

IMPROVING STUDENT LEARNING OUTCOMES BY USING INQUIRY-BASED LEARNING STRATEGY IN ELECTRICAL AND ELECTRONIC CIRCUIT SUBJECT.

Kurniati Agustia¹, Monika Danni Juwita², M. Iksan Ardiyansah³

Students of Technological and Vocational Education, Universitas Negeri Padang
Prof. Dr. Hamka street, Air Tawar Barat, Padang 25131, Indonesia

Kurniatiagustia1717@gmail.com,

monikajuita@gmail.com.

lcsan.ardiyansah14@gmail.com

ABSTRACT

This study aims to determine the improvement of student learning outcomes in electrical and electronic circuit subject by using inquiry-based learning strategy. The strategy of teacher-centered learning is tend to develop the less optimal students' thinking ability, lack of attention in asking the questions and not focusing on the lessons provided by the teacher. This has an impact on the lower grade under the minimum criteria on mastery learning. The type of research used is quasi experimental research with One Group pretest and posttest design. The subjects of this study were students of X-3 Vocational High School 5 Padang. The results of this study show that the average of the pretest value is 49.33 and the posttest average is 77.5. The average of second meeting pretest value is 51.15 and the posttest average is 78.6. The average of the third meeting pretest value is 54.8 and the posttest average is 78.3. The average of fourth meeting pretest score is 59.03 and the posttest average is 78.2. The average fifth meeting pretest value is 53.89 and the posttest average is 78.9. The total average score of meeting 1 to 5 is 0.508 which states an increase in outcomes after using group inquiry learning strategies in total score in medium category. It can be concluded that there is an increase in learning outcomes of electrical and electronic circuits subject of students of class X-3 Vocational High School 5 Padang with the implementation of inquiry-based learning strategy.

KEYWORDS: *Electrical and Electronic Circuits, Inquiry-based learning strategy, Quasi experimental research.*

1. INTRODUCTION

Vocational high school is a form of educational unit system which goal is to prepare the students to be able to work independently in the world of business and industry. In vocational high schools, where the ability must be demonstrated in the workplace on a regular basis, the concept of competence is more significant than the concept of mere knowledge, as the construct of vocational assessment goals (Deutscher and Winther, 2018). Students are required to be able to analyze and think critically to the lessons given in accordance with the purpose of learning. Vocational education can offer different content, different skills with different forms of teaching (Gul, H., 2015).

Public vocational school 5 Padang is one of the vocational schools that produces students whose expert in the certain field. Electrical and electronic circuits subject is one of the compulsory subjects in electrical major at public vocational school 5 Padang. Electrical and electronic circuit is a subject that consist of the

concept of science about electrical components and electronics. This concept is difficult to understand when verbally explained, the use of various teaching aids to provide concrete images and to visualize the concept is important teaching strategy (Korganci, et al, 2015).

However, for the implementation of learning on electrical and electronic circuit is tend to be more teacher-centered. There is still the lack of student's involvement in learning process, students are lazy to ask the teacher or to their friends whether they understand or not about the material. Students are more likely to listen, take notes and copying without understanding it. As a result, the grade of the students is under the minimum criteria of mastery learning. It is the lowest criterion to indicate the learner reaches completeness.

Based on daily test scores in the academic year 2015/2016, the students' repetition value threshold is still low and less than the education unit level curriculum which states that minimum completeness is $\geq 85\%$ of the number of students being taught. Class X-1 completeness value above 75 is 33.33%. Class X-2 completeness is 30%. Class X-3 completeness value is 16.67%. The average percent of the three classes is still less than the completeness set by the curriculum.

Therefore, teachers has to find the right way to improve the learning process. It is to make the appropriate way to engage students thoroughly by inviting them to think critically and able to analyze the material that provided by teachers and ready to be a skillful graduate of vocational school. With the right way, it can create an effective learning process which can reach the minimum criteria of mastery. To overcome these problems, teachers can applied inquiry-based learning strategy. This strategy are the best way to achieve science literacy because students are given the opportunity to discuss and debate scientific ideas (Gormally et al., 2009).

Sanjaya (2006: 196) explains that the inquiry learning strategy is a series of learning activities that emphasize the critical and analytical thinking process to seek and find out for themselves the answer to a questionable problem. Gulo (2011: 84) also explains that it is a series of learning activities that involve the maximum ability of students to search and investigate systematically, critically, logically, analytically, so that they can formulate their own findings with confidence. It can optimize the learning activities of students that will be increasing students' grades, and students are able to work together in group and intergroup competencies.

