The effectiveness of using Edmodo based e-learning in the applied mechanics course

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Abstract. This study aims to investigate: 1) The differences in learning outcomes between the cadets who were taught by using Edmodo-based e-learning and those who were taught by using face-to-face conventional instruction; and 2) The effectiveness of using Edmodo-based e-learning on learning outcomes of cadets. This study was quasi-experimental research involving 39 cadets of the Technica Study Program in the even semester in the academic year of 2018/2019. The assessment was gained from the learning outcomes of the cadets before the treatment (pre-test) and after the treatment (post-test). The data were then analyzed using a t-test to determine differences in the cadets’ learning outcomes and n-gain test to determine the effectiveness of using Edmodo based e-learning in learning outcomes compared to the use of conventional face-to-face instruction. The results of this study showed that: 1) There is a significant improvement in the learning outcomes of the cadets who were taught by using Edmodo-based e-learning compared to those who were taught by using conventional face-to-face instruction with the post-test score of 92.89 for the experimental class and 78.35 for the control class, and 2) The use of Edmodo based e-learning in the Applied Mechanics course was considered quite effective as the value of the n-gain test reached 75.82% for the experimental class. As the use of Edmodo-based e-learning has a very positive impact on improving the learning outcomes of the cadets, this learning media is feasible to be applied to support the learning process.

1. Introduction
In the field of information technology education, it is focused on improving the quality of learning activities to improve the quality of education[1,2]. Maintaining the quality of education is very important. Learning is not just about conveying knowledge, but it must be up to the application of that knowledge[3,4,5]. Maintaining the quality of education is very important. Learning is not just about conveying knowledge, but it must be up to the application of that knowledge. The quality of education can be found in all components of education are met[6,7]. One of the components is educational media. Educational media or learning media grows in line with the development of learning technology[8].

Applied Mechanics is one of the work skills courses in the Technica Study Program at Yogyakarta Maritime Academy[9]. From the results of the field observation, most of the lecturers in the Technica Study Program still used conventional face-to-face learning and there were still many lecturers who did not use learning media[10]. From the results of interviews with cadets, it was found that most cadets felt bored with the learning model and cadets needed suitable learning for the learning process. Media selection is very important to be done by educators [11]. The use of good media can increase motivation and learning outcomes of students[12,13]. Furthermore, the data from the observation
shows that this learning model has a very important role in the process of transfer of knowledge to the cadets. Such e-learning models are urgently needed to provide a positive solution, especially to keep up with the digital age. The development of this learning media needs to be done because, in fact, many educators still use conventional learning models.

In this digital age, a lot of media has been created and can be used to support learning activities, especially e-Learning. Through e-learning, students do not only listen to material descriptions from educators, but also actively observe, do, demonstrate, and so on. E-learning is a learning method in the form of a combination of network technology and multimedia that is mated with pedagogy and andragogy [14,15]. Internet-based learning media or e-learning that is used to support learning activities is Edmodo[16, 17]. Edmodo is a virtual classroom with technology that includes Animoto, wikis, and google documents[17]. Edmodo is an interesting media for educators and students with elements that resemble Facebook[18, 19, 20]. An educator can easily manage a system that provides the best and practical features, so educators are always connected with students and manage student activities easily. Learning activities that can be used by available features on Edmodo media namely content sharing or sharing subject matter, assignments, polls and allow for discussion activities on the comments feature[17, 18].

Edmodo is developed based on the principles of class-based group management and social media [21,22]. In using Edmodo, it is not only lecturers and students who can interact, but parents of students also have an account to participate in communicating with the lecturer, so that they can see their children’s progress during the learning process. Edmodo is a social learning platform for lecturers, students, and parents. Lecturers can also post scores, assignments to students[21, 22, 23].

Based on the problems, the research needs to be carried out on knowing: 1) The differences in learning outcomes between the cadets who were taught by using Edmodo-based e-learning and those who were taught by using face-to-face conventional instruction; and 2) The effectiveness of using Edmodo-based e-learning on learning outcomes of cadets in the Applied Mechanics course at the Technica Study Program, Yogyakarta Maritime Academy.

