
The Effect of Gamification-Based Educational Games on Improving Students' Motivation and Quality of Mathematics Learning in Junior High School

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Abstract

Gamification-based learning has been increasingly applied as an instructional strategy to enhance students' engagement in mathematics learning. This study aimed to describe students' learning motivation and learning quality after the implementation of gamification-based educational games in junior high school mathematics learning. A descriptive quantitative approach was employed involving seventh-grade students at MTs Amalianur Pematang Seleng. Data were collected using a learning motivation questionnaire and mathematics learning tasks integrated into gamification platforms, namely Quizizz and Kahoot.

The data were analyzed using descriptive statistics, including mean scores, score distribution, and categorical interpretation. The results indicate that students' learning motivation tends to fall within the high category, characterized by increased enthusiasm, active participation, and positive attitudes toward mathematics learning. In addition, students' learning quality also demonstrates a positive tendency, as reflected in their ability to understand and solve mathematical problems presented through gamified learning activities.

Overall, the findings suggest that gamification-based educational games can serve as a supportive instructional approach to foster students' motivation and learning quality in mathematics classrooms. However, the results are limited to descriptive interpretation and do not imply causal relationships.

Keywords: Gamification, Learning Motivation, Learning Quality, Mathematics

1. Introduction

Mathematics is a discipline that studies relationships, patterns, forms, and structures through logical, analytical thinking and problem-solving processes (Moniz et al., 2024). Nevertheless, mathematics is often perceived as a difficult, monotonous, and unattractive subject, resulting in low student interest, particularly among junior high school students. In the current era of rapid globalization and technological advancement, the use of technology—especially mobile devices—has increased significantly. This phenomenon has a substantial impact on adolescents, as their leisure activities have shifted toward playing games on smartphones. According to Irnawati et al. (2024), the rapid development of gadgets has a strong influence, particularly through digital games that may lead to addiction. This condition can negatively affect students' motivation to attend school as well as the quality of their learning. In addition, students' motivation to learn has declined, especially in mathematics, as many students experience boredom, fatigue, and a lack of enthusiasm. This issue is often caused by monotonous instructional methods, which reinforce the perception that mathematics is difficult and intimidating.

Educational institutions, particularly schools, play a crucial role in fostering students' learning motivation and quality. Therefore, schools are expected to utilize technological tools as learning media to channel students' interests and creativity, thereby increasing their motivation to learn. Educators are encouraged to explore innovative strategies to create engaging learning environments (Ariyanto et al., 2023). Technological developments have significantly transformed learning patterns, particularly among Generation Z and Alpha learners, who are highly familiar with video games. This condition presents an opportunity to integrate game-based elements into cooperative learning models to enhance students' interest and motivation in learning mathematics. One instructional approach aligned with this trend is gamification-based learning.

Gamification-based learning involves the incorporation of game elements into teaching and learning activities. Gamification is defined as a learning method that utilizes game mechanics to encourage student engagement and motivation (Billa & Malasari, 2025). Examples of gamification tools applicable to mathematics learning include Quizizz and Kahoot. Quizizz is an online learning medium used to deliver instructional content in the form of interactive quizzes enriched with animations and engaging interactions, making it easy to use and appealing to students (Muamalah et al., 2023). Kahoot, on the other hand, is an online game-based platform that allows teachers to create quiz questions accompanied by images or videos. Students access the quiz using a PIN code and respond to the questions provided by the teacher (Yani, 2023).

The implementation of gamification-based learning can help teachers overcome students' low motivation in learning mathematics. Students become more enthusiastic and skillful in solving mathematical problems across various topics presented during classroom instruction. As a result, students' learning quality improves due to increased motivation and active participation. The use of gamification-based educational games aims to encourage students' learning motivation and active engagement in addressing challenges within mathematics learning, particularly in linear algebra topics. This approach offers a constructive solution to improving thematic learning by enhancing students' motivation and learning quality in understanding and solving algebraic problems.

