Application of Gamification-Based Online Learning on Student Learning Outcomes During the Covid-19 Pandemic

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ABSTRACT

The Covid-19 pandemic case had an impact on student teaching and learning activities. Teaching and learning activities that were originally face-to-face changed to online or through the internet network. One of the impacts of online learning is that students feel bored, so the value of student learning outcomes decreases. To overcome these problems gamification is applied to online learning. Gamification is a learning strategy that includes game elements in it. This study aims to see the effectiveness of gamification-based online learning on student learning outcomes. The method used in this research is quasi-experimental with a nonequivalent control group design. The results showed that there were differences between the post-test scores of the gamification-based online learning group and the regular online learning group. This is reinforced by the value of descriptive statistics, namely the mean value of the gamification-based online learning post-test is higher than the post-test value of ordinary online learning. Based on the results of the N-Gain test, the mean value for the N-Gain test in the gamification-based online learning group of 77,3095% is included in the effective category. It was concluded that gamification-based online learning is effective for improving student learning outcomes.

Keywords: online learning, gamification, learning outcomes, effectiveness

INTRODUCTION

Indonesia has experienced cases of the Covid-19 pandemic starting in 2020. This case was caused by a contagious virus, namely the Coronavirus. Day by day the number of transmissions of Covid-19 is getting higher. Therefore, the government took a policy to reduce community activities, one of which was changing teaching and learning activities. Student teaching and learning activities that were originally face-to-face at school were changed to teaching and learning activities from home. Teaching and learning activities carried out from home utilizing the internet network are said to be online learning. Online learning is learning that is carried out through the internet network. Learning is done with the help of online media such as Google Classroom, Moodle, Zoom, and so on. As time goes by, the process of implementing online learning experiences several obstacles, especially during practicum activities. Two-way communication between students and lecturers is reduced, it can be seen from the enthusiasm of students when learning takes place to be passive. To overcome this, an effective strategy is needed in implementing online learning, namely gamification.

Gamification is a learning strategy that applies games to learning activities. The

application of the game in question is to include elements of the game in the learning process. Gamification is used to motivate students to be more enthusiastic and involved in the learning process. That way, it is hoped that the learning process uses gamification, providing alternatives to make the learning process more interesting, fun, and effective (1). An interesting learning process will have an impact on student learning outcomes.

Previously, (2) researched and developed gamification-based online learning using Moodle media. Then, (2) modified online learning on Moodle media by adding gamification. However, in this study, it has not been seen whether the gamification applied affects student learning outcomes. On this occasion, further research was carried out with the aim of research to determine the role of gamification-based online learning in student learning outcomes, especially during the Covid-19 pandemic. In addition, the effectiveness of gamification-based online learning on student learning outcomes will be seen.

LITERATURE REVIEW

According to (3), online learning is defined as learning that is carried out through the help of the internet or online computers in a class, resulting in an interaction between students and lecturers. In addition, online learning does not depend on the location of students and lecturers participating in it. Online learning can be carried out using the Learning Management System (LMS) (4). LMS is an application that handles administrative tasks related to learning such as creating and providing online courses and recording student data (5). Online learning is used as a solution for learning conducted during the Covid-19 pandemic (6,7).

Online learning cannot completely replace face-to-face learning, because the implementation of learning requires interaction and communication between lecturers and students. Interactions in online learning seem to be just the distribution of information, so students lose learning abilities and experiences. One of the reasons is the lack of lecturers' understanding of the concept of online learning so lecturers give more assignments than delivering learning material. In addition, difficulties in internet networks in some areas can cause online learning to not be optimal. Online learning results in students not focusing on learning, online learning facilities are still lacking, and parents and teachers are not ready for online learning (8). In line with this (9) argues that online learning is not effective because students feel bored. This was reinforced by Mediana where as many as 9% of respondents felt they had lost their ability to study, 12% felt bored, and 8.3% needed a vacation (10). The majority of students feel that online learning is ineffective because in practice educators are more dominant in giving assignments rather than explaining the material.

