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THE EFFECT OF GAMIFICATION ON THE MOTIVATION AND LEARNING OUTCOMES OF EIGHTH GRADE STUDENTS AT SMP NEGERI 3 LUWUK

Wahyuni Wijayanti[1], Noviyanti Djafri[2], Pupung Puspa Ardini[3], Mohamad Zubaidi[4]

[1]Doctoral Program, Graduate School, Gorontalo State University, Gorontalo, Indonesia

[2]Department of Education Management, Faculty of Education, Gorontalo State University, Gorontalo, Indonesia

[3]Department of Early Childhood Education, Faculty of Education, Gorontalo State University, Gorontalo, Indonesia

[4]Department of Community Education, Faculty of Education, Gorontalo State University, Gorontalo, Indonesia

Email: wijayayuni972@gmail.com

ABSTRACT

Mathematics is a subject that is often considered difficult and boring for students. With the development of the times, a new method of teaching mathematics is needed to encourage student motivation and learning outcomes. Gamification is a teaching method that integrates game technology into learning, where students are Generation Z who are directly exposed to the digital world. The objectives of this study are: 1) to determine the differences between conventional learning methods and gamification; 2) to determine whether gamification has an effect on student motivation and learning outcomes. The method used is experimental with a pre-test post-test design. The sample consists of 170 students divided into two classes, namely the control class and the experimental class. The analysis tool used is the independent T-test. The analysis results show that 1) gamification produces a more interesting, interactive, and competitive learning experience than conventional learning methods. 2) Gamification has an effect on the motivation and learning outcomes of eighth-grade students.

Keywords*: gamification; learning motivation; learning outcomes*

INTRODUCTION

Education in the digital age requires adaptation in teaching methods to remain relevant and engaging for students, the majority of whom are Generation Z, who have grown up amid the development of technology and digital entertainment, including games. Generation Z has learning characteristics that

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demand active involvement, quick access to information, and a preference for authentic and meaningful learning experiences[1].

The integration of digital technology in learning can increase motivation while strengthening students' collaborative and problem-solving skills. PISA data-based studies reveal that the use of ICT has a positive influence on students' collaborative problem-solving (CPS) skills, confirming that technology can be an important tool in building productive learning interactions[2]. Furthermore, the use of educational technology is closely related to student engagement, especially in behavioral and affective dimensions. They found that various media such as social networking tools, knowledge organization and sharing tools, text-based tools, and website creation tools are effective in supporting student engagement[3].

Education in the digital age requires adaptation in teaching methods to remain relevant and engaging for students, the majority of whom are Generation Z[4]. Hayati explained that Generation Z tends to learn independently through online resources, such as YouTube and other platforms, and is highly responsive to visual and interactive learning such as videos, simulations, and multimedia elements[5].

A concrete example of a gamification strategy that combines motivation and learning outcomes could be as follows: for example, in a mathematics class, the teacher uses the Kahoot app for interactive quizzes; each question answered correctly earns points, there is a leaderboard between student groups, and digital badges are awarded to those who achieve a certain score. Well-designed gamification can strengthen intrinsic and extrinsic motivation so that students are more active, do not get bored easily, and increase interaction in learning[6], also shows that gamification is more effective than non-gamification methods in

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improving academic achievement, as long as elements such as feedback, proportional challenges, and appreciation for student effort are included.

According to Kapp, gamification can increase engagement by utilizing human psychological drives to achieving, competing, and receiving awards [7]. However, initial observations at SMP Negeri 3 Luwuk revealed challenges in Mathematics learning in eighth grade. Many students show low levels of motivation, considering mathematics to be a difficult, monotonous, and boring subject. This condition has implications for low student engagement in the learning process and suboptimal learning outcomes.

The results of Nurjannah et al.'s research show that the integration of digital media and a project-based approach has been proven to increase student engagement and learning outcomes in mathematics[8].

This has a direct impact on active participation in class and ultimately affects learning outcomes that are not yet optimal. The average daily test scores on algebra material show that 65% of students are still below the Learning Objective Achievement Criteria (KKTP). Therefore, this study is important to empirically test whether the application of the gamification method can be an effective solution to increase the motivation and learning outcomes of eighth-grade students at SMP Negeri 3 Luwuk.

