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Research articles

How effective is game-based educational platform on students' learning interest and mathematics problem-solving skills? Empirical evidence from Islamic boarding school

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Abstrak Penelitian ini bertujuan mengetahui dampak penggunaan platform game edukasi, Kahoot, terhadap minat belajar dan pemecahan masalah matematika siswa. Penelitian ini menggunakan pendekatan kuantitatif dengan jenis *quasi experiment* dan desain *non-equivalent control group*. Populasi penelitian adalah seluruh siswa kelas VII di sekolah swasta menengah pertama di Indonesia berjumlah 25 siswa yang dipilih dengan teknik sampling jenuh. Instrumen penelitian berupa angket minat belajar dan tes uraian kemampuan pemecahan masalah. Data dianalisis melalui uji asumsi multivariat, kemudian dilanjutkan dengan uji hipotesis menggunakan Multivariate Analysis of Variance (MANOVA). Hasil uji asumsi menunjukkan bahwa (i) data memenuhi asumsi normalitas multivariat, (ii) variabel dependen memiliki hubungan yang memadai untuk dianalisis secara multivariat, dan (iii) matriks kovarians antar kelompok menunjukkan karakteristik homogen. Selanjutnya,hasil uji MANOVA menunjukkan nilai signifikansi < 0.05 sehingga dapat disimpulkan bahwa penggunaan media Kahoot berpengaruh signifikan, baik secara simultan maupun parsial, terhadap minat belajar dan kemampuan pemecahan masalah matematis siswa. Temuan penelitian ini memperkuat penelitian-penelitian terdahulu yang menyatakan bahwa Kahoot dapat dimanfaatkan sebagai media inovatif untuk pengajaran dan pembelajaran matematika.

Kata kunci *Kahoot, Gamifikasi, Minat belajar, Kemampuan pemecahan masalah, Bilangan bulat*

Abstract This study aims to investigate the impacts of Kahoot, a game-based educational platform, on students' learning interest and mathematical problem-solving abilities. The study employed a quantitative approach with a quasi-experimental research, specifically the non-equivalent control group design. The research population consisted of all seventh-grade students at a private junior high school in Indonesia, totaling 25 students which are selected through saturated sampling technique. The research instruments included a learning interest questionnaire and an essay-based test measuring mathematical problem-solving skills. Data were analyzed through multivariate assumption testing, followed by hypothesis testing using Multivariate Analysis of Variance (MANOVA). The results of the assumption tests indicated that: (i) the data satisfied the assumption of multivariate normality, (ii) the dependent variables demonstrated adequate intercorrelations for multivariate analysis, and (iii) the covariance matrices across groups exhibited homogeneous characteristics. Accordingly, the MANOVA outcomes revealed a significance value of less than 0.05 ($p < 0.05$), indicating that the use of Kahoot had a statistically significant effect, both simultaneously and partially, on students' learning interest and mathematical problem-solving abilities. The research outcomes in this paper strengthened the past studies which claim that Kahoot can be utilized as an innovative instructional platform for teaching and learning mathematics.

Keywords *Kahoot, Gamification, Learning interest, Problem-solving skills, Integers*

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Introduction

The rapid advancement of technology has driven innovation in educational practices, including mathematics instruction. Mathematics plays a vital role in developing logical and analytical thinking skills and serves as a fundamental discipline that contributes to various aspects of daily life (Carolina, Darma, & Nurmaningsih, 2023). Furthermore, mathematical literacy and numeracy are essential competencies that enable students to apply mathematical knowledge in everyday situations and make informed decisions (Han, Susanto, Dewayani, Pandora, Hanifah, Miftahussururi, Nento, & Akbari, 2017). Despite its importance, many students still perceive mathematics as a difficult subject, which negatively affects their interest in learning mathematics (Arigunawan, Sukajaya, & Suryawan, 2020). Students frequently experience difficulties in understanding mathematical problems, applying systematic procedures, and comprehending mathematical concepts. One of the primary factors contributing to these difficulties is students' low interest in learning mathematics (Rohimin, Masrul, & Hanafi, 2024).

