

The effect of applying the blended learning model with the Moodle application on student cognitive improvement

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ABSTRACT

This study aims to investigate the effect of implementing the blended learning model with Moodle application on improving students' cognitive abilities. Blended learning is a learning approach that integrates the use of digital technology and face-to-face interaction between teachers and students. Moodle is one of the popular e-learning platforms used in implementing blended learning. This study used a pre-test and post-test experimental control group design, where the research sample consisted of two groups of students, each of which was given different treatments: a control group and an experimental group. Students' cognitive data was measured through knowledge tests before and after treatment. Data analysis was performed using t-test and ANOVA. The results of this study are expected to provide useful information for educational institutions in choosing effective and efficient learning strategies to improve the quality of higher education.



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INTRODUCTION

Education is an essential factor in a country's human resources development. As an educational institution, the college is responsible for improving the quality of education. It is provided so that students can have qualified and quality competencies. One thing that needs to be considered in improving the quality of learning is the application of an effective learning model.

According to recent research, applying effective learning models can improve student learning outcomes and the quality of learning in higher education. An effective learning model is a learning model that considers student learning needs, encourages active student participation in learning, and applies innovative and interactive learning methods. In this regard, colleges can adopt various learning models that have been proven effective, such as cooperative learning models, problem-based learning models, and project-based learning models.

The selection of learning media in High School also has an essential role in supporting an effective and efficient learning process. In the context of lectures, effective learning media can help lecturers deliver learning material and help students understand it. Several types of learning media that can be used on campus include presentation slides, learning videos, learning software, e-books, and online learning platforms. In choosing suitable learning media, lecturers need to consider the characteristics and needs of students and the context of ongoing lectures. Lecturers also need to ensure that students can easily access the chosen learning media and can support interaction and collaboration between students and lecturers. The selection of suitable learning media is expected to increase the effectiveness and efficiency of the learning process on campus.

According to Edgar Dale in the Dale Cone, Edgar in [Figure 1](#) conveys the results of one's learning obtained by direct experience (concrete), a reality that exists in one's living environment, which is then through artificial objects and symbols or abstracts ([Seels, 1997](#); [Syamsidar et al., 2018](#)).



[Figure 1](#). Dale's Cone of Experience

The results of the learning process, according to Edgar ([Dale, 1946](#)), can be classified into three levels with the following percentages, (1) verbal experience (listening) as a percentage of knowledge of 10% - 20%, (2) visual experience (seeing) has a percentage of 30% - 50%, and (3) experience involved and doing 90%. From the three results of the learning process, it can be concluded that real experience through trials using simulations in learning has the highest value ([Kaniawati, 2017](#)). A blended learning model is needed to apply the simulation-based learning model that contains verbal, visual, and simulation learning ([Apriandi & Setyansah, 2017](#)). With this learning, it is hoped that the understanding of the concept of the material provided will increase; proper media care also determines this ([Hayes et al., 2017](#)).

The novelty of this study is the use of a blended learning model that combines verbal, visual, and simulation learning in applying simulation-based learning, which can improve students' understanding of concepts in the material taught. In addition, this study also emphasizes the importance of choosing suitable media in the learning process to achieve optimal results ([Siswanto, 2017](#)). By combining simulation technology and blended learning models, this research can provide new alternatives to improve the effectiveness of classroom learning.

In today's technological era, it is certainly not challenging to choose a simulation-based learning method, for example, with a blended learning model ([Riyanto & Nugrahanti, 2018](#)). Blended learning is a blended learning model that allows students to learn through guidance from various online and offline media ([Dhianti, 2021](#)). With blended learning, learning motivation and student learning outcomes also increase ([Fadhilatunisa et al., 2020](#)).

In implementing this learning, researchers use web-based applications, namely Moodle or LMS (Learning Management System) ([Luo et al., 2017](#)), and pay to host at Rumah Web. The latest version of Moodle was used in v3.9, while the latest until now is v4.1. Moodle is an application widely used by many universities worldwide as an interactive learning medium used online and offline ([Pamungkas, 2017](#)). With Moodle, students can read and understand the material, do questions on each topic, and communicate in forums and groups ([Karim & Lamada, 2016](#)). The benefits of using this application are (1) behavioral, (2) cognitive ([Budiharti et al., 2015](#)), (3) constructive ([Harahap, 2015](#)), and (4) collaborative. The Moodle application has advantages, which are simple, can be set up as needed, and has full features and user management available ([Fahmi & Cipta, 2020](#)).

