The Effects of Multimedia Learning on Students Achievement in Terms of Cognitive Test Results

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Abstract. Multimedia learning is also known as learning media, which involves information technology in the form of computer or Android, by bringing together two or more elements consisting of voice, video, text and images incorporated in a multimedia software for students interactively. The purpose of this research is: (1) improving student achievement through multimedia learning in robotics course; (2) compare the students' learning achievement between classes that apply multimedia learning application with the class using conventional method. This research method using an experiment that is comparing two different treatment. Information on learning achievement was obtained through the test. The object of this research is the student of informatics engineering STMIK AKBA, Indonesia even semester of year 2016/2017 which take the course of robotics. Sampling using purposive sampling technique counted 60 people. Analysis of research results using descriptive and inferential analysis. The research results showed that: (1) the application of multimedia learning can improve student achievement for robotics courses; (2) the difference test shows that the learning achievement of the multimedia learning class student is better than the conventional class student.

1. Introduction
Multimedia is the synergy of various media in which the media are like written digital media, graphics, animation, audio (dialogue, sound effects, story), still images (visual drawing and drawing), and moving videos [1], [2], [3]. Meanwhile, interactive multimedia is a two-way learning that is done to convey one or various forms of information from the sender to the recipient by utilizing the latest application in the form of Android or computer. Interactive multimedia conveys in the form of tutorials and is more interesting than conventional learning. Interactive multimedia is considered capable of completing student learning activities, both for theory study and in the form of exercise [4], [5], [6]. In addition, online learning can contribute significantly in improving student learning activities in integrated learning [7]. The use of multimedia learning can also significantly affect students' positive attitudes of learning and improve motivation and self-learning experiences for students [8], [9], [10].

The results of researchers observations on the learning conditions of the object of research indicate that students are less enthusiastic & motivated to learn robotic courses. Researchers suspect the problem is due to the use of conventional learning methods without accompanied by other multimedia
devices. The learning of the robotic courses that have been done so far using the lecturing type learning method. Educators have never shown a physical example of a component used in the making of a robot and shown only images in robotic lecture presentations. Thus, student achievement for robotics course is still quite low. There are 15 (25%) students who have a C exam score, 10 (16.66%) of the people who get D, and 7 (11.66%) of those earning E. While A is 20 (33.33%) and B as many as 8 people (13.33%) from 60 students who follow the robotics courses.

Based on the problem, the researcher tried to improve the students' learning outcomes of the robot courses class by doing an experiment that utilizes multimedia learning device. The essence of multimedia learning is distributed into several elements of media that can affect student achievement. Both in the cognitive, psychomotor and their attitudes in learning. It is also revealed by [11] that the use of multimedia learning can contribute as well as a very significant impact on student learning outcomes. Multimedia can be used as a very effective tool to improve skills in the process of practicum learning. Therefore, researchers use multimedia learning to improve student achievement in robotics courses. Multimedia learning is used as comparator variable between a conventional class with experiment class, to know the difference of learning achievement between classes receiving material with multimedia learning compared to class without using multimedia learning or conventional.

2. Research Methods

This study used an experimental method by comparing two different treatments between classes of students who were given treatment using multimedia software learning with class without learning media or conventional. This research was conducted for 3 months with the object of this research is the students of informatics engineering class 61 (Ti.61) and the student of the informatics engineering class 62 (Ti.62) STMIK AKBA, Indonesia the even semester of 2016/2017 with the population of 60 people divided into 2 (two) different classes of experimental class and conventional class. Sampling using purposive sampling technique, the population is also used as sample research by considering the characteristics of robotics courses class consists of only two classes, namely Ti.61 and Ti.62. Data collection technique is done by giving test instrument to participants of robotics course. Data analysis techniques used are descriptive and inferential statistical analysis using the application of IBM SPSS Statistics version 20.00.