In the educational context, students' interest in learning plays an important role in academic achievement. Students with a strong interest in learning tend to be more motivated and actively engaged during classroom activities. Therefore, educators need to implement effective and engaging instructional strategies to foster students' interest in learning (Rohimin et al., 2024). One effective approach is to design interactive and student-centered learning activities that encourage active participation and improve classroom engagement.

Improving students' interest in learning is closely associated with the development of mathematical problem-solving skills. Problem-solving refers to the process of identifying and applying appropriate strategies to overcome difficulties and achieve specific goals (Sa'diyah & Fathani, 2024). These skills are essential because they enable students to address challenges not only in mathematics but also in other academic subjects and real-life situations (Astuti & Ulia, 2025).

However, the mathematical problem-solving skills of Indonesian students remain relatively low. This issue is reflected in the results of international assessments, such as the Programme for International Student Assessment (PISA) 2018 and the Trends in International Mathematics and Science Study (TIMSS) 2015. In PISA 2018, Indonesia ranked 72nd out of 79 participating countries, with an average mathematics score of 379, which was considerably lower than the international average of 487. These findings indicate that many Indonesian students have limited mathematical literacy skills and often struggle to solve non-routine problems that differ from the examples provided during classroom instruction (Rambe & Afri, 2020). In addition, many students continue to demonstrate low interest in mathematics learning.

To address these challenges, classroom instruction needs to be redesigned to create a more engaging and motivating learning environment. The use of interactive learning media can increase students' motivation and participation during classroom activities (Muqoddaroh, Misriah, Pangura, & Fakhriyana, 2024). Previous studies have also demonstrated that gamification-based learning can improve students' academic achievement and creative thinking (Aljraiwi, 2019). Furthermore, gamification has been reported to enhance students' learning experiences and motivation in mathematics learning (Alt, 2023). A systematic review by (Zainuddin, Kai, Chu, Shujahat, & Jacqueline, 2020) further confirmed that gamification can positively influence student engagement, motivation, and learning outcomes across various educational contexts. One technology-based learning medium that has gained considerable

attention is Kahoot. Kahoot is a game-based learning platform that enables students to participate actively in interactive quizzes and classroom activities (Hayati, 2024). Previous studies have demonstrated that Kahoot effectively enhances students' engagement and participation in learning activities (Wang & Tahir, 2020). In addition, the time-limited quiz feature encourages students to think quickly and accurately when solving problems (Wigati, 2019).

Kahoot can also be integrated into various instructional activities, including pre-tests, post-tests, practice exercises, and enrichment tasks. The platform is accessible through students' and teachers' mobile devices using a Gmail account (Bunyamin, Juita, & Syalsiah, 2019). Furthermore, Kahoot can be implemented individually or collaboratively, creating a more interactive and enjoyable learning environment. Its attractive interface and game-based features make it particularly suitable for today's digital generation (Hidayat, Supriani , Setiawan, & Lubis, 2023).

Several previous studies have reported the positive impact of Kahoot on students' learning outcomes. Astuti and Ulia (2025) found that Kahoot has significantly improved the students' mathematical problem-solving skills. Similarly, Vernanda, Rifdarmon, Maksum, and Wakhinuddin (2024) reported that Kahoot was positively influence students' learning interest. Consistent with this finding, Vassya, Cahyadi, and Listyarini (2023) also reported that the use of Kahoot positively influenced students' learning interest. This finding is supported by Sugiani (2023), who found that the use of Kahoot positively affected students' learning interest and learning outcomes. In addition, Putri, Laswadi, and Oktafia (2025) revealed that the Problem-Based Learning (PBL) model assisted by Kahoot significantly enhanced vocational school students' mathematical problem-solving abilities. Nevertheless, most previous studies have been descriptive in nature and have not quantitatively examined the simultaneous effect of Kahoot on both students' interest in learning and mathematical problem-solving skills.

The question regarding simultaneous effect of Kahoot educational game platform on both students' learning interest and mathematical problem-solving skills remains open. The quantitative studies investigating the relationship between these two variables in the context of mathematics learning are still limited. Accordingly, this study seeks to investigate the impact of integrating Kahoot as an educational game-based learning platform on students' learning interest and their mathematical problem-solving abilities. The findings are expected to provide valuable insights into the design and implementation of more engaging, interactive, and student-centered mathematics instruction through the effective integration of technology in classroom learning environments.

