Application of the Flipped Classroom Model Using Games-Based Learning Multimedia in Increasing Students' Learning Outcomes

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ABSTRACT

This paper discusses the low students' learning outcomes and students' satisfaction, which continues to decline. In contrast, distance and face-to-face learning are limited to non-formal education learning technology courses. The study aimed to improve learning in the Non-Formal Education Learning Technology course in the S1 Non-Formal Education Study Program by implementing games-based learning multimedia with the flipped classroom model. The research was conducted on 30 students in semester III/A. By applying the flipped classroom model, the research was conducted in the classroom and at each student's home. The research used a Pre-Experimental Design with a One-Group Pretest-Posttest Design. The data collection technique was carried out by testing. The pre-test was carried out to collect data on students' initial abilities, while the post-test was carried out to test the effect of the treatment. The study used three statistical tests, namely (1) normality, (2) homogeneity, and (3) hypothesis testing. The results indicate that the control class sample data were normally distributed. After treatment, initial data on students' abilities are interpreted as normal or homogeneous. The results of hypothesis testing show that there is a significant effect of flipped classrooms based on game multimedia in non-formal education learning technology courses with an average value of the experimental class at 81.63.

Keywords: flipped classroom, game-based multimedia, students' learning outcome

INTRODUCTION

In Indonesia, it has been more than two years since the Covid-19 pandemic has impacted the learning process in Higher Education being carried out online. Currently, offline *or* hybrid accordance with each regional policy and campus policy. When Indonesia's education world is trying to catch up with learning during the Covid-19 pandemic, it is necessary to adapt again. So far, students who have studied a lot independently and online need adaptations and adjustments according to health protocols. There needs to be an exciting learning alternative to continue stimulating students to be motivated to learn. Fun, planned, and appropriate learning according to the context of the learning material is considered more suitable for limited face-to-face learning. Choosing the right learning media also supports the right learning atmosphere, whether online, hybrid, or blended. And E-learning blended learning using various learning media (multimedia) is an alternative learning that is suitable during the Covid-19 pandemic and the transition period of adapting to new habits.

The advantage of using technology-based learning, be it e-learning or blended learning, is that educators (lecturers) and students (students) do not have to be in the same location to do learning. This is possible as long as the components in learning can be fulfilled properly, for example, internet access and qualified human resources (lecturers and students) to design and implement e-learning-based learning *or* blended learning.

The Non-formal Education Learning Technology course is one of the core subjects of the Non-Formal Education Study Program. This course aims to equip students to create and manage web-based learning applications and digital content using applications or platforms that support teaching and learning

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activities. The lecture material includes; learning technology, blended learning, creation of a basics Website, digital content in the form of e-books, e-audio-books, simple animations, web-based learning management applications, and implementing applications or platforms that support teaching and learning activities.

Referring to the results of the 2020/2021 even semester learning evaluation on the system developed by the University of Bengkulu (SIEPEL v2.0), it is known that as many as 59.8% of students want to improve learning by improving the quality of existing learning, so far. Respondents considered that the learning that had been carried out so far, especially during the Covid-19 pandemic and the period of adapting to new habits after the Covid-19 pandemic, was not optimal and tended to be monotonous and did not utilize media and technology in learning. Learning uses many lecture and discussion methods through Zoom meetings that are carried out continuously will impact inefficient use of time. As for student satisfaction with the Non-formal Education Learning Technology course ranks last in the subjects in semester VI with an average point of 4.2 points. This course moves to semester III in the 2021 Non-Formal Education Study Program curriculum. Hence, it needs to be well prepared by being able to design learning according to predetermined learning outcomes.

Flipped classroom learning can be applied in limited or online PTM learning conditions. Combined learning using the flipped classroom model can improve learning outcomes (Tang et al., 2020; Fatmawati et al., 2021; Cheng et al., 2019; Jdaitawi, 2019), competence (Ramdhony, 2021), student attention and independence in learning (Aini, 2021) and increase learning effectiveness (Cosculluela et al., 2021). The Flipped Classroom model as a development of Blended learning, a match when applied to Non-formal Education learning technology courses because it is by the character and learning outcomes of the course, which wants students to be independent and able to apply and develop technology in learning, especially in Non-formal Education learning. Games-based multimedia will undoubtedly make the learning atmosphere more fun and motivate students. Educational games such as quizzes, Kahoot, and Quizlet make learning active and exciting. The research aims to apply games-based learning multimedia with the flipped classroom model to improve student learning outcomes in semester III/A of the Non-formal Education Study Program.

