



Effectiveness of using kahoot-assisted interactive video-based learning media on junior high school students' understanding of mathematical concepts



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ABSTRACT

This study aims to determine the effectiveness of using interactive video based learning media assisted by Kahoot in improving students' understanding of mathematical concepts. This research employed a quantitative approach with a one-group pretest-posttest design. The participants were 21 seventh-grade students of SMP Muhammadiyah Way Sulan. The data were collected using a mathematical concept comprehension test consisting of five essay questions. The results of the Wilcoxon Signed Rank Test indicated a significant difference between the pretest (mean = 36.0) and posttest (mean = 87.6) scores with an Asymp. Sig (2-tailed) value of $0.000 < 0.05$. This finding suggests that the use of interactive video-based learning media assisted by Kahoot is effective in improving students' understanding of mathematical concepts. Therefore, interactive learning media can serve as an alternative instructional strategy to enhance students' engagement and learning outcomes in mathematics.

1. Introduction

Mathematics is one of the basic subjects that plays an important role in developing logical, systematic, and critical thinking skills in students. Through mathematics learning, students are not only taught about formulas and numbers, but are also trained to solve problems in a rational and structured way in everyday life [1].

However, in practice, mathematics learning in schools still faces various obstacles. Many students consider math to be a difficult and boring subject because the delivery is less interesting and tends to be teacher-centered.

This condition has an impact on the low level of understanding of students' concepts, especially in materials that require high abstraction skills such as algebra. According to several observations in the

field, most students have not reached the Minimum Completeness Criteria (KKM), which indicates the need to update learning strategies. One of the efforts that can be made to overcome this problem is to utilize technology-based interactive learning media [2]. This medium is believed to help students understand mathematical concepts visually and contextually, thereby reducing boredom and increasing their engagement during the learning process.

Interactive learning media, especially learning videos and the Kahoot! platform, are able to provide a more interesting and participatory learning atmosphere [3], [4], [5]. Interactive videos make it easy for students to understand concepts through concrete visualizations [6], while Kahoot! Providing a game-based learning experience (gamification) that can increase students' motivation and memory of the material taught [7].

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Previous research has shown that the use of interactive digital media can strengthen student engagement and improve learning outcomes, especially in concept-based math learning [8], [9], [10]. This research is in line with the findings [11] which stated that the development of teaching materials based on the PQ4R method was able to effectively instill students' understanding of mathematical concepts. In addition, studies [12] and [13] also show that the use of Kahoot! In teaching and learning activities can increase student active participation and learning outcomes. Thus, the merger of learning video media and Kahoot! It is expected to be an innovative alternative in improving students' understanding of mathematics concepts at the junior high school level.

Based on this background, this study aims to analyze the effectiveness of the use of interactive learning media based on Kahoot! to the understanding of mathematics concepts of grade VII students of SMP Muhammadiyah Way Sulan. This research also focuses on the extent to which the media can help students achieve learning completeness in accordance with the KKM that has been set by the school

This research is expected to make a real contribution to the development of mathematics learning strategies in schools, especially through the use of interactive technology-based media. The results of this research can be a reference for teachers in choosing and designing learning media that not only attract students' attention, but are also effective in improving their understanding of concepts. In addition, this study is also expected to enrich empirical studies on the effectiveness of Kahoot! and learning videos as innovative media in mathematics education in the digital era [14].

2. Method

2.1. Research Design

This research employed a quantitative approach with a quasi-experimental design. A quantitative approach was selected because the research data consisted of numbers that were statistically analyzed to test the formulated hypotheses [15]. A quasi-experimental design was used because field conditions did not allow for the random assignment of a control group. The specific research design utilized was the *One Group Pretest-Posttest Design*, which involved only one experimental group without a comparison control group.

2.2. Research Setting and Participants

This research was conducted at SMP Muhammadiyah Way Sulan, South Lampung Regency, during the odd semester of the 2025/2026 academic year. The research subjects consisted of 21 seventh-grade students who served as the single experimental group. The sample was selected using a saturated sampling technique, as the entire population of seventh-grade students was used as the research sample due to its limited number.

2.3. Development Procedure

In this design, the procedure was carried out systematically. The students were given a pretest before the treatment to determine their initial mathematical concept understanding. Subsequently, the students received a treatment involving interactive video-based learning media assisted by Kahoot. Finally, a posttest was administered to evaluate the improvement in learning outcomes after the treatment. This design allowed the researcher to compare the results before and after the learning process to assess the effectiveness of the applied media. The overall research design is illustrated in the following Table 1.

Table 1

One Group Pretest-Posttest Design

Group	Pretest	Treatment	Posttest
Experimental Class	O_1	X (Learning with video & Kahoot!)	O_2

2.4. Instruments and Data Collection

The instrument used in this study was a mathematical concept comprehension test consisting of 5 essay questions. Before being administered, the instrument was pilot-tested to determine its validity, reliability, difficulty level, and discriminating power [16]. The validity test was conducted using the Pearson Product Moment Correlation formula with the help of SPSS 26. The analysis showed that all items had an r -calculated value greater than the r -table ($r > 0.433$), making them valid.

The reliability test, using Cronbach's Alpha, yielded a score of 0.997, which falls into the very high category, indicating excellent internal consistency. The difficulty index test showed four items in the moderate category and one in the easy category. The discrimination index test revealed that

all items had good to very good discriminating power. Thus, the instrument was deemed suitable for use. In addition to the test, observations of student engagement and documentation (such as grading lists and school profiles) were conducted directly in the classroom with the guidance of the mathematics teacher.