Theoretical review

Learning interest

Learning interest refers to an internal motivation that encourages individuals to engage in learning activities in order to develop knowledge, skills, and experience. It is closely related to students' feelings of enjoyment, curiosity, attention, and active participation in the learning process. Students who possess a high level of learning interest tend to show greater enthusiasm and motivation in achieving optimal learning outcomes. Previous studies have highlighted the importance of learning interest in supporting students' academic achievement. Azizah, Mashuri, and Novianti (2023) stated that learning interest reflects students' seriousness and focus during the learning process and serves as a motivating factor that encourages them to continue learning

in order to achieve maximum academic outcomes. Similarly, Harahap, Masruro, Saragih, Hasibuan, Simamora, and Toni (2022) explained that learning interest functions as an internal drive that motivates individuals to improve their knowledge, skills, and learning experiences. In addition, Friantini & Winata (2019) described learning interest as a feeling of preference and attachment toward a particular activity that emerges naturally without external coercion. In line with this perspective, interest can also be interpreted as a strong tendency and desire toward something considered meaningful or enjoyable. Furthermore, Rohimin et al. (2024) emphasized that learning interest is one of the fundamental factors influencing learning success and academic achievement. Therefore, fostering students' learning interest is essential to improve both engagement and academic performance. In mathematics education, learning interest plays a significant role in helping students understand and master mathematical concepts effectively.

Learning interest generally consists of four main aspects: feelings of enjoyment, interest, attention, and involvement. Feelings of enjoyment are reflected in students' comfort and enthusiasm during learning activities. Interest refers to students' willingness and curiosity to explore learning materials more deeply. Attention relates to students' ability to concentrate and remain focused throughout the learning process, while involvement refers to students' active participation in various classroom activities. Learning interest is influenced by both internal and external factors. Internal factors include motivation, emotional condition, and prior knowledge, whereas external factors involve the family environment, school environment, teachers, and learning media. Among these factors, the use of engaging learning media is considered an effective strategy for increasing students' interest in learning, particularly in mathematics, which is often perceived as a challenging subject.

Mathematics problem-solving skills

Mathematical problem-solving skills are considered fundamental competencies in mathematics education because they enable students to analyze, interpret, and solve mathematical problems systematically. Problem-solving is also recognized as one of the primary objectives of mathematics learning, as it helps students develop logical, critical, and analytical thinking skills that can be applied in both academic and real-life contexts. Wahyudi and Anugraheni (2017) defined problem-solving as the process of overcoming challenging problems that cannot be solved through routine or previously familiar procedures. Similarly, Rosidah Parta, and Sisworo (2022) emphasized that mathematical problem-solving skills are among the essential abilities that students must master in order to solve problems encountered in everyday life. In addition, Riyanti (2021) stated that mathematical problem-solving skills are key competencies in mathematics learning and are influenced by students' learning interest as an important internal factor. Therefore, the development of mathematical problem-solving skills should be supported by learning environments and instructional strategies that encourage students' engagement and motivation in learning mathematics.

According to George Polya, mathematical problem-solving consists of four main stages: (1) understanding the problem, in which students identify the information provided and determine what is being asked; (2) devising a plan, where students select appropriate mathematical strategies or procedures to solve the problem; (3) carrying out the plan, during which students apply the selected strategies systematically to obtain a solution; and (4) looking back, in which students review and evaluate both the procedures and the final answer to ensure the correctness and accuracy of the solution.