3. Result and Discussion

Instrument research is used to measure student achievement. The validity test of the research instrument used before being applied shows a valid result. The result of the validity test shows that the research instrument has fulfilled the valid criterion with the value of 0.30 and the result of the reliability test analysis of 0.75 which is stated to satisfy the reliable criteria [12], [13]. Furthermore, data collection is done through cognitive tests both for conventional classes and for experiment classes. Based on the treatment given and the results of the analysis in the experiment class for each student obtained the test score, either before the use of multimedia as well as after and after using multimedia learning devices. The analysis results show the pretest score before using multimedia learning and post-test after using the application. The results of the analysis can be seen in Table 1. Result of descriptive analysis of experiment class.

Referring to Table 1. Result of descriptive analysis of experiment class, the pretest achievement result of the experiment class students showed the average score of 67.73. Meanwhile, the average post-test results in the experiment class using multimedia learning shows the mean value of 82.70. The results of descriptive analysis indicate that the value of learning achievement in the experiment class has increased by 14.96%, and to clarify it can be seen that shown in Figure 1. Student learning achievement in multimedia learning classroom.
Table 1. Result of Descriptive Analysis of Experiment Class

| Multimedia Learning | Pretest_ex | Posttest_ex |
|---------------------|------------|-------------|
| N                   | 30         | 30          |
| Range               | 34         | 15          |
| Minimum             | 45         | 75          |
| Maximum             | 79         | 90          |
| Mean                | 67.7333    | 82.7        |
| Std. Deviation      | 9.05894    | 4.14521     |
| Variance            | 82.064     | 17.183      |

Table 1. Result of descriptive analysis of experiment class and Figure 1. Student learning achievement in multimedia learning classroom, visualize the data through tables and graphs showing that the use of multimedia learning influences the value of student achievement as evidenced by an increase of 14.96%. The pretest result shows the mean score of 67.73 and post-test obtained 82.7 (82.7-67.73 = 14.96) from the number of students as many as 30 people. Furthermore, the use of learning media in the experiment class produces a maximum value of 90, a minimum value of 75, a range of 15, a standard deviation of 4.14, a variance of 17.18 and a mean value of 82.7. Compared to student achievement before using multimedia learning obtained an average value of 67.73. The number is much smaller when compared with after using multimedia learning. In addition, the value of the range is obtained at 34, the minimum value of the analysis results is 45 and the maximum is 79. Then, for the standard deviation is 9.05 and the variance of 82.06.

Figure 1. Student Learning Achievement in Multimedia Learning Classroom

The conventional class is a test participant or student who does not use multimedia learning and only uses lecture methods until the meeting is over. Although, it can not be denied that the lecture method is also important to provide an introduction for students in understanding the material presented. Lecture methods can be combined with other methods, known as Mix methods. Mix method helps students who do not understand something that is displayed through multimedia learning, it can be explained through the lecture method, as well as vice versa.

The conventional class using only the lecture method shows the average pretest result of 68.73 with a minimum value of 45.00 and a maximum of 78.00. The average score on the conventional class appears to be slightly larger than the pretest obtained from the experiment class. Furthermore, the range obtained for 33.00 and standard deviation of 8.44 and variance obtained 71.30. The results of the analysis in this section were obtained from classes that did not use multimedia learning. Then, the post-test gets a maximum value of 87.00 with a minimum value of 54.00, and the average obtained for 74.70. Looking at the mean score appears to have a larger score than the previous pretest score so that the average increase from pretest to post-test was obtained at 5.97% (74.70-68.73 = 5.97) with a range.
value of 33, the standard deviation was obtained of 7.72 and variance of 59.66. The results of this study can be seen more clearly in Figures 1. Student learning achievement in multimedia learning classroom and Figures 2. Student learning achievement in the conventional classroom.

![Figure 2](image1.png)

**Figure 2.** Student Achievement in The Conventional Class

The test scores on the conventional class for post-test have better test results compared to the pretest as shown in Figure 2. Student learning achievement in the conventional classroom. Referring to the results of the tests of the two different classes between the experiment class and the conventional class can be further analyzed to prove whether the cognitive test results better experiment class or otherwise. Therefore, in order to prove it is further done inferential analysis using t-test and data normality test because in statistical analysis parametric requirement that must be fulfilled first is to know whether data in a normal category or not. The results of normal test analysis can be seen in Figure 3. The result of normality test of data.