2.5. Data Analysis

The data analysis techniques utilized descriptive and inferential quantitative approaches. Descriptive analysis was conducted to depict the pretest and posttest results, including the highest, lowest, and average scores, as well as the percentage of students achieving the minimum mastery criteria (KKM 70). Inferential analysis was used to test the hypothesis. Because the Shapiro-Wilk normality test showed that the data was not normally distributed ($p < 0.05$), hypothesis testing was performed using the non-parametric Wilcoxon Signed Rank Test with a significance level of $\alpha = 0.05$.

3. Results and discussion

3.1. Analysis Stage

The research data from the 21 seventh-grade students indicated a significant improvement in their average scores, rising from 34.71 on the pretest to 85.95 on the posttest. Furthermore, the percentage of learning completeness increased from 0% to 85.71%. These results demonstrate that the majority of students successfully reached the KKM after participating in the learning process utilizing interactive video-based learning media assisted by Kahoot.

Table 2

Descriptive Data of Student Pretest and Posttest Results

Descriptive Statistics	Pretest	Posttest
Number of Students (n)	21	21
Minimum Score	0	63
Maximum Score	60	100
Average (Mean)	34,71	85,95
Standard Deviation	19,57	11,94
Number of Successful Students	0	18
Mastery Percentage	0%	85,71

(Note: KKM = 70)

3.2. Design Stage

Prerequisite testing in the form of a normality test was conducted to determine whether the pretest and posttest data were normally distributed. This test is crucial as it

dictates the type of hypothesis test to be used. The normality test was performed using the Shapiro-Wilk method with the assistance of SPSS 26, given that the sample size was less than 50 students.

Table 3

Results of Normality Test for Pretest and Posttest Data

Variable	Statistic	df	Sig. (p-value)	Information
Pretest	0.881	21	0.015	Not Normal
Posttest	0.861	21	0.007	Not Normal

Based on the analysis, the significance values (p-value) were 0.015 for the pretest data and 0.007 for the posttest data. Since both values are less than 0.05, the data was not normally distributed, meaning that parametric testing (such as the paired sample t-test) could not be used.

3.3. Development Stage

Because the normality test indicated a non-normal distribution, the hypothesis was tested using the non-parametric Wilcoxon Signed Rank Test. This test aimed to determine if there was a significant difference between the students' pretest and posttest scores following the application of the Kahoot-assisted interactive video learning media.

Table 4

Results of Wilcoxon Signed Rank Test

Data Type	N	Z Calculated	Asymp. Sig. (2-tailed)	Information
Pretest				
-	21	-3.920	0.000	Significant Difference
Posttest				

Based on the Wilcoxon Signed Rank Test results, an Asymp. Sig. (2-tailed) value of $0.000 < 0.05$ was obtained. Thus, it can be concluded that there is a significant difference between the pretest and posttest results.

3.4. Implementation Stage

The significant difference indicates that the use of interactive video-based learning media assisted by Kahoot has a positive impact on improving students' understanding of mathematical concepts [12], [17]. According to Arsyad (2011) [3], learning media acts as an assistive tool in the learning process that can clarify messages, boost learning motivation, and facilitate students in grasping abstract materials. In this context, instructional videos provide visual representations and concrete explanations, while Kahoot fosters an active and competitive learning atmosphere through interactive quizzes.

This aligns with Fauzan (2019) [13], who explained that technology-based gamification like Kahoot can significantly enhance student participation and learning motivation. This is further reinforced by Mayer (2019) [18], who asserted that multimedia-based learning helps students integrate verbal and visual information, optimizing their cognitive processes. Furthermore, immediate feedback provided through Kahoot's quiz mechanism supports learning reinforcement [19], while gamification elements in digital assessment have been shown to positively affect student performance and motivation [20-25].

3.5. Evaluation Stage

Through interactive video-based learning media assisted by Kahoot, students do not just passively receive material but actively engage in the learning process [26-29]. The combination of material visualization and educational games allows students to independently build conceptual connections, reinforce their understanding, and overcome difficulties typically encountered in conventional mathematics learning [30-34]. These results corroborate earlier research by Asyhara, Yuniarti, & Asmiati (2018) [11], which stated that using interactive learning media and methods can instill mathematical concept comprehension more effectively than conventional learning. Additionally, these findings are consistent with Licorish et al. (2018) [12], who found that the Kahoot! Application improves student engagement, sharpens learning focus, and aids in long-term concept retention. Therefore, it can be concluded that the implementation of Kahoot-assisted interactive video learning media is an effective innovation for enhancing junior high school students' understanding of mathematical concepts [35-36].

4. Conclusion

Based on the results of research and data analysis, it can be concluded that the use of interactive learning media based on Kahoot assisted videos is effective in improving the understanding of mathematics concepts of grade VII students of SMP Muhammadiyah Way Sulan. This is evidenced by the results of the Wilcoxon Signed Rank Test which shows a significant difference between pretest and posttest scores after treatment is given. The increase is not only due to the mastery of formulas, but also due to the use of learning media that is interesting, interactive, and able to visualize mathematical concepts in a concrete way. Video media helps students understand the material visually and auditory, while Kahoot increases motivation, engagement, and competitive spirit in

the learning process. The results of this study are in line with the findings of Asyhara, Yuniarti, & Asmiati (2018) who stated that interactive teaching materials can instill a deeper understanding of mathematical concepts, and Licorish et al. (2018) who showed that the use of Kahoot is able to create an active and fun learning atmosphere. Thus, Kahoot-assisted video-based interactive learning media can be used as an alternative learning strategy that is effective in improving students' understanding of mathematical concepts.

CRedit authorship contribution statement

MR Sulthon: Conceptualization, Methodology, Investigation, Writing - original draft. **D Efendi:** Supervision, Validation, Writing - review & editing. **F Marian:** Resources, Data curation, Formal analysis, Writing - review & editing. **K Cengiz:** Validation, Formal analysis, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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