Kahoot educational game platform

Kahoot is an online learning platform that provides an engaging quiz-based environment to support classroom instruction. By utilizing this platform, the teaching and learning process becomes more interactive, enjoyable, and less monotonous. Sagala, Dewi, Hutagaol, Haloho, Aini, and Tangson (2021) stated that the use of Kahoot can create a more dynamic learning atmosphere and increase students' participation during classroom activities. In addition, Wirani (2022) explained that Kahoot is one of the first Student Response Systems (SRS) designed to provide a game-based learning experience by integrating motivational and gameplay principles. Similarly, Hayati (2024) described Kahoot as a gamification-based learning platform that enables students to actively participate in interactive quizzes. The effectiveness of Kahoot as a gamified learning tool has also been reported in previous study (Ghawail & Yahia, 2022). Through this platform, quizzes can be delivered in a game-like format in which students receive points for correct answers and obtain immediate feedback on their performance. In the context of mathematics education, the use of Kahoot has been shown to enhance students' motivation, attention, and engagement during the learning process. The platform also creates a more enjoyable learning environment, which can contribute to increased learning interest. Utami, Qomariyah, and Surakarta (2025) stated that Kahoot is one of the most effective online learning media for supporting interactive and efficient learning activities. Furthermore, Castillo, Pablo-Lerchundi, and Morales-Alonso (2025) explained that the gamified features of Kahoot can help reduce students' negative emotions during learning and improve their overall learning well-being. One of the main advantages of Kahoot is the use of time-limited questions, which encourage students to think quickly and accurately when solving problems. Wigati (2019) emphasized that time constraints in Kahoot activities can train students' speed and accuracy in answering questions. In addition, quizzes with varying levels of difficulty can improve students' analytical thinking and problem-solving abilities. In line with these findings, Astuti and Ulia (2025) considered Kahoot a relevant learning medium for supporting the development of students' mathematical problem-solving skills.

Method

This study employed a quantitative approach using a quasi-experimental and non-equivalent control group pretest–posttest design. The two groups were assigned without individual randomization; however, both groups completed a pretest to assess their initial equivalence (Sugiyono, 2017). The comparison between pretest and posttest scores is commonly used to evaluate changes in students' abilities following an instructional intervention (Sukarelawan, Indratno, & Ayu, 2024).

In this study, the implementation of the Kahoot educational game platform during instruction was designated as the independent variable (X), whereas students' learning interest (Y_1) and mathematical problem-solving ability (Y_2) were treated as the dependent variables. A quasi-experimental design was employed, as random assignment of participants was not practicable within the existing classroom context. To evaluate the effectiveness of the intervention, Multivariate Analysis of Variance (MANOVA) was utilized to determine whether statistically significant differences existed between the experimental and control groups across the combined dependent variables. Furthermore, MANOVA enabled the examination of the simultaneous influence of Kahoot-based learning on students' learning interest and problem-solving ability.

Population and sample

The population of this study consisted of all seventh-grade students enrolled in the second semester of the 2025/2026 academic year at a private Islamic junior high school in Lombok, Indonesia. A saturated sampling technique was employed at the class level, allowing all classes an equal opportunity to be assigned as either the experimental or control group. Two classes were selected as sample: Class VII A, consisting of 13 students (4 male and 9 female students), served as the experimental group, while Class VII B, consisting of 12 students (6 male and 6 female students), served as the control group. The assignment of classes was intended to minimize sampling bias.

Research instruments

The test instrument was designed to measure students' mathematical problem-solving abilities. The instrument consisted of two essay questions on integer topics, developed based on Polya (1957) stages of problem solving: understanding the problem, devising a plan, carrying out the solution, and reviewing the results. The test was administered twice: as a pretest to assess students' initial abilities and as a posttest to evaluate their improvement following the treatment.

Table 1 presents the problem-solving skill indicators based on Polya's theory. Consecutively, Table 2 presents the test item to assess the students' mathematical problem-solving skills.

Table 1. Indicators of problem-solving skills

No.	Problem- solving indicator (George Polya)	Description of the question/Activity measured	Question number
1.	Understanding the problem	Write down what is known and what is asked	1,2
2.	Plan for problem-solving	Choosing the right Operation/formula	1,2
3.	Implement a problem-solving plan	Counting by step	1,2
4.	Check back	Check the results again	1,2

The test instrument was designed to measure changes in students' mathematical problem-solving abilities. The instrument consisted of two open-ended essay questions on integer topics, developed based on stages of problem solving: understanding the problem, devising a plan, carrying out the solution, and reviewing the results. The test was administered twice, namely as a pretest to assess students' initial abilities and as a posttest to evaluate their improvement following the treatment. The use of only two items was justified by the fact that each question was designed as a complex open-ended problem requiring students to apply all stages of Polya's problem-solving process. Therefore, each item was capable of comprehensively assessing students' mathematical problem-solving abilities rather than measuring isolated skills. The development of the test items involved several stages, including identifying learning objectives and indicators based on integer topics and Polya's framework, constructing contextual open-ended problems requiring multi-step reasoning, and aligning each item with the indicators of problem-solving skills.

