

The implementation of *Kahoot!* based assessment and its impact on student's motivation to learn mathematics

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ABSTRAK

Penelitian menggunakan aplikasi Kahoot! meningkatkan motivasi belajar peserta didik dalam pembelajaran Matematika. Penelitian ini menggabungkan prosedur pra-eksperimental dengan metode kualitatif dan kuantitatif dalam desain one group pretest-posttest. Peneliti menemukan bahwa ketika peserta didik menggunakan aplikasi Kahoot!, motivasi belajar matematika mereka meningkat sebesar 12% ($60.58 > 54.03$). Hasil analisis kualitatif menyatakan bahwa aplikasi Kahoot! membuat pembelajaran matematika lebih menarik, tidak membosankan, meningkatkan interaksi sosial terhadap pembelajaran matematika, serta memberikan dorongan kompetitif yang positif. Selain itu, berdasarkan hasil analisis kuantitatif menunjukkan adanya perbedaan yang signifikansi antara nilai motivasi belajar matematika sebelum dan sesudah penerapan aplikasi Kahoot!. Hasil uji t menunjukkan nilai signifikansi (Sig) lebih rendah dari nilai alpha ($0,000 < 0.05$), sehingga H_0 ditolak dan H_1 diterima yang berarti terdapat pengaruh yang signifikan antara sebelum dan sesudah menggunakan aplikasi Kahoot!. Hasil uji N-Gain motivasi belajar Matematika sebesar 0.30, skor ini dikategorikan sedang yang artinya penggunaan aplikasi Kahoot! dalam pembelajaran Matematika cukup efektif dalam meningkatkan motivasi siswa.

ABSTRACT

This research utilizes *Kahoot!* to enhance students' motivation to learn Mathematics. This study combines pre-experimental procedures with qualitative and quantitative methods in a single-group pretest-posttest design. The results indicate that the use of the *Kahoot!* Application resulted in a 12% increase in students' motivation to learn mathematics, with a mean score of 60.58 compared to 54.03. The results of the qualitative analysis indicate that *Kahoot!* The application enhances the appeal of mathematics learning, fosters a more engaging and enjoyable learning experience, facilitates social interaction and collaboration in mathematics learning, and provides positive competitive motivation. Furthermore, the quantitative analysis revealed a notable discrepancy in students' motivation to learn mathematics before and after the introduction of *Kahoot!* Application. The results of the t-test indicate that the significance value (Sig) is less than the alpha value ($0.000 < 0.05$), thereby rejecting the null hypothesis (H_0) and accepting the alternative hypothesis (H_1). This implies that there is a notable impact between the pre-and post-use of the *Kahoot!* Application. The N-Gain test result for motivation in learning mathematics is 0.30, which is categorized as moderate. This indicates that the use of the *Kahoot!* Application in mathematics education is quite effective in improving student motivation.



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INTRODUCTION

One of the most significant challenges in mathematics education is the lack of student motivation (Tiara et al., 2019). Motivation is an internal drive that pushes someone to achieve goals in line with their desires and inner motivations (Uno, 2007). In the context of education, learning motivation refers to the student's desire to engage in learning activities that ensure the achievement of learning objectives and provide direction in the learning process (Fibriani & Damris, 2014). A lack of motivation in learning hinders the learning process and prevents the achievement of maximum learning goals for the students (Susanti & Nuriyatin, 2015).

A significant number of students perceive mathematics as one of the most difficult disciplines to learn (Gita, 2021). Due to its abstract nature, mathematics is considered a challenging topic by students, leading to their lack of enthusiasm towards the subject, ultimately affecting their motivation to study (Istiqlal & Wutsqa, 2013). This low motivation is often attributed to a lack of understanding of mathematical concepts and interest in the subject (Rahmayani & Amalia, 2020).

In mathematics education, a lack of student motivation is often observed through assessment activities (Lestari et al., 2018). Previous research conducted by Fitriati (2017) revealed that 28% of students had low motivation in mathematics class, with an average motivation score of 58,9%. This indicates that the current assessment methods are not effective in motivating students to learn mathematics. Additionally, the assessment methods used in mathematics education are predominantly conventional, such as paper-based tests, which have been demonstrated to diminish student motivation when answering mathematical questions (Ernawati et al., 2023). The findings from research interviews with eighth-grade mathematics teachers in Jakarta indicated that assessment activities are usually conducted in written form, with minimum development of learning motivation for mathematics. This finding indicates that the motivation for learning mathematics in this school is categorized as low. It is evident that a novel approach to assessment activities is required in order to facilitate more engaging and motivating mathematics learning.