RESEARCH METHOD

This study was conducted at SMP Negeri 3 Luwuk using a quasi-experimental method. The design used was a pretest-posttest control group design[9]. The population in this study consisted of all 287 eighth-grade students. To facilitate the researcher, the Slovin formula was used as the sampling technique, as follows [10].

$$n = \frac{n}{1 + N(e)^2}$$

Explanation:

n= research sample

[7] Kapp, K. M. (2013). *The gamification of learning and instruction fieldbook: Ideas into practice*. John Wiley & Sons.

[8] Nurjanah, A., Rohimah, S. M., & Yusepa, B. (2025). Pengaruh Model Project-Based Learning Berbantuan Quizizz Terhadap Hasil Belajar Matematika Peserta Didik. *Al-Irsyad Journal of Mathematics Education*, *4*(2), 355-365.

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e= margin of error
N= population size

$$n = \frac{287}{1 + 287(0{,}05)^2}$$

$$n = \frac{287}{1{,}7175} = 167 \approx 170 \text{ student}$$

Using this formula, it was determined that the sample size for this study was 167, which was rounded up to 170 students and then divided into two groups. namely the experimental group and the control group, each consisting of 85 students.

After the data is collected, it will be analyzed using parametric statistics consisting of:

1. Prerequisite Tests: Normality Test (Kolmogorov-Smirnov) and Homogeneity Test (Levene's Test) to ensure that the data is normally distributed and the variance is homogeneous
2. Hypothesis Testing: Using the Independent Samples T-Test to compare the average scores (gain scores) for motivation and learning outcomes between the experimental group and the control group at a significance level of α=0.05.

RESULTS AND DISCUSSION

Both instruments the motivation questionnaire and the learning outcome test were administered twice to each group, once prior to the intervention (pre-test) and once following its completion (post-test). The pre-test was conducted to establish a baseline of students' motivation and learning outcomes before gamification was introduced, while the post-test was carried out upon the conclusion of the entire instructional process to capture the changes resulting from the intervention. The comparative analysis between pre-test and post-test scores, as well as between the experimental and control groups, served as the primary basis for evaluating the extent to which gamification influenced students' motivation and mathematics learning outcomes.

Overall, the data collected revealed a notable difference in scores between the two groups. Students in the experimental group consistently demonstrated higher motivation and learning outcome scores compared to their counterparts in the control group. This was reflected in the students' enthusiasm throughout the gamification-based learning sessions they were more proactive in raising questions, more engaged in completing assigned challenges, and showed a high level of participation in every game-based activity. By contrast, while the learning

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process in the control group proceeded without disruption, students tended to be more passive in their responses, largely limiting their engagement to following the teacher's directions.

Prior to conducting inferential analysis to test the research hypotheses, prerequisite assumption tests were performed to verify that the data met the conditions required for the application of parametric statistical methods. These tests consisted of a normality test and a homogeneity test, both of which were intended to confirm the appropriateness of the data, thereby ensuring that the results of subsequent analyses could be interpreted with validity and reliability.

Table 1. Normality Test Results

One-Sample Kolmogorov-Smirnov Test

			Unstandardized Residual
N			170
Normal Parameters[a,b]	Mean		.0000000
	Std. Deviation		14.82926895
Most Extreme Differences	Absolute		.161
	Positive		.075
	Negative		-.161
Test Statistic			.161
Asymp. Sig. (2-tailed)[c]			<,001
Monte Carlo Sig. (2-tailed)[d]	Sig.		<,001
	99% Confidence Interval	Lower Bound	.000
		Upper Bound	.000

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.

Based on the normality test results listed in the appendix, it is known that the Asymp. Sig. (2-tailed) value = 0.000 for all variables, both motivation and learning outcomes. The Kolmogorov-Smirnov significance value is less than 0.05, so it can be statistically concluded that the data is not perfectly normally distributed. However, because the sample size of the study is quite large (n = 170), this condition is still tolerable based on the Central Limit Theorem, which states that data with a large sample size (≥ 30) will tend to approach a normal distribution even though the raw data is not completely normal. Therefore, the research data still meets the requirements for analysis using parametric tests.