Table 2. Instrument for mathematical problem-solving proficiency

No.	Test item
1	On Monday, Andi had Rp45,000. He lent Rp18,000 to his friend, and then received Rp12,000 as a cash gift from his older sibling. On Tuesday, Andi bought stationery for Rp25,000. How much money does Andi have left now? Explain the steps of the solution!
2	The temperature in Mataram city at 06.00 is 18°C. After 2 hours, the temperature drops by 5°C. At 12.00, the temperature again dropped 3°C from the previous temperature. However, in the afternoon the temperature rose again to 7°C. What was the temperature of Mataram city in the afternoon? Show the Solution Steps!

Prior to data collection, the instrument was validated by a mathematics education lecturer. The validation process assessed three main aspects: content accuracy, item construction quality, and language clarity. The instrument was evaluated using a four-point rating scale, and the validation results showed that the instrument obtained a score of 15 out of 16, indicating good validity. Therefore, all test items were considered valid and appropriate for use in the study.

The learning interest questionnaire used in this study was adapted from the instrument developed by Haryati (2021). The instrument was selected because its indicator structure aligned with the objectives of this study, particularly in measuring students' enjoyment, interest, attention, and involvement in learning activities. The questionnaire employed a four-point Likert scale consisting of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The questionnaire results were used to determine students' levels of learning interest in Kahoot-based learning. The instrument consisted of 25 statements, including 16 positive statements and 9 negative statements Haryati (2021).

Data analysis

The data in this study were analyzed using Microsoft Excel and IBM SPSS Statistics software. Microsoft Excel was utilized for preliminary data processing, including data tabulation, scoring, and descriptive statistical analysis. IBM SPSS Statistics was employed to conduct inferential statistical analyses, including prerequisite testing and hypothesis testing.

Data analysis was conducted using Multivariate Analysis of Variance (MANOVA). Four multivariate test statistics, namely Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root, were applied to examine the simultaneous differences in students' learning interest and mathematical problem-solving abilities between the experimental and control groups following the treatment. When the MANOVA results indicated statistically significant differences, the analysis was continued with univariate tests (Tests of Between-Subjects Effects) to determine the effect of Kahoot-based learning on each dependent variable separately.

The prerequisite tests included multivariate normality, independence of dependent variables, and homogeneity tests. Multivariate normality was assessed using Mahalanobis Distance to identify potential multivariate outliers. The data were considered to satisfy the assumption of multivariate normality if no extreme outliers were detected. Furthermore, the independence of the dependent variables was examined using the KMO and Bartlett's Test to determine the suitability of the data for multivariate analysis. Homogeneity testing was conducted using Levene's Test to examine the equality of variances across groups and Box's M

Test to assess the equality of covariance matrices. The data were considered to meet the homogeneity assumption if the significance values (Sig.) were greater than 0.05.

Hypothesis testing was performed using MANOVA to examine the effect of Kahoot-based learning on students' learning interest and mathematical problem-solving abilities, both simultaneously and partially. Decision-making was based on the significance value (Sig.), where the null hypothesis (H_0) was rejected when Sig. $\leq$ 0.05, indicating a significant effect, and accepted when Sig. > 0.05, indicating no significant effect.

Findings

In this study, two classes were involved. Class VII A served as the experimental group while receiving the instruction using a Kahoot-based educational game approach. On the other hand, Class VII B served as the control group and was taught using a conventional learning approach. A pretest was administered prior to the treatment to assess students' learning interest and mathematical problem-solving abilities. After the instructional process had been completed, a posttest was conducted to examine changes in students' learning interest and mathematical problem-solving abilities in both groups. The results of the descriptive statistical analysis for the two dependent variables are presented in Figure 1 and 2, respectively.

