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Effectiveness of Educational Statistics Learning Modules

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Abstract
This research was conducted at the Faculty of Islamic Studies, Indonesian Muslim University, Education Study Program, with the aim of this research being to determine the effectiveness of the Educational Statistics learning module. The research method uses a quantitative research type with an experimental One Group Pretest-Postest Design approach, with a sample of 20 students from the education study program at the Faculty of Islamic Religion, Indonesian Muslim University (FAI-UMI). The results of the research show that the results of the analysis, fulfilling the assumptions of normality and homogeneity, as well as hypothesis testing using the paired t-test, show that the average value of post-test Educational Statistics learning outcomes is significantly different and much higher than the average pre-test Educational Statistics learning outcomes. It was concluded that the application of the Educational Statistics learning module was effective.

Keywords*: modul, learning, statistics.*

INTRODUCTION

Educational Statistics Learning specifically and learning in general, (Sanjaya, 2011), suggests that learning in Indonesia should fulfill the four pillars of education formulated by UNESCO, namely: (1) Learning to know, which implies that learning is basically not only oriented towards products or learning outcomes, but must also be oriented towards the learning process, (2) Learning to do, implies that learning is not just hearing and seeing with the aim of accumulating knowledge, but learning to do with the ultimate goal of mastering competencies that are very necessary in era of global competition, (3) Learning to be, implies that learning is forming humans who "become themselves", (4) Learning to live together, is learning to work together. (Delors et al., 1998)(Benavot, 2011).

Learning Educational Statistics consists of facts, concepts or assumptions that originate from the realities of life, so to understand them requires creative efforts in thinking, analyzing and applying them in various real situations (Wahab & Junaedi, 2021). Educational Statistics learning must be packaged in such a way that it is interesting by using strategies, approaches, methods or teaching techniques that can foster students' enthusiasm for learning, make it easier for them to comprehend and comprehend what is presented so as to create optimal learning outcomes. (Wicaksono & Purnomo, 2021) (Purnomo et al., 2008) (Suwandi, 2011) (Rahman, 2018) (Yazidi, 2014)

Based on the teaching experience of researchers in the Education study program, Faculty of Islamic Studies, Indonesian Muslim University (FAI-UMI), the results of learning Educational Statistics were not satisfactory, especially in the two-sample t-test analysis. The results of observations of students from the FAI-UMI education study program revealed that students had difficulty understanding the

two-sample t-test material, especially in the application of statistical software. Students are also used to understanding material based on lecturers' explanations during learning. Lecturer-centered learning causes students' abilities to be less explored and requires longer learning time, this causes learning to be less effective.

Based on the results of observations in the field, in implementing Educational Statistics learning, lecturers only use teaching materials in the form of textbooks. To present the material contained in the textbook. Apart from that, there are limited textbooks provided by universities and the unavailability of learning modules on Educational Statistics material, especially in the FAI-UMI Education Study Program.

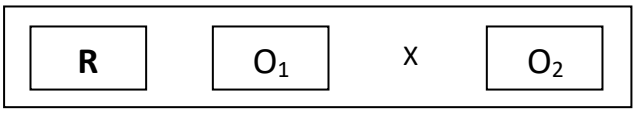
METHOD

Based on the main objective of this research, it is to find out effective Educational Statistics (PSP) learning. Thus, this type of research is quantitative research. Data about the effectiveness of learning modules can be in the form of; Educational Statistics Learning Outcomes (HBSP). The data source is 20 students from the FAI-UMI Education study program.

The effectiveness of educational statistics learning is obtained by comparing the pre-test and post-test scores on educational statistics learning results which will be analyzed statistically. The experimental method used in this research, namely; One Group Pretest-Posttest Design (Sugiyono, 2014).

The design used in this research is One Group Pretest-Posttest Design which can be described as follows;

Graph 1. MPSP Trial Experimental Design Scheme



Data analysis of educational statistics learning outcomes (Sugiyono, 2009) is as follows:

Table 1. Educational Statistics Learning Outcomes Category

Interval Scale	Category
85 ≤ HBLS ≤ 100	The Highest
65 ≤ HBLS ≤ 84	High
55 ≤ HBLS ≤ 64	Quite High
35 ≤ HBLS ≤ 54	Low
0 ≤ HBLS ≤ 34	The Lowest

RESULT AND DISCUSSION

Result

The learning was carried out over nine meetings, namely two test meetings (pre-test and post-test) and seven material meetings. The Educational Statistics learning outcomes test is given to students at the beginning of the meeting (pre test) and at the end of the meeting (post test), the aspects they want to know include: basic knowledge aspects, two sample t test concept aspects, two sample t test application aspects, calculation aspects of the two-sample t test, and aspects of the interpretation of the two-sample t test. The pre-test and post-test were given to determine the description of Educational

Statistics learning outcomes using descriptive statistical analysis and to determine the effectiveness of student learning outcomes (Arikunto, 2018).