In inquiry-based learning, students become engaged in many of the activities and thinking processes that scientists use to produce new knowledge. Science educators encourage teachers to replace traditional teacher-centered instructional practices, such as emphasis on textbooks, lectures, and scientific facts (Abdi, 2014). In inquiry-based learning strategy, each group member must ensures that members really master the subject matter given by the teacher because each of individual success is very decisive in solving the group of materials given. The main focus of this study is improving student learning outcomes by using inquiry-based learning strategy in the subjects of electrical and electronic circuit at Vocational High School Negeri 5 Padang.

2. METHOD

This study involved 30 student of class X-3. This type of research is a Quasi-experimental design with one group pretest and posttest. Sugiyono (2010: 74) explains that the design of one group pretest-posttest research used one group or one class only. In undertaking this study, a group of subjects were treated for a certain period in the form of learning using inquiry-based learning strategy. In this

design, the measurement is done twice. Initial tests in the form of pretest given to students prior to being treated. This test is done to know the amount of mastery of student material to the subjects of Electrical and Electronics Circuits. After the pretest followed by the implementation of learning using inquiry-based strategy to know students learning outcomes then performed posttest.

3. RESULTS AND DISCUSSION

Description of research data is the data of learning outcomes Electric Circuits and Electronics, preliminary data is obtained through the result of pretest student learning which numbered 30 people. Then for the final data is giving posttest, after the class was taught by using inquiry-based learning strategy. This research subject is class X-3. Data is collected every meeting in one basic competence. The basic competence of this alternating current circuit has five meetings. Here are the results of research conducted:

The First Meeting

At this first meeting, the students' pretest score ranges from 32-76 and the student's posttest score is 59-95. Class X-3 as the subject of research is learned by using inquiry-based learning strategy. The pretest's result between highest and lowest are formed into the highest score = 71 and lowest score = 50 with total student 30 people. By using statistical calculation, the average score of \bar{X} (pretest) is 49.33 and standard deviation (SD) 16,57.

The posttest results are held after the learning, the highest score 95 and the lowest 59. Average score is 77.5 with standard deviation 9.38. Based on the results of research can be seen the most frequencies achieved on a score of 78-84. Students have achieved a great deal of mastery, as evidenced by the average score of 77.5 students who exceed the minimum criteria of the minimum completeness of 75. It can be seen that the value of posttest in the first meeting, the students who score above 75 is 22 people. It is increased from the pretest which no one get the perfect grade from the test.

The Second Meeting

At this second meeting the students' pretest score ranges between 32-76 and the student's posttest score ranges from 56 to 96. Class X-3 as study subjects is learned by using inquiry-based learning strategy. The pretest's result between the highest and the lowest are formed into the highest score = 76 and lowest score = 32 with total student 30 people. By using the statistical calculation, the average score of \bar{X} (pretest) is 51.15 and standard deviation (SD) 18,18. The number of students who achieve mastery only 3 people.

As for posttest result after learning, highest score 88 and lowest 52, average score is 77,6 with standard deviation 9,92. It can be seen that the value of posttest at the second meeting, the students who achieve mastery over 75 is 23 people, increased from pretest results that only 3 people are get perfect grade.

The Third Meeting

At this third meeting the students' pretest score ranges from 30-75 and the student's posttest score is 60-95. Class X-3 as research subject that is learned by using inquiry-based learning strategy. The pretest result between highest and lowest are formed into the highest score = 71 and lowest score = 50 with total

student 30 people. By using the statistical calculation, the average score of \bar{X} (pretest) is 54.8 and standard deviation (SD) 9.83. The number of students who achieve mastery only 2 people.

The posttest results is held after the learning, the highest score 95 and the lowest 60. Average score is 78.3 standard deviation 8.13. It can be seen that the posttest value of the third meeting, the students who achieve the completeness of values above 75 is 23 people, increased from pretest results that only 2 people are get perfect grade.

The Fourth Meeting

At this fourth meeting the students' pretest score ranges from 32-76 and the student's posttest score is 50-90. Class X-3 as research subject that is learned by using inquiry-based learning strategy. The pretest result between highest and lowest are the highest score = 82 and lowest score = 37 with total student 30 people. By using the statistical calculation, the average score of \bar{X} (pretest) was 59.03 and standard deviation (SD) 10.09.