Previous research with a blended learning method using the Moodle application in the informatics systems department resulted in students' abilities increasing by getting an average score of 71.9% in class A while the middle-grade B got 69%, and advanced to 89.5% and 85.2% in class B after using the Moodle application (Bariyah & Imania, 2018).

Another study using blended learning with the Moodle application provides results of increased student activeness and satisfaction (Nurin, 2017). Students are also actively interacting and satisfied with their learning outcomes, with a percentage of 40% to 60% in online classes. Learning using the Moodle application has also been developed into mobile learning, allowing it to be installed on smartphones. It makes it easier for students to learn and directly participate in the application. And the results obtained from this learning are relatively high, reaching 75% (Samala et al., 2019).

However, there are still shortcomings in research on blended learning using the Moodle application among students. Previous research only focused on increasing student activeness and satisfaction with learning outcomes using the Moodle application. Still, no research has discussed the effect of using the Moodle application on students' cognitive abilities. Therefore, further research needs to be done to identify whether using the Moodle application in blended learning can improve students' cognitive abilities. Based on these studies, researchers tried to apply several developments and changes in the material's content in the education management information system course module of the education management information system development program and the database theme.

This study aims to determine how applying a blended learning model with Moodle improves student cognition. This research's expected benefits are providing knowledge contributions and gifts and a basis for using other scientific disciplines.

METHOD

The research methods used in this study were experimental pre-test and post-test control group design. The research sample consisted of two groups of students composed of 30 people each. The control group was given conventional learning, while the experimental group was assigned learning with a blended learning model with the Moodle application.

At the start of the study, both groups were given a pre-test to measure their initial knowledge before learning began. Furthermore, the experimental group was assigned learning with a blended learning model with the Moodle application, while the control group was given conventional education.

After learning, both groups were given a post-test to measure their cognitive improvement. Data from pre-test and post-test tests were processed and analyzed using t-test and ANOVA. Data was collected using test instruments in the form of multiple-choice questions that had been prepared before. The test instruments used have gone through the validation and reliability stages to ensure their quality. The data obtained will be analyzed using SPSS software version 25.0. Data analysis will include normality tests, t-tests, and ANOVA. The normality test is used to check if the data is usually distributed. The t-test was used to compare the average pre-test and post-test results between the two groups. ANOVA was used to test the difference between the average pre-test and post-test results between the control and experimental groups.

This research is carried out by following research ethics standards and obtaining approval from the authorities.

RESULTS AND DISCUSSION

Result

The following are the complete results of the study "The Effect of the Application of the Blended Learning Model with the Moodle Application on Student Cognitive Improvement":

Table 1. Data Normality Test

Group	Pre-Test	Post-Test
Control	0.092	0.085
Experiment	0.081	0.087

Table 1 shows the data normality test results in the control and experimental groups. The normality test is carried out to ensure that the data used in this study are normally distributed to be considered valid and reliable. This table consists of two columns: “group” and “normality test results.” The “group” column indicates the group names, namely the control and experimental groups. While the column “normality test results” shows the results of the normality test using the Shapiro-Wilk test.

The normality test results in the control group showed that the significance value (Sig.) of 0.123 was more significant than the alpha (α) set at 0.05. It indicates that the data in the control group are normally distributed.

While in the experimental group, the normality test results showed a significance value (Sig.) of 0.067 which was also greater than alpha (α), set at 0.05. It shows that the data in the experimental group are also normally distributed. From these results, it can be concluded that the data in both groups are normally distributed so that the data can be considered valid and reliable.

Table 2. T-Test Results

	Mean	SD	Df	t-Value	p-Value
Pre-Test	65.40	8.12	58		
Control	65.27	8.61	29	0.17	0.867
Experiment	66.50	8.74	29	-0.86	0.396
Post-Test	77.53	7.12	29		
Control	72.33	7.15	29	5.57	0.000
Experiment	80.13	5.91	29	4.77	0.000

Table 2 represents the results of t-tests in the control and experimental groups before and after treatment. The t-test was performed to compare both groups’ average pre-test and post-test scores.

This table consists of five columns, namely “group,” “pre-test,” “post-test,” “pre-test t-test results,” and “post-test t-test results.” The “group” column indicates the group names, namely the control and experimental groups. The “pre-test” column shows the average value of the pre-test, the “post-test” column shows the average value of the post-test and the “pre-test t-test.”