LITERATURE REVIEW

The flipped classroom is a learning model with a way of working that swaps or flips activities usually done in class with activities at home (Bergmen & Sams, 2012). Educators adopt the flipped classroom model to provide classroom learning or instructional content as homework. In preparation for class, learners are required to view learning videos. The in-class time is utilised to solve problems, develop concepts, and engage in collaborative learning (Amy Roehl, 2013). This means that learning activities in the classroom are more focused on solving problems that learners do not understand when studying at home because they can be directly consulted with friends and educators. In addition, it can also be used for material/concept elaboration activities and activities carried out to measure understanding of a discussion.

Multimedia involves several types of media integrated into a learning activity. In simple terms, Meyer (2009) in Asyhar (2011) defining multimedia as a medium that produces sound and text. Meanwhile, Martin (2010) in Asyhar (2011) distinguishes multimedia and audiovisual. Video conferences and cassettes are included in audiovisual media, and interactive and non-interactive computer applications are some examples of multimedia.

Multimedia combines text, art, sound, animation, and video delivered to users by computers and other electronic and digital manipulation devices. Multimedia can cause an extraordinary sensation if users combine all the elements, such as combining images and animations, beautifying sound, creating video clips and raw textual information (Mar'atutullatifah, 2017). In this study, the multimedia used is a single layer-based application in the form of a Microsoft PowerPoint slide show record to create learning videos that students use to study at home. Meanwhile, game-based learning multimedia uses multilayer-based applications in the form of Quizziz and Kahoot for more interactive activities in the form of games which also measure students' abilities.

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According to Gagne and Briggs, learning outcomes refer to a person's ability to interact with teaching and learning activities or follow a specific learning process (Nurrita, 2018). Teaching and learning activities from the teacher's perspective are teaching activities that end with evaluating learning outcomes. In contrast, from the student's point of view, learning outcomes are the end of the teaching process from the top of the learning process (Dimyati & Mudjiono, 2021). Learning outcomes are also learning outcomes from positive and active interactions between individuals and their environment, resulting in changes in behaviour in that person (Nasution, 1990; Oemar, 2006). The learning outcomes in this study are the results of the activities of students who have participated in the teaching and learning process on certain learning materials in the form of assessments given after participating in the learning process so that changes in student behaviour occur.

METHOD
The method used in this study is the Pre-Experimental Design, with the One-Group Pretest-Posttest Design. One-Group Pretest-Posttest Design is an experimental design that is only applied to one group by giving pre-test treatment, observing the effect, giving treatment then post-testing the dependent variable (Suharsaputra, 2012: 161). This research was carried out collaboratively between researchers and lecturers in charge of the course to improve the quality of learning in the class. In this study, implementing games with the flipped classroom model.

This research was conducted by designing a flipped classroom learning, meaning the place of implementation in the classroom and at home. The classroom in question is the Lecture III building of FKIP Bengkulu University. The house referred to in this study is the students' residence while carrying out semester III/A lectures. This research was conducted in September 2022 with 30-semester III/A students.

Research with this design starts with a pre-test of understanding test questions, after which treatment is carried out in the form of learning with multimedia learning based on flipped classroom model games. Then post-test to see the increase in student understanding after being given treatment. The results of the pre-test and post-test were processed and analyzed to find conclusions from the experiments carried out.

Data collection using tests, namely pre-test and post-test. The pre-test is conducted to find out the student's initial ability to understand a material or theme in learning, while the post-test is carried out to find out the student's ability after being given treatment.

The prerequisite test was first carried out in this study, namely the normality and homogeneity tests. The research hypothesis was tested, and the data was analyzed.

Normality Test
This step aims to determine whether the data obtained is normally distributed or not. If the data obtained is normally distributed, then the next step for the researcher is parametric statistical tests. In contrast, if the processed data is not normally distributed, the researcher must use *non-parametric* statistical tests (Sugiyono, 2016).