To attract students to the online learning process, the latest learning innovations are needed, namely the use of gamification in learning. Gamification is defined as the use of game design elements in non-game contexts (11). Gamification is a solution that is included in the e-learning system that increases motivation and learning outcomes (12). Game mechanisms such as points, levels, prizes, and feedback in gamification are offered to be integrated into the e-learning system (13). The review was conducted by (14) on the level-up plugin gamification in Moodle, where there is a positive response to level-up to improve Moodle. Gamification-based interactive learning can be a new variation in teaching and learning activities and run effectively when Work From Home (15). Furthermore, (10) said that the application of gamification in the Blended Learning model to Graphic Design learning outcomes increased in value but did not have a significant effect. In addition, (16) and (17) conducted research on the effect of gamification elements on student learning outcomes in e-learning java programming using CodeManiac (CoMa) media. Based on the results of research (18), 67.7% of students stated that online learning with gamification was felt to be more fun,

and more efficient to implement. This is reinforced by statement (19) that giving gamification is effective in learning mathematics. Gamification can also give a new color to the learning process because the learning process is not monotonous. The learning process uses online gamification features, providing alternatives to make the learning process more interesting, fun, increasing motivation, and more useful and effective, especially during the Covid-19 pandemic (20). Based on the results of research (21) which conducted a meta-analysis on the effects of gamification on learning outcomes both cognitively, motivationally, and behaviorally, gave positive results.

MATERIALS & METHODS

This study uses a quantitative research approach. Quantitative research is research conducted for data in the form of numbers (22). This type of research is experimental research using quasi-experimental with a nonequivalent control group design (23). The sample in this study was 20 students of PBSI Universitas Islam Darul 'ulum Lamongan semester 6 consisting of 10 students in class A as the experimental class and 10 students in class B as the control class. The experimental class is a class that uses gamification-based online learning, while the control class is a class that uses regular online learning. The sampling technique uses cluster random sampling. Data collection techniques used two types of tests, namely pre-test, and post-test. The first research stage is validity and reliability testing. This test aims to see if the pre-test and post-test questions can be used validly and reliably when collecting data. The second stage, perform data analysis. The data analysis technique was carried out using an independent sample t-test. Before the independent sample t-test is carried out, it is necessary to carry out the normality test and homogeneity test. The final stage of this research is to determine the effectiveness of gamification-based online learning using the N-gain test. To assist the process of data analysis, researchers used SPSS 25 software.

RESULT

Before data analysis, the validity and reliability of the pre-test and post-test instruments were first performed. The validity test is used to test the items on the instrument used whether valid or not (24), while the reliability test is used to measure the reliability of the instrument and whether it can be used repeatedly (24). The validity test uses Pearson's correlation, while the reliability test uses the Cronbach-alpha value. The following are the results of validity and reliability tests.

Table 1. Validation Test Result

Question	Pre-test			Post-test		
	p-value	r-value	Criteria	p-value	r-value	Criteria
1	0,000	0,652	Valid	0,000	0,865	Valid
2	0,000	0,629	Valid	0,000	0,665	Valid
3	0,000	0,877	Valid	0,000	0,827	Valid
4	0,000	0,706	Valid	0,001	0,598	Valid
5	0,000	0,709	Valid	0,000	0,751	Valid
6	0,032	0,392	Valid	0,005	0,494	Valid
7	0,033	0,389	Valid	0,017	0,433	Valid
8	0,002	0,549	Valid	0,001	0,560	Valid
9	0,000	0,629	Valid	0,000	0,725	Valid
10	0,000	0,652	Valid	0,000	0,674	Valid

As seen in Table 1, the p-value for each question item is less than 0.05, and the r-value for each question item is greater than the r-table value of 0.3610. Question items are said to be valid if they have a p-value <0.05 and r-value <r-table (22). That way, each question item in the pre-test and post-test questions is said to be valid. That is, the instrument questions on the pre-test and post-test questions can be used as an accurate measurement tool. Next, a reliability test was

performed using the Cronbach-alpha value. Here are the results.