Based on the results of the study, it is showed that the most frequency on the interval score of 44-50 is achieved by students. The achievement is still much below the minimum completeness criteria of 75. There is no students are get the perfect grade in the fourth pretest meeting. The posttest results are held after the learning, the highest score 91 and the lowest 50. The average score is 76.1 standard deviation 9.38. It can be seen that the value posttest at the fourth meeting, the students who achieve mastery score above 75 is 21 which increased from pretest results.

The Fifth Meeting

At this first meeting the students' pretest score is between 35-75 and the student's posttest score is 60-95. Class X-3 as study subjects is learned by using inquiry-based learning strategy. The pretest results are the highest score = 75 and lowest score = 35 with 30 students. By using the statistical calculation, the average score of \bar{X} (pretest) is 49.33 and standard deviation (SD) 10.04.

Based on the results of the study, it is showed that the most frequency on the interval score of 49-55 is achieved by students. The achievement of student values are still under the minimum completeness criteria that is 75. The number of students who get the perfect grade in the fifth pretest meeting is only 2 people. It can be seen that the value of the fifth meeting, the students who achieve mastery over the value of 75 is 22, there is an increasing from pretest results that only 2 people.

DATA ANALYSIS

Normality test

Normality test conducted to determine whether the study sample is normally distributed or not, testing normality using Chi Square Test (Riduwan, 2006). Normality test is done from the data of class X TITLL3 which gives the result of pretest and posttest.

$$x^2 = \sum_{i=1}^k \frac{(fo-fe)^2}{fe} \quad (1)$$

Information:

x^2 = Results of Chi-square calculations

fo = Frequency being observed
fe = Expected frequency

With the following test criteria: If $X^2_{\text{count}} \geq X^2_{\text{table}}$, meaning the data distribution is not normal. If $X^2_{\text{count}} \leq X^2_{\text{table}}$, meaning that the data is normally distributed with the level of significance $\alpha = 0.05$, and the degrees of freedom (df) = k-1.

Improved Learning Outcomes

The calculation to know the data of pretest and posttest learning result has increased, an analysis is done using gain score formula. The calculation is done five times by comparing the pretest and posttest of the research result. The improvement of student learning outcomes after following the learning activity can be measured by giving pretest and posttest. The improvement of learning outcomes can be analyzed using normalized gain score (Hake ,1999).

$$\langle g \rangle = \frac{(\%<S_i> - \%<S_i>)}{(100 - \%<S_i>)} \quad (2)$$

Information :

g = normalized gain score score
S_f = score from posttest
S_i = score from pretest

The First Meeting

It can be seen that the average increases by using the gain score formula is 0.558. Thus it can be explained that the learning outcomes of students after learning by using inquiry-based learning strategies at the first meeting has increase in the category of being.

The Second Meeting

It can be seen that the average increases by using the gain score formula is 0.498. Thus it can be explained that the learning outcomes of students after learning by using inquiry-based learning strategies at the second meeting has increased in the medium category.

The Thrid Meeting

It can be seen that the average increases by using the gain score formula is 0.519. Thus it can be explained that the learning outcomes of students after learning by using inquiry-based learning strategies at the third meeting has increased in the medium category.

The Fourth Meeting

It can be seen that the average increases by using the gain score formula is 0.460. Thus it can be explained that the learning outcomes of students after learning by using the inquiry-based learning strategy at the fourth meeting has increased in the medium category.

The Fifth Meeting

It can be seen that the average increases by using the gain score formula is 0.508. Thus it can be explained that the learning outcomes of students after

learning by using inquiry-based learning strategy at the fifth meeting has increased in the medium category.

4. CONCLUSION

Results of study on the subjects of electrical and electronic circuits using inquiry learning strategy can create your group of students to think more critically, students are more active, and able to participate in a study group. During the study the students with the help of the teacher has seen more active, more able to think critically, both individually and in groups. This is in accordance with the learning inquiry-based learning strategies.

The result of the gain score is obtained the average of the overall results from the first meeting until the fifth meeting is 0.508, this means the improvement of learning outcomes by using inquiry-based learning strategies have medium category. It can be concluded that by applying the inquiry-based learning strategy can improve student learning outcomes, because of the increase of learning outcomes that significance between pretest and posttest.

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