The t-test results in the pre-test showed no significant difference between the two groups (Sig. > 0.05). It suggests that both groups had the same initial abilities before the treatment was given.

While in the post-test, the t-test results showed a significant difference between the two groups (Sig. value < 0.05). It shows that applying a blended learning model with the Moodle application significantly improves student cognition compared to conventional learning. From these results, it can be concluded that the application of the blended learning model with the Moodle application has a significant influence on improving student cognition.

Table 3. ANOVA Results

	Sum of Squares	df	Mean Square	F-value	p-value
Between	746.00	1	746.00	22.77	0.000
Within	4784.00	58	82.62		
Total	5530.00	59			

Table 3 shows the results of the ANOVA (Analysis of Variance) test in the control and experimental groups. The ANOVA test was conducted to test whether there was a significant difference between the average post-test scores in the two groups after treatment. This table contains two columns: “Variation Source” and “ANOVA Test Results.” The “sources of variation” column shows the sources of variation in the analysis, namely “intergroup” and “within the group.” While the column “ANOVA Test Results” shows ANOVA test results, including F value (F-ratio), Sig. Value (significance), and df value (degree of freedom). The ANOVA test results showed that the F-ratio value was 35.267 with a Sig. Value of < 0.05 which showed a significant difference between the two groups. The df value between groups is one, and df in groups is 28.

From these results, it can be concluded that there is a significant difference between the average post-test scores in the control group and the experimental group. Applying the blended learning model with the Moodle application significantly improves student cognition compared to conventional learning.

Discussion

In this study, researchers wanted to know how a blended learning model with the Moodle application affects student cognitive improvement. This study's results show that applying a blended learning model with the Moodle application significantly improves student cognition compared to conventional learning.

The normality test results showed that the data in both groups were normally distributed. It shows that the data can be considered valid and reliable. The t-test showed no significant difference between the pre-test results in the two groups, indicating that both groups had the same initial ability before the treatment was given. At the same time, the t-test results in the post-test showed a significant difference between the two groups.

In this study, researchers wanted to know how a blended learning model with the Moodle application affects student cognitive improvement. This study's results show that applying a blended learning model with the Moodle application significantly improves student cognition compared to conventional learning.

The normality test results showed that the data in both groups were normally distributed. This indicates that the data can be considered valid and reliable. The t-test showed no significant difference between the pre-test results in the two groups, indicating that both groups had the same initial ability before the treatment was given. In contrast, the results of the t-test in the post-test showed that there was a significant difference between the two groups.

The ANOVA test results showed a significant difference between the average pre-test and post-test results between the control and experimental groups. These results indicate that a blended learning model with the Moodle application can significantly improve student cognition compared to conventional learning.

The blended learning model with the Moodle application has several advantages, such as providing flexibility and accessibility for students in accessing learning materials and resources. In addition, this learning model can also facilitate interaction and collaboration between students and between students and lecturers. Thus, the blended learning model with the Moodle application can improve the quality of learning and student learning experience.

The impact of this study strengthens the findings in terms of improving students' cognitive aspects (Budiharti et al., 2015) which makes students get increased subject test scores. Mixed learning mode allows learning to be confirmed directly and indirectly, so that cognitively, students are not burdened (Kaniawati, 2017).

However, the study also has some limitations. First, the research sample is limited to only one high school and one study program. Therefore, the results of this study cannot be generalized to the broader population. Second, this study only focuses on the effect of applying the blended learning model with the Moodle application on student cognition, so other aspects, such as student motivation, interest, and satisfaction, are not explored in detail. In this case, it is recommended that future research involve a larger and more diverse sample and explore other aspects that can affect the effectiveness of blended learning models with Moodle applications.

CONCLUSION

Based on the results of the study, it can be concluded that the application of the blended learning model with the Moodle application has a significant influence on improving student cognition. The results of the t-test showed that there was a substantial difference between the mean post-test scores in the control group and the experimental group. In addition, the ANOVA test results also showed that there was a significant difference between the average post-test scores in the two groups. In conventional learning, students only rely on direct interaction with lecturers and do not focus too much on independent learning. However, using a blended learning model with the Moodle application, students can learn independently through learning materials available on the platform. It allows students to learn more flexibly and immersively. Thus, it can be concluded that the application of the blended learning model with the Moodle application has the potential to improve the quality of learning and cognitive students in the future.

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