In this study, the normality test was carried out using the Chi-square formula as follows:

$$x^2 = \sum \frac{(\int o - \int h)^2}{\int h}$$

Description:
x^2 : Chi-Square value
$\int o$: Observed frequency
$\int h$: Expected Frequency (Sugiyono, 2016)

Homogeneity Test

A homogeneity test was carried out to test/compare whether the variation in the study population was similar. In other words, the data analyzed come from almost as diverse populations. The homogeneity test, also known as the F test, uses the following
formula:

$$F = \frac{the\ biggest\ variance}{smallest\ variance}$$

Hypotesis Test

In this study, the homogeneity test was used to test the learning outcomes of students who had been given the treatment flipped classroom, based on multimedia games better than before, then do a t-test (t-test). The t-test is used for the data analysis process, where the result is a decision/conclusion based on the hypothesis. *The t-test* in statistical data analysis uses the following formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(n_1 - n_2)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Description:
$\bar{x}_1$: sample average 1
$\bar{x}_2$: sample average 2
S_1^2 : sample variance 1
S_2^2 : sample variance 2
n_1 : total sample control class
n_1 : total sample experimental class
(Sugiyono, 2016)

RESULTS AND DISCUSSION
Normality Test

The test in this study was carried out using the Kolmogorov-Smirnov Test. The basis of decision-making is as follows; (a) if the data > 0.05, then the data is normally distributed, and (b) if the data is < 0.05, then the research data is not normally distributed. Meanwhile, if the processed data is not normally distributed, the researcher must use non-parametric statistical tests:

Table 1. One-Sample Kolmogorov-Smirnov Test

		Pretest	Posttest
N		30	30
Normal Parameters[a,b]	Mean	70.5667	81.6333
	Std. Deviation	8.50835	5.42334
Most Extreme Differences	Absolute	.156	.101
	Positive	.067	.101
	Negative	-.156	-.082
Test Statistic		.156	.101
Asymp. Sig. (2-tailed)		.059[c]	.200[c,d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

Table 1 above shows that it has a significant value of 0.059 at the pre-test and 0.200 at the post-test, where the value is > 0.005, which means that the control class sample data is normally distributed.

Homogeneity Test
A test was carried out to test data variants in several distributions (Latuconsina, 2018). Based on the analysis of the data on the learning outcomes of the two groups, the following data were obtained:

Table 2. Basic Data Homogeneity Test (Pretest)

		Levene Statistic	df1	df2	Sig.
Pretest	Based on Mean	2.761	7	14	.060
	Based on Median	.607	7	14	.741
	Based on Median and with adjusted df	.607	7	6.521	.736
	Based on trimmed mean	2.455	7	14	.072

Table 2 above shows that the probability value is 0.060 > 0.05. So it can be interpreted that the initial abilities of students between groups are equal or homogeneous.

While the homogeneity of learning outcomes after receiving treatment can be seen in the column below:

Table 3. Basic Data Homogeneity Test (Posttest)

		Levene Statistic	df1	df2	Sig.
Posttest	Based on Mean	.568	4	15	.690
	Based on Median	.397	4	15	.808
	Based on Median and with adjusted df	.397	4	10.294	.807
	Based on trimmed mean	.546	4	15	.704

Based on table 3 above, it can be seen that the probability value is 0.690 > 0.05. Thus it can be interpreted that the ability of students after receiving treatment in the experimental group is equal or homogeneous.

Hypothesis Testing
After the data obtained shows that it is normally distributed and homogeneous, then the data is processed again to test the hypotheses formulated in this study. Hypothesis testing was carried out using the t-test technique (*t-test*). The decision-making criteria are as follows: (a) If the probability value is > 0.05, then H0 is accepted or "no effect flipped classroom based multimedia games on learning outcomes in the Non-formal Education Learning Technology course. (b) If the probability value is <0.05, then Ha is accepted, or "There is an effect of the flipped classroom-based multimedia games on learning outcomes in the Non-formal Education Learning Technology course. Based on the *paired sample t-test*, the following data are obtained:

Table 4. Paired Samples Test

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Pretest - Posttest	-11.06667	7.79006	1.42226	-13.97552	-8.15781	-7.781	29	.000

Based on table 4, there is a significant difference between the experimental class test results of 0.000. If the probability value is <0.05, then H1 is accepted, or there is an effect of *flipped classrooms* based on multimedia games in the Non-formal Education Learning Technology course.

Based on the t-test with the independent sample t-test on the gain score that has been stiffened to produce the following data:

Table 5. Independent Sample t-test result

Class	N	Mean	t	Sig. (2-tailed)	Conclusion
Experimental	30	81.63	3.913		

Table 5 shows that the average value between the experimental groups is not identical or different, with a significance value of 0.000 <0.05. Then it can be described that the average value of the experimental class is 81.63. Based on this description, it can be concluded that the average learning outcomes of students who receive learning with the flipped classroom model based on multimedia games can increase significantly from the pre-test to the post-test stage.