The implementation of interactive educational games as a learning tool has been demonstrated to enhance student motivation (Irwan et al., 2019). Research on interactive learning media conducted by Cahyaningtias and Ridwan (2021) indicates that interactive learning media significantly impacts students' learning motivation. The utilization of technology, such as internet-based learning, has become increasingly important in the overall learning process, including assessment, given its current advancements (Puteh et al., 2017). Therefore, an assessment-based learning resource is essential to support students in completing assessment tasks quickly and objectively, thereby fostering motivation to learn mathematics.

One interactive learning resource that uses enjoyable assessment techniques is *Kahoot!*. *Kahoot!* is an educational platform that incorporates the concept of games and can be used for teaching both in educational institutions and for individual learning (Oktari, 2020). Additionally, *Kahoot!* serves as an online learning tool with features such as quiz games, discussions, and surveys (Sakdah et al., 2021). The use of *Kahoot!* as a student activity tool enhances motivation in learning by providing an engaging, stimulating, and non-boring environment for students (Warsihna & Ramdani, 2020).

Kahoot! is often considered superior due to its design elements. It has an appealing interface, attractive colors, timing, and alternative solutions that enhance curiosity about the material. Besides, the music played within *Kahoot!* can also increase a person's biological hormones, motivating them to actively engage and solve questions with a sense of joy (Warsihna & Ramdani, 2020). Research on student enthusiasm towards *Kahoot!* has been conducted, including Marisda (2023), who found that using *Kahoot!* in the learning process can boost student motivation. Additionally, a study by Tetep and Arista (2022) demonstrated that using the *Kahoot!* Application has a significant positive impact, thereby, motivating students to learn.

Several studies on the relevant topic have also been conducted by several experts In 2021, with the theme of implementing *Kahoot!* Applications as a *Kahoot!*-based learning media to assess learning outcomes in the context of the 4.0 industrial revolution. This evidence shows that using *Kahoot!* as a teaching tool has a beneficial on students' academic performance in fifth-grade ecology lessons (Sakdah et al., 2021). In 2021, with the theme of the role of the educational game *Kahoot!* in mathematics learning, student learning outcomes improved, they quickly understood

the material, became more independent, improved their thinking and learning abilities, and had a positive attitude toward learning by actively participating in the learning process with greater enthusiasm. Accordingly, learning became enjoyable and captivating, leading to an increased desire to learn (Sulistiyawati et al., 2021).

The research conducted in 2021 also focused on the development of interactive learning media in mathematics education, specifically using *Kahoot!* Application. The study demonstrated that the implementation and utilization of interactive learning media, especially *Kahoot!* Application effectively optimizes student learning outcomes (Rahma & Nurhayati, 2021). In 2022, with the theme of using interactive learning media and the *Kahoot!* Game in mathematics material on limits during the new normal era, it was found that interactive learning media and the *Kahoot!* Game had a significantly positive impact on improving student learning outcomes, as evidenced by the increased average scores of students (Kamila et al., 2022).

In light of the aforementioned research, this study hypothesizes that using *Kahoot!* based assessments can enhance the motivation of students in mathematics class. Several studies have examined the use of the *Kahoot!* Application in a general context, but only a few specifically evaluate its impact on student motivation to learn mathematics in the classroom. Therefore, the novelty of this research lies in the implementation of *Kahoot!* based assessments to enhance the motivation of middle school students in learning mathematics.

Several previous studies have examined the use of *Kahoot!* Application as a learning and evaluation tool. However, this research provides significant contributions in the context of education, particularly in junior high schools. This is important because methods and outcomes can vary based on cultural and educational contexts in Indonesia. Therefore, this study explores the impact of implementing *Kahoot!* based assessments on student motivation in learning mathematics. Therefore, this research is expected to serve as a viable solution for enhancing student learning motivation and facilitating a deeper understanding of mathematical concepts, ultimately maximizing learning objectives.

METHOD

This study utilized a combination of qualitative and quantitative research (mixed methods) with a pre-experimental method. Sugiyono defines mixed research method as an approach that includes components of both quantitative and qualitative methodologies to produce valid, reliable, and objective data (Setiana & Firmansyah, 2021). For the research design, this study employed a one-group pretest-posttest approach, with no control group for comparison, and only one group received treatment during a specific period. The treatment involved providing mathematics learning assessments using the *Kahoot!* Application to that group. Additionally, the study included independent variables and dependent variables. The *Kahoot!* application served as the dependent variable in this research, while mathematics learning motivation was the independent variable.

