

The effectiveness of using *physics e-modules* based on *contextual teaching and learning (CTL)* on momentum and impulse material

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Abstract. This study aims to determine the effectiveness of Contextual Teaching and Learning (CTL)-based physics E-Module on momentum and impulse material for grade XI students of SMA Negeri 2 Palembang. The method used in this research is Pre-experimental design one-group pretest-posttest design. The population in this study was all grade XI students of SMA Negeri 2 Palembang and the sample of the study was grade XI Science 7. The instrument used is a test of student learning outcomes in the form of multiple choice and the data of this test result uses t-test analysis. The results showed that the average pretest score of students was 48.25, the average posttest score of students was 76.75. normal distributed normality test with significance (0.083) with significance level 5% with error margin (0.05) then H_a is accepted and the data is normally distributed. Homogeneous test with significance (0.073). This shows that this data is said to be homogeneous because the significance value ($0.05 < 0.05$) with a significance level of 5%, then H_0 is rejected and H_1 is accepted. Furthermore, to measure the learning outcomes of researchers using questionnaire instruments with Likert scale analysis, the answers of 40 students, namely 3472, were found to be very agreeable. This shows the effectiveness of the E-Module media used in learning the physics of momentum and impulse matter.

1. Introduction

This research is something that needs to be owned by everyone where the responsibility of every educator needs to play an important role in educating. Learning is said to be successful if a person is able to repeat the knowledge obtained from the material he has found it is called rote learning. Then, if what has been found is able to be conveyed and expressed in its own language, it is called overlearning [1]. Teaching materials are part of learning resources that act as tools or ways to help students achieve core competencies in learning [2]. Teaching materials play an important role in the world of education, especially for an educator in carrying out effective learning activities. There are various forms of learning materials that can be used by an educator in mastering learning, namely books, LKS, internet, and modules. Modules are learning subjects that are systematically designed based on a certain curriculum that is packaged in the smallest form of learning and allows it to be studied independently in a certain unit of time [3]. Technological advances are growing, the use of modules is transformed as E-Modules. E-modules have many benefits for mastering media and are considered more practical so that students are no longer too dependent on educators, where educators are one source of mastery of information. The motive for using E-Modules in mastery can be very useful for educators because it can help educators explain learning material so that it can be described in detail in realizing learning objectives by using E-Modules based on Contextual Teaching and Learning (CTL) [3]. Contextual Teaching and Learning (CTL) is a learning idea that connects material with real conditions in order to benefit his life [4]. The existence of this teaching material is to gain knowledge and align the use of E-Modules based on Contextual Teaching and Learning (CTL) with the effectiveness of using teaching materials. The Contextual Teaching and Learning (CTL) learning model at the constructivism level refers to the learning process that focuses on students (Student Center), so students need to be active during the learning process. Based on observations made by researchers, it is known that in teaching and learning activities are more likely to be centered on

educators, student activities only listen, write then memorize. The advantage of E-Modules compared to print modules is that they are interactive, easy to navigate, allow to load video, audio, animation, and exams that can be immediately

Get comments effectively. The use of E-modules provides many advantages for students, namely the time used is flexible. E-modules also provide opportunities for learners to correct weaknesses, mistakes and deficiencies in learning. The use of well-structured E-modules can provide many advantages for students, namely the time used is flexible, improving student learning outcomes because E-modules have clear, specific and directed goals. E-modules also provide opportunities for learners to correct weaknesses, mistakes and deficiencies in learning. And E-modules can assess the level of learning outcomes of students [8].

2. Method

The type of research used in this study is quantitative research. Quantitative research in the form of numbers and analysis using statistics. The design used is *pre-experimental design*, this is because there are no sample variables, and the sample is selected random [5]. The techniques used for field data collection are observation, tests, and documentation. The data collection instruments used are tests and questionnaires. The location of the study was conducted at SMA Negeri 2 Palembang. The collected field data is analyzed by calculating the condition test and prerequisite test.

3. Results and Discussion

3.1. Results of pr-test and post-test data

Researchers analyzed data from all Pre-test and Post-test answer results with the aim of determining the effectiveness of using physics e-modules based on contextual teaching and learning on momentum and impulse material. Researchers conducted pre-tests and post-tests then carried out analysis on prerequisite tests and condition tests.

3.1.1 Data normalization test

Table 1. Normalization test results with SPSS 25

| | Shapiro-Wilk | | |
|-------------------------|--------------|----|------|
| | Statistic | Df | Sig. |
| Unstandardized Residual | .951 | 40 | .083 |

Table 1 shows normally distributed data with significance (0.083), which is greater than the margin of error (0.05). This data is obtained by finding the residual value of the entire sample first so that the display is only one table and to know also this test data using Shapiro-Wilk. The normality test has criteria if the significance value is greater than the tolerance value (0.05) then the data can be said to be normal (sig >0.05). Meanwhile, if the significance value is smaller tolerance level (0.05) then the data is said to be abnormal (GIS < 0.05) to find out a normal data or not [6].