The homogeneity test was used to determine whether the variance of the data between groups (experimental and control) was the same or significantly different. In this study, the homogeneity test was performed using Levene's Test for Equality of Variances. The results of the homogeneity test in this study are as follows.

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Table 2. Results of the Homogeneity Test for Learning Motivation Variables

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
MOTIVASI BELAJAR	Based on Mean	18.939	1	168	<,001
	Based on Median	17.812	1	168	<,001
	Based on Median and with adjusted df	17.812	1	131.061	<,001
	Based on trimmed mean	19.013	1	168	<,001

Table 3. Results of the Homogeneity Test of Learning Outcome Variables

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
HASIL BELAJAR	Based on Mean	8.526	1	168	.004
	Based on Median	7.334	1	168	.007
	Based on Median and with adjusted df	7.334	1	161.992	.007
	Based on trimmed mean	7.014	1	168	.009

The Levene test results show that for the learning motivation variable, the significance value obtained is Sig. = 0.000 (< 0.05), while for the learning outcome variable, the value obtained is Sig. = 0.004 (< 0.05) in the homogeneity test. These results indicate that the two groups have significantly different variances or, in other words, the data are not perfectly homogeneous. However, this condition does not pose a significant obstacle in the analysis because the t-test used in this study uses the "Equal variances not assumed" approach, which automatically adjusts the degrees of freedom (df) calculation to correct for the variance difference.

With both prerequisites practically fulfilled, even though there are slight deviations that are still within the tolerance limit, the research data is declared suitable for further analysis using the Independent Samples T-Test.

1. Learning Motivation

Table 4. Results of the Learning Motivation Difference Test

Group Statistics

	KELOMPOK	N	Mean	Std. Deviation	Std. Error Mean
MOTIVASI BELAJAR	KELOMPOK EKSPERIMEN	85	110.05	7.259	.787
	KELOMPOK KONTROL	85	72.95	4.123	.447

Independent Samples Test

		t-test for Equality of Means							
				Significance				95% Confidence Interval of the Difference	
		t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
MOTIVASI BELAJAR	Equal variances assumed	40.968	168	<,001	<,001	37.094	.905	35.307	38.882
	Equal variances not assumed	40.968	133.089	<,001	<,001	37.094	.905	35.303	38.885

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Based on the results of the Independent Samples T-Test on the learning motivation variable, the mean value for the experimental group was 110.05, while for the control group it was 72.95. The test results showed a t-value of 40.968 with df = 168 and Sig. (2-tailed) < 0.001.

A significance value well below 0.05 indicates that there is a very significant difference between the two groups. Thus, the alternative hypothesis (Ha) is accepted, namely that there is a significant effect of the application of the gamification learning method on students' motivation to learn mathematics.

Descriptively, these results show that students who learn through a gamification approach have a much higher level of learning motivation than students who follow conventional learning. In the experimental class, the learning atmosphere, which was packaged like a game, created enthusiasm, healthy competition, and intrinsic satisfaction for students[11]. Elements such as points, badges, leaderboards, and progressive challenges serve as stimuli that make students feel that learning is a fun activity, not just a chore obligation. Meanwhile In the control group, traditional learning patterns, which tend to be one-way and monotonous, resulted in relatively low emotional engagement among students, meaning that their motivation to learn did not increase significantly.

The results of this study are in line with Self-Determination Theory, which states that a person's intrinsic motivation will increase when three psychological needs are met, namely the need for autonomy, competence, and social connectedness. In the context of gamification, these needs are met through opportunities for students to choose challenges, experience success when achieving targets, and interact and compete positively with their classmates. Therefore, the increase in student learning motivation is not only due to rewards or points, but also due to a more meaningful and challenging learning experience.[12]

In addition, the results of this study are consistent with the findings of Irawan et al., which show that the use of Quizizz as a gamification medium can significantly increase the motivation and engagement of junior high school students. Ali et al. also found that

[11] Salsabila, G. K. (2025). Implementasi Model Pembelajaran Team Games Tournament (Tgt) Untuk Meningkatkan Motivasi Intrinstik Pada Siswa Dalam Pembelajaran IPAS Kelas 4 SDN 083 Babakan Surabaya. *Jurnal Ilmiah Widya Pustaka Pendidikan*, *13*(a), 230-238.