2. Method
The research method used in this study was a quasi-experimental[24]. The research design used two classes, namely the experimental class and the control class. The experimental class is the class that is given treatment, in this study the treatment given was lectures using e-learning based on Edmodo. While the control class was a class that is used for comparison of the experimental class, namely by using conventional face to face lectures. The following is an overview of research generally.

| Class          | Pre-test | Treatment | Post-test |
|----------------|----------|-----------|-----------|
| Experiment (E) | O₁       | X₁        | O₂        |
| Control (C)    | O₃       | X₂        | O₄        |

Notes:
E : Experimental Class
C : Control Class
O₁ : Initial test before the experimental class treatment
O₂ : Final test after experimental class treatment
O₃ : Initial test before control class treatment
O₄ : Final test after control class treatment
X₁ : Treatment with Edmodo-based e-learning
X₂ : Treatment without Edmodo-based e-learning

This research was conducted at the Technica Study Program, Yogyakarta Maritime Academy. When this research was conducted in April 2019 - May 2019 in the Applied Mechanics course. Data collection is taken from the learning outcomes of cadets before treatment (pre-test) and learning
outcomes of cadets after the treatment (post-test). Data analysis used hypothesis testing. Hypothesis Testing is a test conducted to find out the truth of the hypothesis. Because the hypothesis is a conjecture or a temporary answer to the existing problem, it is necessary to test the truth of the hypothesis. The analysis to be tested is "The Effectiveness of Edmodo-Based E-learning in Applied Mechanics Courses at Technica Study Program, Yogyakarta Maritime Academy". This hypothesis was tested using t-test and n-gain analysis. t-test was conducted to determine the differences in learning outcomes of cadets who used Edmodo-based E-learning with those using conventional face to face lectures in applied mechanics courses, especially between the experimental class and the control class. In this study, if the data have proven to meet the requirements of normal distribution and variance between homogeneous classes, a t-test is performed. This test is done using a t-test to post-test data. Tests used using t the difference in the average of two samples that are mutually free (Independent sample t-test). The two samples were compared to see whether there were differences or not after being given treatment to each sample. The research hypotheses are as follows:

$H_0$ : There are no differences in learning outcomes of cadets using Edmodo-based E-learning compared to learning outcomes of cadets using conventional face to face methods

$H_a$ : There are differences in learning outcomes of cadets using Edmodo-based E-learning compared to learning outcomes of cadets using conventional face to face methods

The basis for decision making in the independent sample t-test is as follows:

1. If the value of sig. (2-tailed) $> 0.05$, then $H_0$ is accepted and $H_a$ is rejected, which means there is no difference in learning outcomes of cadets using Edmodo-based E-learning compared to learning outcomes of cadets using conventional face to face methods

2. If the value of sig. (2-tailed) $< 0.05$, then $H_0$ is rejected and $H_a$ is accepted, which means there are differences in learning outcomes of cadets using Edmodo-based E-learning compared to learning outcomes of cadets using conventional face to face methods. N-gain test is to determine the effectiveness of using Edmodo-based e-learning with the formula:

$$n - gain = \frac{post\ test\ score - pre\ test\ score}{ideal\ score - pre\ test\ score} \quad (1)$$

The following is the interpretation of gain effectivity

| Table 2. n-Gain Effectiveness Interpretation |
|---------------------------------------------|
| Percentage (%) | Interpretation |
| <40 | Ineffective |
| 40-55 | Less effective |
| 56-75 | quite effective |
| >76 | Effective |

3. Result and Discussion

By using IBM SPSS Statistics 23 software, the descriptive statistics test is obtained as follows:

| Table 3. Descriptive statistics for pre-test and post-test of control and experimental class |
|---------------------------------------------|
| N | Minimum | Maximum | Mean | Std. Deviation |
|---------------------------------------------|
| Pre-test control | 20 | 40.00 | 98.00 | 72.6500 | 17.42435 |
| Post-test control | 20 | 57.00 | 90.00 | 78.3500 | 9.21255 |
| Pre-test experimental | 19 | 40.00 | 80.00 | 65.7895 | 13.87075 |
| Post-test experimental | 19 | 85.00 | 100.00 | 92.8947 | 4.18854 |