The subject of this research was eighth-grade students in one of the junior high schools located in Jakarta, Indonesia, with a total of 36 students. Purposive sampling was employed, by intentionally selecting individuals or groups by the researcher based on specific characteristics or objectives relevant to the ongoing research (Sugiyono, 2013). In this study, questionnaires and interviews were used as data collection methods. Qualitative and quantitative data were used in this research. Qualitative data was garnered through unstructured interviews, while quantitative data was obtained through pretest and posttest questionnaires from students. Qualitative analysis was used to describe the learning process using *Kahoot!* Application. Further, the level of motivation possessed by students in mathematics learning, both before and after using *Kahoot!* Application was determined by analyzing quantitative data.

Prior to commencing the research, the researcher conducted an initial test on the instrument, specifically content validation. This assessment involved two expert validators, one of whom was a mathematics lecturer. Subsequently, the instrument underwent validity and reliability testing using IBM SPSS Statistics software version 26. The formulas used in this testing were the *product moment and Cronbach's Alpha*. The study began with a pretest administered at the beginning of the session. Meanwhile, the posttest was given to measure mathematics learning motivation

through a questionnaire. Then, interviews were conducted with the participants, following their motivation to learn mathematics before and after using *Kahoot!* Application. This research design was selected to understand the differences in mathematics learning motivation before and after implementing the *Kahoot!* Application in learning evaluation.

The instrument comprised fifteen statement items regarding motivation for learning mathematics. Five answer options were displayed on a Likert scale, with the first option being “Strongly Agree” with a score of 5, “Agree” with a score of 4, “Neutral” with a score of 3, “Disagree” with a score of 2, and “Strongly Disagree” with a score of 1 (Khoirunnisa & Ulfah, 2021). [Table 1](#) presents the questionnaire grid, specifically designed for the purpose of assessing students' attitudes toward mathematics learning.

Table 1. Motivation to study mathematics

No.	Mathematics Learning Motivation Indicator	Description of mathematics learning motivation indicators	Number of questions
1.	Intrinsic motivation	The impact felt by students, experiencing happiness while studying mathematics, can trigger motivation to continue striving even when facing difficulties, because this grows naturally within them.	3
2.	Extrinsic motivation	The enthusiasm for learning mathematics in students can be enhanced when there is external support, such as family encouragement, friends, recognition, and positive academic achievements, in addition to their own internal motivation.	3
3.	Homework grade	The perspective of the students regarding the subject of mathematics.	3
4.	Confidence	The students' belief that success in understanding mathematics depends on themselves.	3
5.	Self-efficacy	The students believe that they can achieve success in solving mathematical problems thanks to their abilities.	3
Number of statements			15

The normality and homogeneity tests were conducted to identify the appropriate parametric statistical analysis for hypothesis testing. The normality and homogeneity tests were performed using SPSS Statistics version 26. The normality test was performed using the *Shapiro-Wilk* test because the research sample size was only 36, less than 50 samples. The homogeneity test was used to ensure data homogeneity. To assess effectiveness, a paired t-test was used to determine if there was a significant difference between two experiments or two samples when comparing their means. Additionally, the N-Gain test was conducted to assess the effectiveness of the method or treatment. To collect reliable information about students' motivation towards mathematics after using *Kahoot!* Application, interviews were performed using a thematic analysis approach, extracting key themes from each interview result (Braun & Clarke, 2019).

RESULT

This study aims to ascertain whether the *Kahoot!* Application has an impact on students' motivation to learn mathematics. This result is evident from the data analysis conducted by applying SPSS Statistics version 26. Besides, the data were subjected to descriptive analysis, as an initial step in analyzing the descriptive information, and the results are listed in [Table 2](#). Based on [Table 2](#), the average pretest score is 54.03. Additionally, the average post-test score indicates a value of 60.58. The average motivation for learning mathematics in the posttest is higher compared to the average motivation in the pretest. This suggests that student's motivation to learn mathematics is influenced by the use of *Kahoot!* Application.

Table 2. Descriptive analysis of motivation for learning mathematics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pretest	36	27	42	69	54.03	6.614
Posttest	36	28	46	74	60.58	6.754

Table 3. The result of the normality test for motivation to learn mathematics data

	Shapiro-Wilk		
	Statistics	df	Sig.
Pretest	0.961	36	0.223
Posttest	0.982	36	0.805

In the subsequent stage, inferential statistical analysis was applied to the data, specifically testing hypotheses and prerequisite assumptions. Homogeneity and normality tests are prerequisite assumptions. The normality test was conducted to determine whether the data follows a normal distribution. The results of the normality test are presented in [Table 3](#).