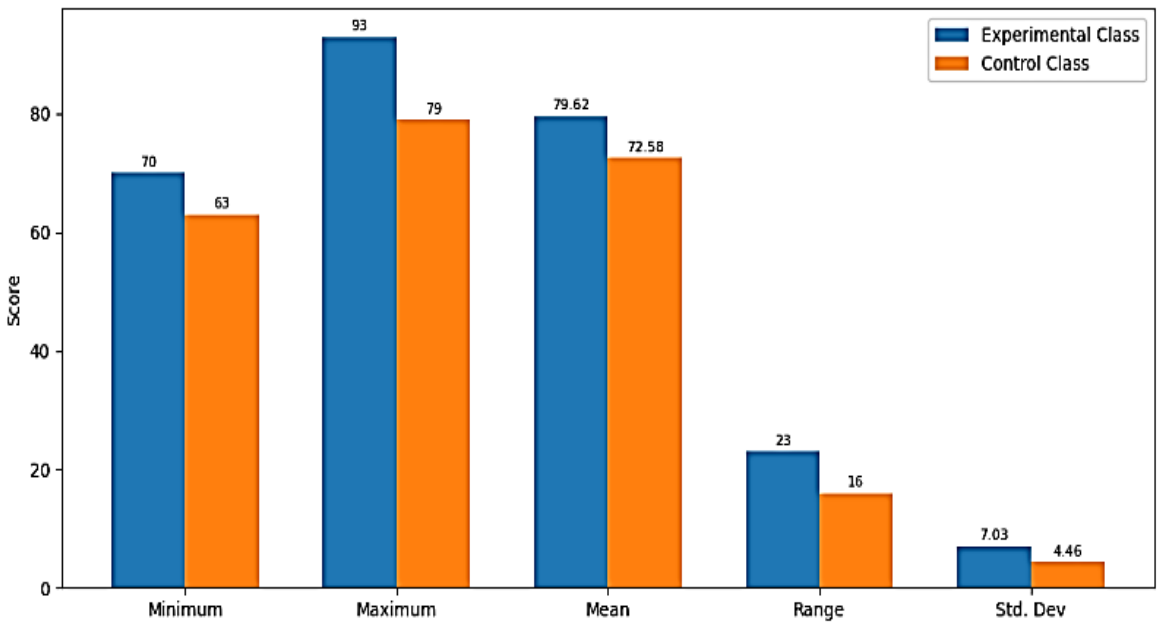

Figure 1. Descriptive statistics for learning interest

There one can see that the students' learning interest score in the experimental group (79.62) was higher than that of the control group (72.58). These findings suggest that students who participated in game-based learning demonstrated greater learning interest than those who experienced conventional learning. Furthermore, the experimental group achieved higher maximum and minimum scores, indicating better overall learning outcomes among students who received the treatment.