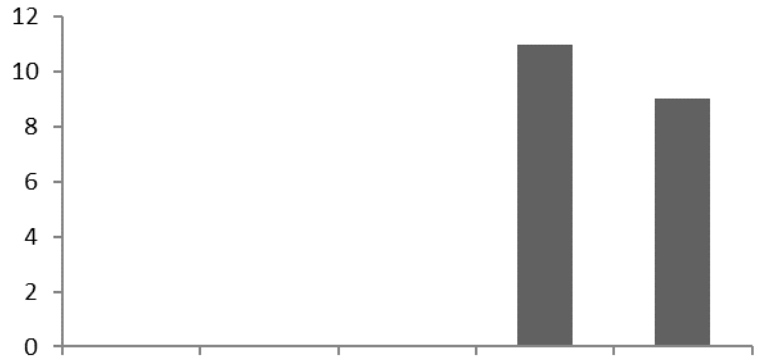
(1) Description of pre-test Educational Statistics learning outcomes
The educational statistics learning outcomes aspect consists of 24 question items including 5 question items about basic knowledge, 8 question items about the concept of the two-sample t test, 3 question items about the application of the two-sample t test, 5 question items about the calculation of the two-sample t test, 3 items questions about the interpretation of two-sample t tests. Ideally, the correct answer is given a score of 1 and the wrong answer is given a score of 0, then converted to a score of 100, the lowest score is 23.6 and the highest score is 42.5, the mean is 34.6 with a standard deviation of 5.5. To find out the frequency distribution of each category, see Table 2.

Table 2. Pre-Test Frequency Distribution of Educational Statistics Learning Results

Category	Interval Score	Frequency	Percentage (%)
The Highest	85 – 100	0	0
High	65 – 84	0	0
Quite High	55 – 64	0	0
Low	35 – 54	10	50
The Lowest	0 – 34	10	50

Based on the frequency distribution in Table 2, it can be explained that of the 20 respondents who were given a pretest on educational statistics learning outcomes in relation to the total pretest score, there were 10 respondents (50%) with low learning outcomes, and 10 respondents (50%) with low learning outcomes. very low. This means, of the 20 respondents who were given the pretest, most of the students had very low learning outcomes, so it was concluded that the pretest Educational Statistics learning outcomes were generally low learning outcomes.

Graph 2. Pre-test of HBSP



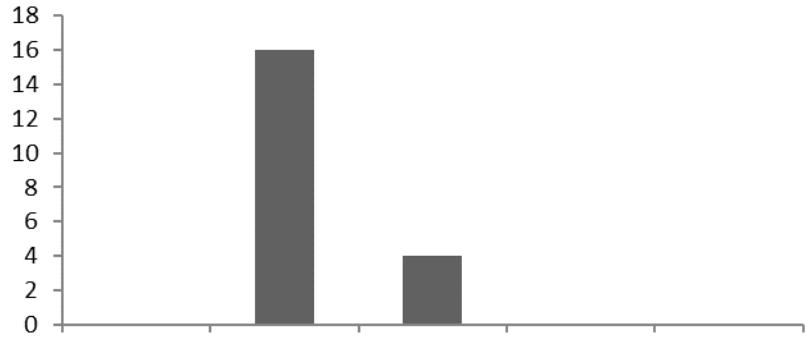
(2) Description of post test Educational Statistics learning outcomes
The post-test total score aspect of educational statistics learning results consists of 24 question items including 5 question items about basic knowledge, 8 question items about the concept of the two-sample t test, 3 question items about the two-sample t-test application, 5 question items about the two-sample t-test calculation, and 3 questions about the interpretation of the two-sample t test. Ideally, the correct answer is given a score of 1 and the wrong answer is given a score of 0, then converted to a score of 100, the lowest score is 55.6 and the highest score is 82.6, the mean value is 72.7 with a standard deviation of 7.8. To find out the frequency distribution of each category, see Table 3.