Table 2. Reliability Test Result

Value	Pre-test	Post-test
Cronbach-alpha	0,808	0,847

As seen in Table 2, the Cronbach-alpha values for each of the pre-test and post-test questions were 0.808 and 0.847. Then, (24) says that the problem is said to be reliable and can be accepted if the Cronbach-alpha value is greater than 0.6. That way, the pre-test, and post-test questions are said to be reliable. That is, pre-test and post-test questions can be used as instruments for reliable data collection.

After the pre-test and post-test question instruments are said to be valid and reliable, then these instruments can be used for data collection. When collecting data, both classes, both experimental and control classes, were given the same pre-test questions. In the experimental class, gamification-based online learning was applied, while the control class used ordinary online learning. The learning media used is Moodle. After implementing the learning in each class, an assessment of student learning outcomes was carried out using the same post-test questions for each class. The following is a summary of descriptive statistics on student learning outcomes from the experimental and control classes.

Table 3. Descriptive Statistics

Category	Experiment Class		Control Class	
	Pre-test Score	Post-test Score	Pre-test Score	Post-test Score
Mean	5,80	9,00	5,70	7,20
Median	6,00	9,00	5,50	7,00
Modus	6,00	9,00	5,00	7,00
Standard Deviation	1,317	0,816	1,337	0,789
Variance	1,733	0,667	1,789	0,622
Minimum value	3,00	8,00	4,00	6,00
Maximum value	8,00	10,00	8,00	8,00

Based on Table 3, it can be seen that the average post-test score for the experimental class is higher than the post-test average score for the control class. This means that student learning outcomes using gamification-based online learning are better than student learning outcomes using regular online learning.

The next stage is data analysis. The data analysis technique was carried out using an independent sample t-test. Independent test sample t-test is Before the independent test sample t-test is carried out, it is necessary to carry out a normality test and homogeneity test. The normality test is used to test whether the data follows a normal distribution or not (25,26), while the homogeneity test is used to test whether the data has the same variance or not (25,26). Both of these tests need to be carried out because they are a prerequisite for conducting an independent sample t-test.

Table 4. Normality Test

Data	P-value Score
Pretest_Experiment	0,053
Pretest_Control	0,200
Posttest_Experiment	0,200
Posttest_Control	0,091

Based on the results of the normality test in Table 4, it can be seen that the p-value for each pre-test and post-test result in the experimental and control classes is greater than 0.05. That is, the results of the pretest and posttest in the experimental and control classes follow a normal distribution.

Table 5. Homogeneity Test

Homogeneity Test	Pretest (Experiment & Control)	Post-test (Experiment & Control)
P-value Score	0,552	0,850

It can be seen from Table 5, the homogeneity test for the pretest in the experimental and control classes has a p-value of 0.552 greater than 0.05. This means that the pretest data for the experimental and control groups have a homogeneous variance. The homogeneity

test for the post-test in the experimental and control classes has a p-value of 0.850 greater than 0.05. This means that the post-test data for the experimental and control groups have a homogeneous variance. Furthermore, an independent sample t-test was carried out for pretest and posttest data in the experimental class and control class.

Table 6. Independent Sample t-Test

Independent Sample t-Test	Pretest (Experiment & Control)	Post-test (Experiment & Control)
P-value Score	0,868	0,000

Based on the results in Table 6, the p-value for the pretest in the experimental and control groups was 0.868 which was greater than

0.05. That is, there is no difference in the pretest scores of the experimental group and the control group. The post-test in the experimental and control groups was 0.000 which was less than 0.05. That is, there are differences in the post-test scores of the experimental group and the control group.

The final stage of this research is to determine the effectiveness of gamification-based online learning using the N-Gain test. Before carrying out the N-Gain test, the N-Gain data was tested first by carrying out the normality test, homogeneity test, and independent sample t-test. Following are the results of the data analysis performed for N-Gain.