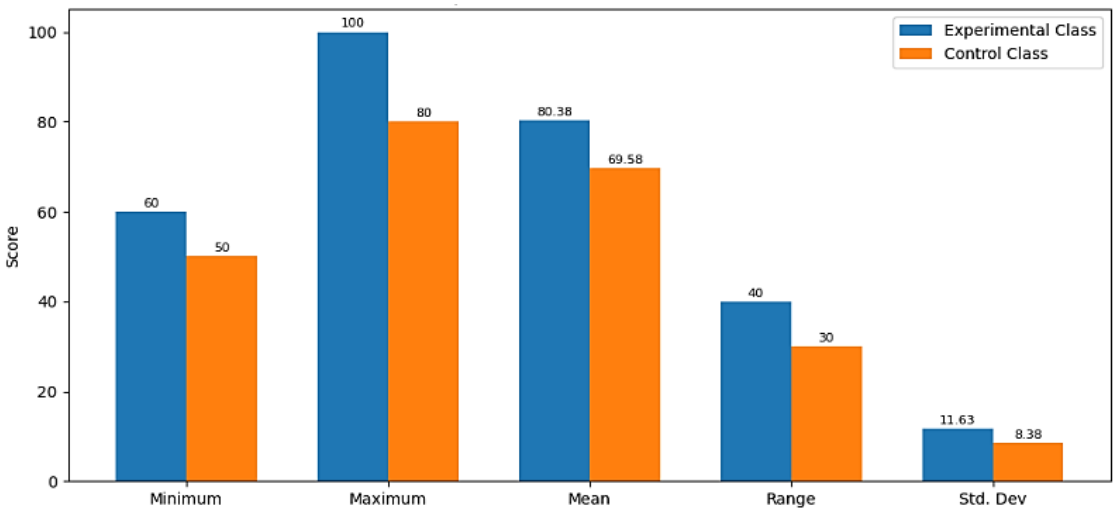

Figure 2. Descriptive statistics for problem-solving skills

The results presented in Figure 2 indicate that the experimental group achieved a higher average score than the control group. The average score of students' mathematical problem-solving abilities in the experimental group was 80.38, whereas the control group obtained an average score of 69.58. These findings suggest that the use of Kahoot-based learning not only increased students' learning interest but also enhanced their mathematical problem-solving abilities. Therefore, it can be concluded that Kahoot-based educational game media had a positive effect on students' learning interest and mathematical problem-solving abilities in integer material among seventh-grade students.

Table 3. Multivariate normality test outcomes (Mahalanobis distance)

Statistic	Value
Minimum	0.00031
Maximum	4.87867
Chi-Square(df=2,p < .001)	13.82
Conclusion	No outlier was detected (normal)

Based on the Mahalanobis distance test (see Table 3), the minimum value obtained was 0.00031, while the maximum value was 4.87867. Since the maximum value was lower than the Chi-Square critical value of 13.82 (df = 2, p < .001), no multivariate outliers were detected. Therefore, the data satisfied the assumption of multivariate normality and were considered appropriate for further analysis using MANOVA.

Table 4. Homogeneity test outcomes

Variable	Levene Statistic	Sig.	Conclusion
Learning interest	1.377	0.253	Homogeneous
Problem-solving	1.071	0.311	Homogeneous

Box's M test

Test	Value	Sig.	Conclusion
Box,s M	3.802	0.328	Homogeneous

As seen in Table 4, the results of Levene's test indicated that the significance values for learning interest (p = .253) and problem-solving ability (p = .311) were greater than .05, suggesting that the variances across groups were homogeneous. Furthermore, Box's M Test produced a significance value of p = .328, which was also greater than .05, indicating that the covariance matrices were equal across groups. Therefore, the assumption of homogeneity required for MANOVA was satisfied.

Table 5. MANOVA test outcomes
Simultaneous hypothesis test (Multivariate test)

Statistic	Value	F	Sig.	Conclusion
Pillai's Trace	0.419	7.918	0.003	Significant
Wilks' Lambda	0.581	7.918	0.003	Significant
Hotelling's Trace	0.720	7.918	0.003	Significant
Roy's Largest Root	0.720	7.918	0.003	Significant

Table 5 presents the simultaneous hypotesis test outcomes where the significance value across all multivariate tests was 0.003, which is less than 0.05. Therefore, the alternative hypothesis (H_1) was accepted, while the null hypothesis (H_0) was rejected. This result indicates that game-based learning through Kahoot has a simultaneous effect on students' learning interest and mathematical problem-solving abilities in integer topics among seventh-grade students.

Table 6. MANOVA test outcomes
Partial hypothesis test (Univariate test)

Variable	F	Sig.	Conclusion
Learning interest	8.740	0.007	Significant
Problem-solving	6.988	0.015	Significant

Accordingly Table 6 presents the partial hypotesis test outcomes. There one can see that the significance values for learning interest (p = 0.007) and problem-solving ability (p = 0.015) were both lower than 0.05. Therefore, it can be concluded that the use of Kahoot in mathematics instruction has a significant partial effect on students' learning interest and mathematical problem-solving skills.

The results of the MANOVA analysis, both simultaneously and partially, showed that the implementation of Kahoot in mathematics instruction had a significant effect on students' learning interest and mathematical problem-solving skills. In the simultaneous test, the significance value of 0.003 indicated a significant difference between the experimental and control groups. Meanwhile, in the partial tests, both dependent variables also showed significant value, with p = 0.007 and p = 0.015 for learning interest and problem-solving skills, consecutively. Thus, the research hypothesis formulized in this study is accepted.