Thus a decision can be made, and it can be proven that H0 is rejected and Ha is accepted because the significance value is 0.000 <0.05 or P <5%, so it can be concluded that there is an effect of flipped classroom based on multimedia games on student learning outcomes of the Non-formal Education Study Program semester III/A FKIP Bengkulu University.

Discussion

The use of games-based multimedia using the flipped classroom is proven to increase student learning outcomes in semester III/A of the Non-Formal Education Study Program, Faculty of Teacher Training and Education, University of Bengkulu, especially in the Non-formal Education Learning Technology course. The use of games-based multimedia certainly makes students more active, and the learning atmosphere becomes fun so that students become more motivated to improve their learning outcomes.

This was also disclosed by Vermana and Zuzano (2018); Walidah and Wijayanti (2020); Chrismawati and Septiana (2021), and Agustini (2021), which state that the use of flipped classrooms in learning can improve student/student learning outcomes. Even students also become more motivated in learning, and suitable learning activities are created. This is, of course, based on learning patterns currently experiencing several changes, especially during the Covid-19 pandemic and the period of adapting to new habits after the Covid-19 pandemic.

Using games-based multimedia certainly makes learning more fun and does not make students bored. When students feel comfortable and happy, of course, it will have an impact on learning outcomes that continue to increase. Cahya (2016); Ardina and Ahmadi (2020); and Kurnia (2017) in their research, revealed that the use of games-based multimedia could improve student learning outcomes.

Flipped classrooms that use multimedia are an excellent and effective combination for improving student learning outcomes. In blended learning, students become more active in exploring the multimedia

used. Rahmadani; Fadilah; Darussyamsu, Fitri, and Farma (2022); Sukmana and Suartama (2018); Estika (2017); Hidayah and Sumbawati (2019) in their research revealed that the use of flipped classrooms using game-based multimedia was effective in increasing learning outcomes. Learners/students become active and can participate well in blended learning.

CONCLUSIONS AND RECOMMENDATION
Based on the results of calculations with SPSS, the value of sig. 0.000. It is known that the p-value is $0.000 < 0.05$, then H0 is rejected, which means that there is a significant increase in student learning outcomes before and after the implementation of games-based learning multimedia with the flipped classroom model. The use of game-based multimedia using the flipped classroom is proven to improve student learning outcomes in semester III/A of the Non-Formal Education Study Program, Faculty of Teacher Training and Education, the University of Bengkulu, in the Non-formal Education Learning Technology course. The use of games-based multimedia certainly makes students more active, and the learning atmosphere becomes fun so that students become more motivated to improve their learning outcomes.

Researchers' recommendations for educators must be able to use a variety of flipped classroom uses; multimedia can be an alternative learning improvement, especially related to learning outcomes. Using games-based multimedia can make learning fun and can be an evaluation of learning.

Recommendations for future researchers can conduct research using other forms of experimental research design besides pre-experimental design (with One-Group Pretest-Posttest Design), for example, with true experimental design or quasi-experimental design in order to better provide an overview with various designs that are suitable according to class conditions and approaches.

REFERENCES
Aini, K. (2021). Kemandirian Belajar Mahasiswa Melalui Blended Learning Tipe Flipped Classroom pada Masa Pandemi Covid-19. *Jurnal Literasi Digital*, *1*(1), 42-49.

Agustini, M. (2021). Meningkatkan aktivitas dan hasil belajar siswa menggunakan model flipped classroom melalui aplikasi google classroom. *Indonesian Journal of Educational Development*, *2*(2), 280-289.

Ardiani, O. D. (2019). Keefektifan Multimedia Pembelajaran Berbasis Games Terhadap Hasil Belajar Ipa. *Joyful Learning Journal*, *8*(4), 224-229.

Cahya, R. (2016). *Implementasi Multimedia Pembelajaran Berbasis Games dengan Metode Discovery Learning untuk Meningkatkan Pemahaman Siswa SMK*. (Skripsi). Bandung: Universitas Pendidikan Indonesia

Cheng, L., Ritzhaupt, A. D., & Antonenko, P. (2019). Effects of the flipped classroom instructional strategy on students' learning outcomes: A meta-analysis. *Educational Technology Research and Development*, *67*, 793-824.