Table 7. Output for N-Gain

Data	Normality Test (P-value Score)	Homogeneity Test (P-value Score)	Independent Sample t Test (P-value Score)
NGain_Experiment	0,200	0,281	0,001
NGain_Control	0,06		

Based on Table 7, it can be seen that the N-Gain values for the experimental and control classes follow a normal distribution because the p-values for both are greater than 0.05. In the homogeneity test, it can be seen that the p-value of 0.281 is greater than 0.05, meaning that the N-Gain value has a homogeneous variance. On the independent test results of the sample t-test, a p-value of 0.001 is less than 0.01, so it can be said that there is a difference in the N-Gain value of the experimental and control groups. Furthermore, the value the effectiveness of gamification-based online learning can be seen based on the average value of the N-Gain for each class. The following are the results of the N-Gain test.

Table 8. N-Gain Test

N-Gain Test	N-Gain_Experiment	N-Gain_Control
Mean	77,3095%	28,6667%

As seen in Table 8, according to (27) the average value for the N-Gain experimental class was 77.3095% included in the effective category, while the average value for the N-Gain control class was 28.6667% included in the less effective category. Thus, it can be concluded that the use of gamification in

online learning is effective in increasing student learning outcomes

DISCUSSION

This paper contributes to the application of gamification-based online learning to student learning outcomes. The use of online learning during Covid-19 provides comfort for students (6). Based on the research that has been done, this study uses test assistance to determine student learning outcomes. From the data that has been analyzed, it is obtained that the p-value of the post-test scores of the experimental class and the control class is 0,000, and a significance level of 5% or 0,05 has been determined, so the p-value can be written as less than the significance level, namely 0,000 <0,05. Thus, the initial hypothesis is rejected and the alternative hypothesis is accepted. This means that there are differences in the learning outcomes of students using gamification online learning and regular online learning, so it is interpreted that online learning with gamification is better used to improve student learning outcomes. These results are also reinforced by the average post-test scores of student learning outcomes

between the experimental class and the control class.

Several things cause differences in the average value of student learning outcomes between the experimental class and the control class, namely the learning model carried out in class. In the experimental class, gamification-based online learning was carried out. According to (28), the gamification strategy plays an important role in the learning process, especially in student performance. Gamification in learning strategies that implement game elements in non-game applications to bind and motivate users in solving problems. In this strategy, learning is made more interesting and encourages students to be more involved in learning. By involving gamification in online learning, there is a relationship between learning outcomes and learning models. Gamification-based online learning can help students solve problems so that student learning results increase.

In contrast to the experimental class, in the control class learning is carried out in an ordinary online manner where learning activities are centered on the lecturer and provided material online via the internet and Moodle media. Then, students are asked to understand the material and examples uploaded in Moodle on the LMS. Students are also given assignments to complete. As a result, learning is less effective and reduces the demand for students to follow the learning process. This can be seen from the value of the post-test results in the control class which is smaller than the experimental class.

The results of the study show that the gamification-based online learning model can be used by lecturers as an effort to support and motivate students in the learning process so that students are more interested in the learning process. Using gamification-based online learning makes learning conditions in the classroom more enjoyable so and it has a positive impact on student learning outcomes. Gamification provides various benefits for students including increased motivation and good appearance,

developing of 21st-century skills, encouraging social interaction, increased competitiveness in learning, and giving freedom students (29). Several studies that strengthen gamification can affect online learning, including by (7,13,30,31). This proves that there is a significant effect of gamification-based online learning on student learning outcomes of more than 77% based on the N-Gain results. Thus the objectives of this research were achieved. The gamification-based online learning model was effectively used to improve student learning outcomes.

CONCLUSION

Based on the results of the research that has been done, it is found that there is a difference between the post-test scores of the experimental group and the control group. Reinforced by the results of the mean values of both, which stated that the mean post-test value of the experimental group was higher than the post-test value of the control group. In addition, gamification-based online learning is effective for improving student learning outcomes, because the mean value of the N-Gain experimental group is included in the effective category. For further research, research on gamification-based online learning can improve student learning outcomes based on student achievement motivation.

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