[Table 3](#) displays the results of the normality test conducted using SPSS Statistics version 26. Using the *Shapiro-Wilk* test, the pretest data for mathematics learning motivation yielded a significance value (Sig) of 0.223, which indicates that the data is normally distributed (since it is greater than 0.05). The posttest results also showed that the motivation for learning mathematics had a significance value (Sig) of 0.805, which is still greater than 0.05 indicating normal distribution. In the next stage, a homogeneity test was performed in order to determine whether the data was homogenous or not. [Table 4](#) presents the results of the homogeneity test for mathematics learning motivation.

In [Table 4](#), the homogeneity test was conducted using SPSS Statistics version 26, and yielded a significance level (Sig) of 0.980. Since the significance level of 0.980 > 0.05, the data is considered homogenous. Further data analysis was performed through hypothesis testing using the t-test and N-Gain test, while the results are presented in [Tables 5](#) and [6](#).

Table 4. Homogeneity test results for mathematics learning motivation

Variabel	Aspects	Levene Stistic	df1	df2	Sig.
Motivation for learning mathematics	Based on Mean	0.001	1	70	0.980
	Based on Median	0.000	1	70	1.000
	Based on the Median and with adjusted df	0.000	1	69.752	1.000
	Based on trimmed mean	0.000	1	70	0.991

Table 5. Results of the t-test for Mathematics Learning Motivation

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Pair 1 Pretest – Posttest	-6.556	6.793	1.132	-8.854	-4.257	-5.971	35	0.000

Table 6. N-Gain test results for motivation to learn mathematics

	N	Minimum	Maximum	Mean	Std. Deviation
NGain	36	0.00	0.94	0.3002	0.26439
Valid N (listwise)	36				

Table 5 presents the results of the t-test, using SPSS Statistics version 26, it is based on a significance level (Sig 2-tailed) of $0.000 < 0.05$. The result indicates that H_0 is rejected and H_1 is accepted. This suggests a significant difference in mathematics learning motivation between before and after using *Kahoot!* Application in the mathematics class. Furthermore, in **Table 6** concerning the N-Gain test using SPSS Statistics version 26, the N-Gain value for mathematics learning motivation is 0.30, categorized as moderate. This implies that the use of the *Kahoot!* Application in mathematics education is effective in improving students' motivation to learn the subject. Consequently, since the significance value is less than 0.05, H_0 is rejected and H_1 is accepted. This indicates a difference in mathematics learning motivation among students after implementing *Kahoot!* Application as an assessment tool.

In addition to quantitative data, this research also collected qualitative data from students through interviews. The analysis results of qualitative data, students' responses to learning using the *Kahoot!* Applications are very positive. The students were interviewed about their experiences and motivations in learning mathematics using *Kahoot!* Application. Then, a report that presented direct quotations from the students was compiled. From this interview, several main themes emerged, as discussed in the following.

1. Intrinsic motivation

The majority of participants in the interview stated that learning with *Kahoot!* the application increases their motivation. One student mentioned, *"I like using Kahoot! because it makes lessons more interesting and not boring"*. Another participant added, *"I feel happy and confident when I get the correct answers and my score goes up"*. The results of the interview indicate that *Kahoot!* has the effect of making lessons more engaging, enhancing enjoyment and self-confidence, and boosting intrinsic motivation for students.

2. Extrinsic motivation

The students stated that learning with the *Kahoot!* Application provides external motivation for studying. One student mentioned, *"I am highly motivated by competing with classmates. Seeing who gets the highest score pushes me to work harder"*. Another participant added, *"The scores and rankings in Kahoot! help me track my progress in solving math problems"*. The interview results indicate that competition and the gamification elements in *Kahoot!* provide external motivation and encourage students to improve their performance.

3. Social interaction

The social interaction among students increases with the use of *Kahoot!* Application. One of the students stated, *"My friends are enthusiastic because Kahoot! motivates us to collaborate, work together, and share strategies"*. Interview results indicate that *Kahoot!* enhances positive social interaction, with students consistently benefiting and developing engaging, enjoyable, and supportive learning activities.

DISCUSSION

The research findings indicate that *Kahoot!* based assessment has an impact on students' motivation in learning mathematics. These results align with previous studies, which show that implementing assessment using instructional media presents a positive effect on students' motivation compared to conventional approaches without instructional media systems (Ding, 2019). Research by Wang and Tahir (2020) posits that using platforms, such as *Kahoot!*, that incorporate game elements can enhance motivation and enjoyment in learning, leading to increased student participation in the learning process. Another report by Plump and LaRosa (2017) also demonstrates that utilizing *Kahoot!* in the classroom can contribute to more engaging and dynamic learning, ultimately boosting motivation and student participation in mathematics learning.