2. Methods

This study employed a descriptive quantitative research method aimed at objectively describing phenomena using numerical data, including data collection, data interpretation, and result presentation. The study investigated the effect of gamification-based educational games on improving students' motivation and the quality of mathematics learning at one of MTs in Pematang Seleng. The population of this study consisted of all seventh-grade students. There were two classes involved in the study, namely Class VII-A and Class VII-B, with a total of 63 students. Class VII-A consisted of 31 students, while Class VII-B consisted of 32 students.

The research instruments focused on learning motivation and learning quality, presented in the form of game-based completion questions integrated into the Quizizz and Kahoot applications. The instruments were developed based on indicators of students' motivation and learning quality in mathematics learning and were administered using a gamification-based learning model.

3. Result and Discussion

In this study, validity and reliability tests were conducted to determine whether each statement item within the questionnaire indicators was valid and reliable. These tests were carried out to ensure that the questionnaire items were appropriate for distribution during the field data collection process. The questionnaire employed a Likert scale, which is commonly used to measure behaviors, responses, attitudes, and perceptions toward a particular phenomenon.

The questionnaire consisted of 20 statement items, including 5 items related to the Challenge and Clear Goals indicator, 4 items related to the Progress and Levels indicator, 5 items related to the Student Engagement indicator, and 6 items related to the Instant Feedback indicator. All 20 items represented indicators of Variable X, namely gamification-based educational games, and were administered to 31 seventh-grade students (Class VII-A) at MTs in Pematang Seleng.

To examine the validity of the questionnaire indicators, factor analysis validity was applied using the Kaiser–Meyer–Olkin (KMO) Measure and Bartlett's Test of Sphericity, with a significance level of 0.05 (5%). The validity analysis involved 31 student respondents and was conducted using SPSS version 25. After data processing using SPSS, the following section presents a summary of the results of the item validity testing for the gamification-based educational game questionnaire.

Table 1. Summary of the Validity Test Results for the Gamification-Based Educational Game Questionnaire

No	Indicator	Number of Questionnaire	Anti Image Correlation (KMO and Bartlett's Test)	Significant of Questionnaire	Valid / Invalid
1.	Tantangan & Tujuan Jelas	No. 1	0,633	0,5	Valid
		No. 2	0,616	0,5	Valid
		No. 3	0,481	0,5	Invalid
		No. 4	0,700	0,5	Valid
		No. 5	0,604	0,5	Valid
2.	Progres dan Level	No. 6	0,567	0,5	Valid
		No. 7	0,619	0,5	Valid
		No. 8	0,581	0,5	Valid
		No. 9	0,521	0,5	Valid
3.	Keterlibatan Siswa	No. 10	0,688	0,5	Valid
		No. 11	0,598	0,5	Valid
		No. 12	0,690	0,5	Valid
		No. 13	0,533	0,5	Valid
		No. 14	0,650	0,5	Valid
4.	Umpan Balik Instan	No. 15	0,573	0,5	Valid
		No. 16	0,655	0,5	Valid
		No. 17	0,712	0,5	Valid
		No. 18	0,487	0,5	Invalid
		No. 19	0,509	0,5	Valid
		No. 20	0,530	0,5	Valid

Based on the validity test results, of the 20 questionnaire items, 18 items were found to be valid, while 2 items were identified as invalid. The questionnaire statements for each indicator of Variable X (Gamification-Based Educational Games) were considered valid, as the validation value obtained was 0.605, which is greater than 0.50, indicating that the validity coefficient exceeded the required significance threshold.

Following the validity analysis, a reliability test was conducted on Variable X (gamification-based educational games) using Cronbach's Alpha, with a reliability threshold criterion of 0.50. The results indicate that the questionnaire met the reliability requirements. A summary of the reliability test results for the gamification-based educational game questionnaire is presented in Table 2.