Discussion

The findings of this study indicate that the implementation of Kahoot educational platform has significant effect on students' learning interest and problem-solving skills. Based on the descriptive statistical analysis, the mean score of learning interest in the experimental class was 79.62, which was higher than that of the control class (72.58). This result suggests that game-

based learning creates a more engaging and enjoyable learning environment for students. This finding is consistent with who reported that Kahoot enhances students' enthusiasm and engagement in learning activities. Similarly, Pham, Thai, and Nguyen (2025) found that Kahoot improved students' retention in grammar learning, particularly in English irregular verbs. The interactive and competitive features of Kahoot play an important role in fostering students' intrinsic motivation, leading to higher classroom participation. However, Ghawail and Yahia (2026) noted that continuous use of Kahoot over an extended period may lead to a slight reduction in its motivational effect due to a "wear-off" phenomenon.

In terms of problem-solving skills, the experimental class obtained a higher mean score (80.38) compared to the control class (69.58). This finding is in line with who stated that Kahoot helps students develop faster thinking, better focus, and improved accuracy in solving mathematical problems. The real-time quiz feature encourages students to make quick decisions, apply appropriate strategies, and evaluate their answers effectively. From a mathematics education perspective, this indicates that Kahoot not only enhances engagement but also supports the development of higher-order thinking skills, particularly in relation to Polya's problem-solving stages.

A key contribution of this study lies in its simultaneous analysis of learning interest and problem-solving skills using MANOVA. While previous studies have generally examined these variables separately, the present study demonstrates that Kahoot has a significant multivariate effect on both affective and cognitive domains. This finding provides a more comprehensive understanding that students' learning interest is closely related to their ability to solve mathematical problems. In this sense, Kahoot functions not only as a motivational tool but also as a learning medium that connects engagement with cognitive development in mathematics learning.

Furthermore, this study has practical implications for mathematics instruction. Kahoot can be integrated not only as an assessment tool but also as part of the learning process, including concept reinforcement, formative assessment, and interactive problem-solving activities. This is consistent with gamification theory, which emphasizes that the integration of game elements in learning can improve students' attention, engagement, and motivation Hayati (2024). In mathematics learning, which is often perceived as difficult and less engaging, Kahoot offers an innovative approach to creating a more student-centered and meaningful learning experience.

Overall, the results show that Kahoot positively influences both students' learning interest and problem-solving skills. The use of interactive and game-based learning media enhances students' engagement and motivation, particularly for those who are initially passive or have low interest in conventional learning environments. Through immediate feedback, active participation, and a competitive yet enjoyable atmosphere, Kahoot helps students better understand mathematical concepts and increases their confidence in solving problems. These findings are consistent with previous studies on game-based learning, which highlight its effectiveness in improving student engagement in mathematics. However, this study extends prior findings by showing that Kahoot also contributes to cognitive development, particularly in problem-solving skills, in addition to affective outcomes.

Despite these positive findings, this study has several limitations. First, the sample size was relatively small and limited to one school, which may limit the generalizability of the results. Second, the duration of the intervention was relatively short, so long-term effects could not be fully observed. Third, this study focused only on two variables, namely learning interest and

problem-solving skills, without considering other relevant variables such as critical thinking, collaboration skills, or attitudes toward mathematics.

Therefore, future research is recommended to involve larger and more diverse samples, extend the duration of the intervention, and include additional variables to obtain a more comprehensive understanding of the impact of gamification in mathematics education. Future studies may also explore the integration of Kahoot with other instructional models, such as problem-based learning or collaborative learning approaches, to further enhance students' mathematical competencies.

Conclusion

The findings of this research confirms statistically that Kahoot-based learning has a significant effect on students' learning interest and problem-solving skills. The higher mean score in the experimental group indicates that Kahoot creates a more interactive and engaging learning environment, thereby increasing students' learning interest. In addition, the use of Kahoot has also been shown to improve problem-solving skills, as reflected in the differences of posttest scores between the experimental and control groups. The results of the MANOVA analysis, both simultaneously and partially, confirmed that Kahoot media had a significant effect on the two dependent variables. Kahoot, therefore, can be considered as an innovative alternative digital platform in mathematics learning, particularly for topics that require higher-order thinking skills. The implementation of Kahoot has the potential to improve the quality of learning and provide a more meaningful and engaging learning experience for students.

The author suggests to consistently implement Kahoot in mathematics instruction as an effort to improve students' learning interest and problem-solving skills. The teachers are also encouraged to develop varied learning contexts, activities, and supporting strategies that align with students' characteristics so that the learning process becomes deeper, more meaningful, and more inclusive for all students.

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