval | Category   | Experiment class | Control class |
|----------------|------------|------------------|---------------|
|                |            | Pre-test | Post-test | Pre-test | Post-test |
| < 40.0         | Very less  | 28 | 93.33 | 0 | 0 | 31 | 100 | 0 | 0 |
| 40.0-54.99     | Less       | 2 | 6.67 | 0 | 0 | 0 | 0 | 0 | 0 |
| 55.0-64.99     | Enough     | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 19.35 |
| 65.0-79.99     | Good       | 0 | 0 | 16 | 53.33 | 0 | 0 | 15 | 48.39 |
| 80.0-94.99     | Very good  | 0 | 0 | 14 | 46.67 | 0 | 0 | 10 | 32.25 |
| ≥ 95.0         | Special    | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Where, \( f = \) Number of frequencies

Furthermore, to see the categorization of N-gain (improvement) of student learning outcomes of the experimental class and control class students after learning as a whole can be seen in Table 4.

Table 4. Categorizing the N-gain of student learning outcomes in experimental and control class

| Value interval | Category | N-gain |
|----------------|----------|--------|
|                |          | Experiment class | Control class |
|                |          | \( f \) | % | \( f \) | % |
| 0 ≤ \( g \) < 0.3 | Low | 0 | 0 | 0 | 0 |
| 0.3 ≤ \( g \) ≤ 0.7 | Medium | 10 | 33.33 | 16 | 51.61 |
| 0.7 < \( g \) ≤ 1 | High | 20 | 66.67 | 15 | 48.39 |

Where, \( f = \) Number of frequencies

Descriptively, the average student learning outcomes after learning (post-test) in the experimental class is higher than equal to 81.67, and most of them are in a good category, while the average learning outcomes of the control class after learning is 75.81 and still there is a small portion that categorized as enough. After inferential analysis using the t-test at 95% confidence level (\( \alpha = 0.05 \)) shows that student learning outcomes after learning in the experimental class are significantly better than the control class. Likewise with research conducted where student learning outcomes in the cognitive domain for the experimental class with the SSCS learning model are higher than the control class [14].

Some studies have reported that the SSCS learning model is useful for improving students' critical thinking skills in optical instrument material, but this study analyzes student learning outcomes [6]. Besides with research carried student learning outcomes in the cognitive domain for the experimental class with the SSCS learning model are higher than the control class. This because SSCS components are collaboration and problem solving that make low academic students become self-conscious.
intellectuals that can be clearly in the exploration and completion phase [15]. Students can communicate ideas and clarifications for any issues that result. Student creativity is very outstanding, and various aspects make even though they suggest the same problem. These results in line with the opinion that all students contrast in academic abilities can develop their creative thinking abilities if the learning environment provides opportunities for the development of these ideas [16]. This relevant thinking skills can be developed and improved by contributing meaningful experiences in the learning process [17]. In this study, collaboration and problem-solving is a form of learning experience that can stimulate the creativity of the thinking ability of low academic ability students [18]. Learning activities among students with diverse academic abilities have the potential to improve thinking skills in students’ low academic skills [19].

Descriptive analysis results show that the average improvement in experimental class student learning outcomes is more significant than the average N-gain of class control student learning outcomes, where the average N-gain of the experimental class students is 0.75 while the control class N-gain was amounting to 0.69. This result is in line with inferential testing using the t-test at a 95% confidence level (α = 0.05) indicating that the average N-gain value of the experimental class student learning outcomes is significantly reliable than the average N-gain value of the control class student learning outcomes as proved on Table 2. Unlike the problem with the learning process in the control class, wherever the learning process takes place classically, the teacher explains the learning substance using the lecture method so that students only receive exposure from the teacher. Therefore in the control class, the teacher dominates the learning activities in the classroom. Then students manage to be motionless and accept what is said by the teacher.

Based on these data, can be explained that the differences in the increase in learning outcomes obtained through the provision of different treatments in the learning process, namely in the experimental class, the SSCS learning model were applied while in the control class conventional learning models were used. One part that done in the experimental class is that students prove their theories through practicum so that students have to N-gain hands-on experience in the problem-solving process, giving them the opportunity to learn and establish basic concepts in more meaningful ways. As for the weaknesses of students in the experimental class, students are not active regarding asking questions because the teacher does not provide opportunities for students to ask questions that they do not understand.

Consequently, the use of the SSCS learning model is suitable for use in the physics learning process. Into this model, students can explore understanding and solve problems related to physics because SSCS is strongly recommended implement as one of the models used in the school learning process.

4. Conclusion

Based on the description, learning using the SSCS learning model is better than conventional learning models. This because the application of the SSCS model explores to improve students’ ability to solve problems and can be connected into the real context of students’ lives through experiments, so students do not quickly lose their fundamental concepts.

Acknowledgments

Our thanks go to the Halu Oleo University department of physics education for the assistance of the research grant provided and all the mentors so that this research can complete.

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