Table 2. Pre-Test Frequency Distribution of Educational Statistics Learning Results

Category	Interval Score	Frequency	Percentage (%)
The Highest	85 – 100	0	0
High	65 – 84	15	75
Quite High	55 – 64	5	25
Low	35 – 54	0	0
The Lowest	0 – 34	0	0

Based on the frequency distribution in Table 3, it can be explained that of the 20 respondents who were given a post test on educational statistics learning outcomes, there were 15 respondents (75%) with high learning outcomes, and 5 respondents (25%) with quite high learning outcomes. This means, of the 20 respondents who were given the post test on , most students had high learning outcomes, so it was concluded that post test Educational Statistics learning outcomes were generally high.

Graph 3. Post-test of HBSP



Next, test the hypothesis of differences in educational statistics learning outcomes using the paired t test, by first testing the normality and homogeneity of the data (Sugiyono, 2014), which can be described as follows:

1. Normality Test

The data normality test is intended to obtain normal data distribution or not as a condition for testing parametric statistical hypotheses. The criteria for normality of data distribution are determined by the correspondence between the observed data and a normal distribution. Normality testing uses the Kolmogorov-Smirnov test. The decision making criteria is that if the significance value is smaller than 0.05 then the distribution is not normal, whereas if the significance value is greater than 0.05 then the distribution is normal.

The Lilliefors normality test (Kolmogorov-Smirnov) shows that the p value = 0.4007 is greater than α = 0.05, so the pre test score is normally distributed, while the post test score has a p value = 0.200 greater than α = 0.05 , then it is normally distributed. This means that at a significance level of 5% the normalized gain in pretest and posttest scores of Educational Statistics learning results comes from a normal population.

2. Homogeneity Test

The data homogeneity test is intended to obtain homogeneous data distribution or not as a condition for testing parametric statistical hypotheses. Homogeneity testing uses Levene's test. The decision making criterion is that if the significance value is smaller than 0.05 then the distribution of the two variances is not homogeneous, whereas if the significance value is greater than 0.05 then the distribution of the two variances is homogeneous.

Levene's Homogeneity Test shows that the value of p = 0.213 is greater than α = 0.05, so the

distribution of both pretest and posttest variances is homogeneous, which means that at the 5% level of significance the normalized gain of pretest and posttest scores for Educational Statistics learning outcomes is homogeneous.

From testing the normality and homogeneity of score gains, it can be seen that the score gains are normally and homogeneously distributed. Thus, the test for equality of two means uses a paired t-test.

3. Test the differences in educational statistics learning outcomes
The difference test was carried out on two samples, namely pretest and posttest (Uno, 2008). This difference test was carried out with the aim of determining the effectiveness of the students' Educational Statistics learning module. The decision making criteria are if the significance value is smaller than 0.05 then H0 is rejected or there is a difference, whereas if the significance value is greater than 0.05 then H0 is accepted or there is no difference. The paired t-test difference test with the Minitab program shows that the value of $p = 0.003$ is smaller than $\alpha = 0.05$, so H0 is rejected, which means that at a significance level of 5%, the pretest and posttest scores for educational statistics learning outcomes are different. Thus, the Educational Statistics learning module has proven to be effective, which means that the Educational Statistics learning module is more effective in improving Educational Statistics learning outcomes.

Discussion

The measurement of effectiveness in this research can be seen from the results of studying Educational Statistics and student activity sheets. The effectiveness of the learning module is determined by the learning outcomes tests given to students. The learning outcomes test developed in this study is the Education Statistics learning outcomes test. This test is carried out on subjects who are research subjects. Before treatment, a pre-test was carried out and after treatment, a post-test was carried out. Then all the data from the pre-test and post-test results were analyzed statistically to obtain the results of the analysis requirement assumption tests, namely the normality test and homogeneity test. After fulfilling the assumption requirements, the analysis was continued with the paired t test. (Wahab et al., 2018)

Based on the results of the analysis, the assumptions of normality and homogeneity have been fulfilled, then the paired t test shows that the average value of the post test learning outcomes is significantly different and much higher than the average pre test learning outcomes. Thus, it is concluded that the application of the Educational Statistics learning module is effective.

CONCLUSIONS AND SUGGESTIONS

The Educational Statistics learning module is effectively used to improve student Educational Statistics learning outcomes obtained through indicators of student Educational Statistics learning outcomes which have increased significantly.

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