Table 2. Reliability Test Results of the Gamification-Based Educational Game Questionnaire

Cronbach's Alpha	N of Items
.702	20

The reliability test results for Variable X indicate that the obtained Cronbach's Alpha coefficient was 0.702, which is higher than the predetermined threshold value of 0.50. Therefore, it can be concluded that the questionnaire items for this variable are reliable. Meanwhile, the instrument for Variable Y, namely students' learning motivation and mathematics learning quality, consisted of 20 statement items. These items included 4 statements related to the Interest and Enjoyment indicator, 6 statements related to the Curiosity indicator, 5 statements related to the Challenge and Mastery indicator, and 5 statements related to the Self-Confidence Application indicator. All 20 items representing Variable Y were administered to 31 seventh-grade students (Class VII-A) at MTs in Pematang Seleng. The following section presents the research findings obtained from the field data.

The results of the descriptive analysis indicate that students' learning motivation after the implementation of gamification-based mathematics learning tends to be in the high category. Based on the motivation questionnaire scores, the average motivation score demonstrates that most students showed positive attitudes toward learning mathematics when gamification elements were integrated into instructional activities. Students appeared more enthusiastic, actively participated in learning tasks, and demonstrated greater persistence in completing mathematical problems presented through Quizizz and Kahoot. The distribution of motivation scores shows that only a small number of students fell into the moderate category, while none were categorized as having low motivation. This finding suggests that gamification-based learning creates a more engaging learning atmosphere that supports students' intrinsic motivation to learn mathematics.

Students' learning quality was measured through mathematics learning tasks integrated into gamification platforms. The descriptive analysis reveals that the average learning quality score also falls within the high category. Students demonstrated improved understanding of mathematical concepts, particularly in solving algebra-related problems, as reflected in their task completion and response accuracy.

The results indicate that students were able to apply concepts more confidently and systematically during learning activities. The use of gamified questions encouraged students to think critically while maintaining focus and interest. Overall, the descriptive findings suggest a positive tendency in students' learning quality following the implementation of gamification-based educational games.

The descriptive results show that gamification-based mathematics learning is associated with positive tendencies in both students' learning motivation and learning quality. The integration of game elements such as points, rankings, and immediate feedback appears to foster an enjoyable learning environment that encourages active participation.

These findings are consistent with previous studies indicating that gamification can enhance students' engagement and motivation in mathematics learning. When students are motivated, they are more likely to engage deeply with learning tasks, which contributes to improved learning quality. Although this study does not employ inferential statistical analysis,

the descriptive patterns observed suggest that gamification-based educational games can function as supportive instructional tools in mathematics classrooms.

Furthermore, gamification allows teachers to present mathematical content in a more interactive and student-centered manner. This approach reduces students' anxiety toward mathematics and supports conceptual understanding through practice and repetition embedded in game-based activities.

However, it should be noted that this study is limited by its descriptive design and sample size. Therefore, the findings should be interpreted cautiously and are not intended to establish causal relationships. Future studies may employ experimental designs with larger samples to further examine the effectiveness of gamification-based learning.

4. Conclusion

Mathematics education aims not only to support students in understanding mathematical content but also to develop essential skills such as reasoning, problem-solving, communication, and representation. Achieving these competencies requires students to possess sufficient learning motivation, as motivation plays a crucial role in sustaining engagement and cognitive effort throughout the learning process.

Based on the descriptive findings of this study, the implementation of gamification-based educational games in mathematics learning demonstrates a positive tendency in enhancing students' learning motivation and learning quality. Students showed greater enthusiasm, active participation, and positive attitudes toward mathematics when learning activities were delivered through gamified platforms such as Quizizz and Kahoot. These conditions contribute to a more engaging learning environment that supports students' conceptual understanding and task completion.

Although this study does not establish causal relationships due to its descriptive quantitative design, the results indicate that gamification-based learning can function as a supportive instructional approach in junior high school mathematics classrooms. Therefore, teachers are encouraged to integrate gamification elements as complementary learning media to foster students' motivation and improve the overall quality of learning.

Future research is recommended to employ experimental or quasi-experimental designs with larger sample sizes to further examine the effectiveness of gamification-based educational games on students' motivation and learning quality. Such studies may provide stronger empirical evidence and deeper insights into the impact of gamification in mathematics education.

5. References

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