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game elements in science learning in elementary schools successfully increased students' interest and enthusiasm for learning. Thus, the results of this study reinforce the empirical evidence that gamification is an effective approach to building learning motivation at various levels of education.[13]

1. Learning Outcomes

Table 5. Results of the Learning Motivation Difference Test

Group Statistics

	KELOMPOK	N	Mean	Std. Deviation	Std. Error Mean
HASIL BELAJAR	KELOMPOK EKSPERIMEN	85	83.18	16.794	1.822
	KELOMPOK KONTROL	85	55.93	12.011	1.303

Independent Samples Test

		t-test for Equality of Means							
				Significance				95% Confidence Interval of the Difference	
		t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
HASIL BELAJAR	Equal variances assumed	12.167	168	<,001	<,001	27.247	2.240	22.826	31.668
	Equal variances not assumed	12.167	152.108	<,001	<,001	27.247	2.240	22.823	31.672

Furthermore, in the mathematics learning outcome variable, the Independent Samples T-Test results show that the average score of the experimental group is 83.18, while the control group has an average of 55.93. The t-value = 12.167 with Sig. (2-tailed) < 0.001 indicates that the difference between the two groups is statistically significant. Thus, it can be concluded that the use of the 3-Dimensional Learning Model is effective in improving mathematics learning outcomes It was concluded that the use of gamification methods had a significant effect on improving students' mathematics learning outcomes.

The difference in average scores of 27.25 points shows a very strong improvement effect. Students who learn using the gamification approach gain a more in-depth and enjoyable learning experience. Through the game system, each student is motivated to continue improving their scores, resulting in an increase in the frequency of practice and natural understanding of concepts. Generally, in games, students are encouraged to repeat challenges until they get the best results. This principle makes them unconsciously engage in repetitive learning, which has a positive effect on their memory and mastery of algebra material.

Meanwhile, students in the control group who were taught using traditional lecture methods tended to only receive knowledge passively.

[13] Ali, A., Venica, S. D., Aini, W., & Hidayat, A. F. (2025). Efektivitas media pembelajaran interaktif dalam meningkatkan minat dan motivasi belajar siswa sekolah dasar. *Journal of Information System and Education Development*, *3*(1), 1-6.

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Their involvement in the learning process was limited, reducing their opportunities to internalize mathematical concepts. This resulted in low student ability to apply concepts to problem solving.

Theoretically, these results support Kapp's view that gamification can improve student understanding and engagement through game elements that trigger achievement motivation and curiosity[14]. In addition, research by Mustikasari & Yugopuspito also shows that the application of gamification in science learning can significantly improve learning outcomes by increasing collaborative skills and student focus on tasks.[15] Gamification-based learning not only has an impact on the affective aspect (motivation), but also contributes significantly to the cognitive aspect (learning outcomes).

The results of this study confirm that the increase in learning motivation obtained through gamification is directly correlated with an increase in students' academic achievement. Azhar & Wahyudi say that when students feel challenged, appreciated, and enjoy the learning process, they are more focused and strive to understand the material well[16]. In this case, motivation acts as a mediator that strengthens the relationship between learning methods and learning outcomes.

The findings of this study prove that gamification learning methods not only increase students' enthusiasm and engagement in learning, but also have a significant impact on improving their academic performance. These results are in line with various literature that confirms the effectiveness of gamification in improving learning performance in STEM subjects [17] [18], including mathematics.

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CONCLUSION

Based on the above discussion, it can be concluded that: Gamification results in enjoyable, interactive, and competitive learning. Students are not only recipients of information, but also active participants involved in every learning activity.

The results of the analysis show that there is a significant difference in the level of learning motivation between the experimental group and the control group. There is a significant difference in mathematics learning outcomes between the group taught using the gamification method and the group taught using conventional methods.

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