3.1.2 Homogeneity test

The homogeneity test is carried out after the normality test which is then carried out the second or last prerequisite test. This test has 2 types of tests, namely homogeneity and linearity tests. With homogeneity tests intended for comparative data and linearity tests intended for correlation data.

Table 2 Normalization test results with SPSS 25

Test of Homogeneity of Variance

| | | Levene | | | |
|-------|---|-----------|-----|--------|------|
| | | Statistic | df1 | df2 | Sig. |
| Hasil | Based on Mean | 3.297 | 1 | 78 | .073 |
| | Based on Median | 2.141 | 1 | 78 | .147 |
| | Based on Median and with adjusted df | 2.141 | 1 | 76.828 | .148 |
| | Based on trimmed mean | 3.264 | 1 | 78 | .075 |

Table 2 shows the data obtained homogeneous with significance (0.073). This data is said to be homogeneous because the margin of error (0.05) is smaller than the significance value ($0.05 < 0.073$). Homogeneity test using SPSS Has criteria if the significance value is greater than the tolerance value (0.05), then the data is said to be homogeneous and inhomogeneous if the opposite result is obtained [7].

3.1.3 T-test

Table 3 T-tst Results using SPSS

| | | Paired Samples Test | | | |
|--------|--------------------|---|---------|----|-----------------|
| | | Paired Differences | | | |
| | | 95% Confidence Interval of the Difference | | | |
| | | Upper | T | df | Sig. (2-tailed) |
| Pair 1 | Pretest - Posttest | -24.56304 | -14.642 | 39 | .000 |

Table 3 shows the significance value ($0.000 < 0.05$) so the result is that there is a significant influence on the difference in treatment given to each variable. Where the treatment given after the pre-test, namely in the post-test, can be seen from the significance of less than 0.05. So H_0 was rejected and H_1 was accepted, so it can be concluded that there are differences in student learning outcomes after the E-Module media in class XI Science 7 SMA Negeri 2 Palembang. That is, there is effectiveness of the E-Module media used in learning the physics of momentum and impulse matter. to test hypotheses that are not in the form of comparisons or relationships between two or more variables hypothesis testing using the independent sample T-test if the significance value (sig.) (2-tailed) < 0.05 , then H_0 is rejected and H_a is accepted, if the significance value (sig.) (2-tailed) > 0.05 , then H_0 is accepted and H_a is Rejected.

3.2. Results of questionnaire data

The questionnaire was used to answer the formulation of the problem, namely "Is the use of Physics E-Modules based on Contextual Teaching and Learning (CTL) on momentum and impulse material effective to be carried out in grade XI high school students". The use of this questionnaire is carried out after treatment or after learning physics using E-Module media is completed. Questionnaires that have been compiled and have been tested for validity.

Table 4. Questionnaire Validity Test Results

| Taraf | 800 | 1600 | 2400 | 3200 | 3472 | 4000 |
|-------------------|------------|-------------|-------------|-------------|--------------|-------------|
| Keterangan | STS | TS | KS | S | Hasil | SS |

Table 4 shows the result data obtained from the total answer results of 40 students = 3472, located in the strongly agreed area. So it can be concluded that physics learning in class XI Science 7 SMA Negeri 2 Palembang, students choose physics learning to be more effective by using E-Module media in their learning.

4. Conclusion

Learning physics using E-Module media in class XI Science 7 SMA Negeri 2 Palembang based on pre-test and posttest results. From the t-test data of two samples, significance was obtained ($0.000 < 0.05$). So the result is that there is a significant influence on the difference in treatment given to each variable. So H_0 was rejected and H_1 was accepted, so it can be concluded that there are differences in student learning outcomes after the E-Module media in class XI Science 7 SMA Negeri 2 Palembang. This means that when there are differences in student learning outcomes after the use of E-Module media in learning, there is effectiveness of the E-Module media used in learning the momentum and impulse material physics. Based on the respondents' questionnaire answers from the number of students multiplied by the maximum number of scores for all answer items, $40 \times 100 = 4000$. While the number of scores obtained from the study (student answers) = 3472. Based on these data, the use of E-Module media in learning the physics of momentum and impulse matter = $(3472: 4000) \times 100\% = 0.93 \times 100\% = 93\%$ of the maximum result of 100%. So based on what is obtained from the total answer results of 40 students = 3472, lies in the area strongly agree. So it can be concluded that learning the physics of momentum and impulse matter, students choose physics learning to be more effective by using E-Module media in their learning.

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