Furthermore, research by Zarzycka-Piskorz (2016) also indicates the use of instructional media, such as the *Kahoot!* Application, can motivate students to learn more by tailoring lessons to individual learning styles. According to the study by Alawadhi and Abu-Ayyash (2021), the usage of *Kahoot!* can optimize understanding and motivation for learning, especially in mathematics courses.

Research by [Licorish, et al. \(2018\)](#) states that using *Kahoot!* as a game-based mathematics learning tool can enhance student motivation and engagement in mathematics education. Additionally, according to the study by [Ismail et al \(2019\)](#), using *Kahoot!* can encourage students to learn more effectively and help them understand the material more deeply.

Motivation is an essential component in mathematics learning because it encourages students to work harder to achieve their academic goals ([Cipinding, 2022](#)). Student motivation encompasses various aspects of human behavior and psychology that influence their time management strategies, effort levels, ability to overcome learning challenges, and overall success in the classroom ([Bakar, 2014](#)). Additionally, according to Fidan, motivation represents a feeling of empowerment that drives individuals to carry out specific tasks by providing cognitive, emotional, and psychological contributions ([Cevahir et al., 2022](#)).

[Dewi \(2018\)](#) defines *Kahoot!* as an interactive educational game with several features, one of which is the quiz feature that allows users to create quizzes using the *Kahoot!* Platform for various learning purposes, thereby enhancing the learning process to be more interesting and enjoyable. According to [Graham \(2014\)](#) *Kahoot!* is an online learning platform that offers free and inexpensive questions or quizzes for assessing student learning outcomes. This aligns with the statement from [Iwamoto et al. \(2017\)](#) that *Kahoot!* is an application that creates and delivers questions in a game-show style.

Kahoot! is an interactive learning platform that can be utilized in the teaching process, including in the administration of pre-tests, post-tests, practice questions, and enrichment ([Bunyamin et al., 2020](#)). The benefits of using the *Kahoot!* Application includes the ability of students to think clearly and quickly when questions are presented in a timely manner, and the capacity of educators to create conversations, tests, and questions by adding text, images, and videos ([Ningrum, 2018](#)).

Furthermore, *Kahoot!* Application offers a noteworthy array of media sources, facilitating the use of both computers and smartphones ([Santoso & Widiyanti, 2022](#)). However, a drawback of the *Kahoot!* Application is that, on occasion, users are unable to re-enter the game after losing internet connectivity ([Nasution, 2019](#)). Nevertheless, based on research by [Johnson et al. \(2023\)](#) indicates that despite challenges related to connectivity, the use of the *Kahoot!* Application still has a positive impact on student engagement and motivation, as well as improving the quality of lessons. This suggests that despite its shortcomings, the motivation of students can still be enhanced through the *Kahoot!* Application.

This research encourages the development of a learning process that can be used to train concentration in the classroom using comfortable and enjoyable learning media. Accordingly, students become more motivated to learn mathematics. Schools can use the findings of this research as a stepping stone to utilize game-based learning resources such as the *Kahoot!* Application to enhance student motivation in mathematics class.

CONCLUSION

The findings of this study indicate that the use of the *Kahoot!* Application can significantly enhance students' motivation to learn mathematics. This conclusion is based on both qualitative and quantitative analysis. The results of the statistical test demonstrate a statistically significant difference in motivation levels before and after the implementation of the *Kahoot!* Application. These findings are corroborated by qualitative data obtained from interviews with students, who reported positive experiences and increased motivation in mathematics learning through *Kahoot!* However, it is important to note, that the limitations of this study include a small sample size and the specific learning contexts under investigation. Therefore, it is recommended that further research be conducted with a larger sample size and variations in learning environments, as well as a more in-depth qualitative approach to gain a deeper understanding of students' holistic experiences regarding the use of the *Kahoot!* Application. The findings of this study indicate that the *Kahoot!* Application may be an effective learning tool for enhancing students' motivation in mathematics. Further in-depth studies may yield additional insights into the efficacy of the *Kahoot!* Application in improving motivation for learning mathematics.

Author contributions

The authors made significant contributions to the study's conception and design. The authors was in charge of data analysis, interpretation, and discussion of results. The final manuscript was read and approved by the authors.

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Conflict of interest

The author(s) declare that there is no potential conflict of interest.

Data availability statement

All data are available from the authors.

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