The control class obtained from the 02 class from the 2018/2019 year consisted of 20 cadets. The control class was given treatment using conventional learning face to face. Data retrieval was done in 2 ways, namely using pre-test and post-test. The control class cadets' learning outcomes were as
follows: The pre-test learning outcomes of the control class came from the initial test with the number of items about 10 items. From these tests obtained the highest value of 98 and the lowest value of cadets 40. With an average score of 72.65. Data on the post-test learning outcomes of the control class cadets came from the final data retrieval with the number of items about 10 items. From these tests obtained the highest value of 90 and the lowest value of cadets 57. With an average score of 78.35. The experimental class obtained from class 01 of the even semester TA. 2018/2019 consisted of 19 cadets. The experimental class was given treatment using learning using Edmodo-based E-learning. Data retrieval was done in 2 ways, namely using pre-test and post-test. The data of the pre-test learning outcomes of the experimental class cadets came from the initial test with the number of items with the same problems as the control class. From these tests, the highest score was 80 and the lowest score was 40 with an average score of 65.79. Post-test learning outcomes data for experimental class cadets came from the final data collection with the number of items about 10 items. From this test, the highest score was 100 and the lowest score was 85. With an average score of 92.89.

Then, a t-test was conducted to find out the difference between cadets learning outcomes using Edmodo-based E-learning and those using conventional face to face lectures. In this study the data had been proven to meet the requirements of normal distribution and variance between homogeneous classes, so that t-test can be done. The following is the result of tests conducted:

| Table 4. Independent Samples Test |
|----------------------------------|
| Levene's Test for Equality of Variances | t-test for Equality of Means | 95% Confidence Interval of the Difference |
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Post-test | Equal variances assumed | 11.419 | .002 | -6.289 | 37 | .000 | -14.545 | 2.313 | -19.231 | -9.859 |
| | Equal variances not assumed | -6.399 | 26.827 | .000 | -14.545 | 2.273 | -19.210 | -9.879 |

Based on the results presented in table 4, it is known that the value of sig (2-tailed) was 0.000, so the significance value was 0.000 < 0.05 so that H₀ was rejected and Ha was accepted. So it can be concluded that "There were differences in learning outcomes of cadets using Edmodo-based e-learning compared to learning outcomes of cadets using conventional face to face methods" have been proven. This is reinforced by the increase in the average learning outcomes of the pre-test and post-test grades of the experimental class and the post-test class as in the figure below:
Figure 1. Cadets Learning Outcomes

From the Figure above it can be shown that in the control class learning outcomes of the pre-test and post-test scores of the control class from 72.65 to 78.35 with an increase in the average score of the control class by 5.70. While the experimental class learning outcomes of the pre-test and post-test control class score was 65.79 to 92.89. With an increase in the average value of the experimental class by 27.10. Figure 1 showed that the increase in learning outcomes of the experimental class cadets was higher than the control class based on the treatment carried out.

Then the n-gain test was performed to determine the effectiveness of using Edmodo-based E-learning in the subject of applied mechanics at the Technica Study Program. Calculation of the percentage of interpretation of the effectiveness of the gain test was obtained from the experimental group based on the calculation of the post-test and pre-test score. The following is the n-Gain calculation in the experimental class:

| Class     | Pre-test | Post-test | n-gain (%) |
|-----------|----------|-----------|------------|
| Control   | 78.35    | 72.65     | 40.00      |
| Experimental | 65.79  | 92.89     | 75.82      |

Table 5 shows the n-gain test result, it was 40% for the control class with less effective classification, while the n-gain test result of 75.82% from the experimental class. into the category was quite effective. So based on these interpretations it can be said that the Edmodo-based e-learning lecture was quite effective in improving the learning outcomes of cadets. This learning media is therefore feasible to be applied in the learning process as an alternative to the cadets’ learning needs in this digital age.

4. Conclusion

Based on research conducted on the effectiveness of using Edmodo-based E-learning in the Applied Mechanics Course in the Technica Study program, Yogyakarta Maritime Academy. The following conclusions can be drawn: (1) Learning outcomes of cadets using Edmodo-based e-learning had increased compared to the learning outcomes of cadets using conventional face to face methods. This difference can be seen from the average learning outcomes of cadets through the experimental class post-test of 92.89 and the control class of 78.35. Thus, it indicated that this learning media has a positive impact on the cadets’ learning outcomes; (2) The use of e-learning Edmodo-based was
included in the quite effective category. It can be seen from the acquisition of the n-gain test of 75.82% for the experimental class that falls into the quite effective category. Thus, it indicated that this learning media is feasible to be applied in the learning process to improve the cadets’ learning outcomes.

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