![Figure 3](image2.png)

**Figure 3.** The Result of Normality Test of Data

The data that has been analyzed by inferential statistics fall into the normal category since the data points that spread in the image appear to follow or approximate the straight line, as shown in Fig. 3. The result of normality test of data. Furthermore, the inferential statistical analysis is performed with the aim of comparing student achievement between class experiment with conventional class. The Independent Samples Test is performed to determine the exact difference according to the statistical rule. Previously, homogeneity test was conducted in order to know whether the data group is the same or not. The homogeneity test results indicate that the data is in a homogeneous category or derived
from the student data group having the same variant. The statement is based on the result of the significant value of 0.093 and greater than alpha 0.05. The t-test results can be seen in Table 2. The result of inferential analysis.

Table 2. Result of Inferential Analysis

|                         | Mean Difference | Std. Error Difference |
|-------------------------|-----------------|-----------------------|
| t-test for Equality of Means |                 |                       |
| Ex & Con Equal variances assumed | -8.000          | 1.60050               |
| Equal variances not assumed | -8.000          | 1.60050               |

Table 2. The result of inferential analysis shows that the p-value of the analysis results is < 0.001 and this figure is greater than alpha 0.05. Furthermore, the value of the analysis result in the Equal variances assumed section shows the result of t-test for (4,998) so that the figure appears to have a score greater than the value of t-table whose value is 2.00. Based on the comparison of t-table with t-count of the results of the analysis, it can be stated that there is a real difference of student achievement between experiment class and class using the only conventional method. This opinion is supported by the result of previous analysis which is the improvement of student achievement in the experiment class. The result of the descriptive analysis shows that there is an increase of learning achievement in the experiment or classroom class that uses multimedia learning compared to the conventional class. The results of this study are in accordance with the opinion [14] which explains that with the use of multimedia learning can improve student learning outcomes, compared with the class without using multimedia learning.

Student achievement from experimental research results obtained after passing cognitive tests. The cognitive test aims to measure the level of knowledge of students from C1 level to C6 level based on bloom theory, starting at memory level, understanding, application, analysis, synthesis and evaluation [15]. Thus, the form of questions given according to the level of competence to be achieved. The way took through the task of multimedia learning and with problems that have been developed previously. This method aims to measure students’ ability to the material described earlier.

Multimedia learning provides an instruction in the form of exercise or task to be completed within a predetermined time after the learning process is completed. If the assigned tasks are answered correctly or according to the answers listed in the multimedia application database, then the multimedia learning application can automatically advise the user to proceed to the next discussion of the material. Therefore, the quality of a good environment will greatly affect student achievement, in this case, the use of multimedia learning.

The results of research are relevant to the results of the study [16], [17] which states that multimedia learning gives the spirit to learn and make as a form of student-centered learning and increase the passion, enjoyment and high learning motivation. Furthermore, [18] argues that using multimedia learning that comes with interactive animation can have a positive effect in improving student learning outcomes especially in applying concepts, principles of Java learning and procedures as well as providing different learning styles effects. To that end, the synergy of various forms of instructional media will provide an impressive learning experience for a student so as to transform into a very effective and interactive learning. Because all the activities carried out in the classroom as a simulation of events in real life every day.
4. Conclusion
The result of analysis and discussion of research indicate that there is the influence of multimedia learning to increase student achievement in learning of robotics course, which is indicated by increasing post-test result in experiment class than before using multimedia learning. The increase in student achievement also occurs in the conventional class. The experiment class shows the test result score much better than the conventional class. The result of the analysis is reinforced by the result of inferential analysis showing the difference of student achievement between experiment class and conventional class with t-count value (4.99) bigger than the t-table value (2.00).

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