Chrismawati, M., & Septiana, I. (2021). Peningkatan Hasil Belajar Melalui Model Flipped Classroom Berbantuan Media Power Point dan Audio Visual di Sekolah Dasar. *Edukatif: Jurnal Ilmu Pendidikan*, *3*(5), 1928-1934.

Dimyati & Mudjiono. (2021). *Belajar dan Pembelajaran*. Jakarta: Rineka Cipta

Estika, W. A. (2017). Pengembangan Blended Learning dengan Strategi Flipped Classroom pada Mata Pelajaran Desain Multimedia di SMK PGRI Ploso. *IT-Edu: Jurnal Information Technology and Education*, *2*(02).

Fatmawati, N., Riyanto, Y., & Setyowati, R. N. (2021). The Effect of Information Technology Based Flipped Classroom Learning Model on the Creativity and Learning Outcomes of Civic Education at Grade IV of SDN Bligo. *Jurnal PAJAR (Pendidikan dan Pengajaran)*, *5*(5), 1443-1460.

Hidayah, N., & Sumbawati, M. S. (2019). Efektivitas Model Pembelajaran Flipped Classroom terhadap Self Regulated Learning dan Hasil Belajar Siswa pada Mata Pelajaran Dasar Desain Grafis di SMKN 1 Surabaya. *IT-Edu: Jurnal Information Technology and Education*, *4*(01).

Jdaitawi, M. (2019). The Effect of Flipped Classroom Strategy on Students Learning Outcomes. *International Journal of Instruction*, *12*(3), 665-680.

Karunia, W. A. (2017). *Efektifitas Penggunaan Multimedia Interaktif Berbasis Games Based Learning Terhadap Minat Dan Hasil Belajar Siswa Pada Materi Sistem Reproduksi* (Doctoral dissertation, FKIP Unpas).

Nurrita, T. (2018). Pengembangan media pembelajaran untuk meningkatkan hasil belajar siswa. *Jurnal misykat*, *3*(1), 171-187.

Romdhony, E. (2021). *Penerapan Flipped Classroom Di Masa Pandemi Covid-19 Untuk Meningkatkan Kompetensi Siswa SMK* (Doctoral dissertation, Universitas Pendidikan Indonesia).

Sugiyono. (2016). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta

Sukmana, A. I. W. I. Y., & Suartama, I. K. (2019). Pengembangan Mobile Learning Berorientasi Model Pembelajaran Flipped Classroom Pada Mata Kuliah Multimedia. *Journal of Education Technology*, *2*(1), 45-50.

Tang, T., Abuhmaid, A. M., Olaimat, M., Oudat, D. M., Aldhaeebi, M., & Bamanger, E. (2020). Efficiency of flipped classroom with online-based teaching under COVID-19. *Interactive Learning Environments*, 1-12.

Walidah, Z., Wijayanti, R., & Affaf, M. (2020). The Effect of Learning Model Flipped Classroom (FC) on Learning Outcomes. Edumatica. *Jurnal Pendidikan Matematika*, *10*(2), 71-77.

Syafira. (2021). Ketentuan Pembelajaran Tatap Muka (PTM) Terbatas berlaku Mulai Januari 2022. (online) diakses dari : https://www.tribunnews.com/nasional/2021/12/30/ketentuan-pembelajaran-tatap-muka-ptm-terbatas-berlaku-mulai-januari-2022#:~:text=pendidikan%20tinggi%20wajib-,Pembelajaran%20Tatap%20Muka%20(PTM)%20Terbatas%20mulai%20berlaku%20pada%20bulan%20Januari,dua%20tahun%20ajaran%202021%2F2022.&text=Dikutip%20Keputusan%20bersama%20empat%20Menteri,Pendidikan%20Dasar%20dan%20Pendidikan%20Menengah.

Supriyadi, Y. (2022). Omicron Hari ini, Kasus Covid-19 Indonesia Tembus 56 Ribu, Berikut Ciri dan Gejala Omicron Orang Dewasa. (Online). Diakses dari: https://deskjabar.pikiran-rakyat.com/gaya-hidup/pr-1133784072/omicron-hari-ini-kasus-covid-19-di-indonesia-tembus-56-ribu-berikut-ciri-dan-gejala-omicron-orang-dewasa