



# Kahoot! As a collaborative gamified mathematics learning platform for Indonesian junior school students

Wanda Nugroho Yanuarto<sup>1\*</sup>, Eka Setyaningsih<sup>1</sup>, Kiki Nur Umiatun<sup>1</sup>

<sup>1</sup> Universitas Muhammadiyah Purwokerto, Jawa Tengah, Indonesia

✉ [wandanugroho86@gmail.com](mailto:wandanugroho86@gmail.com)\*

## Article Information

Submitted May 01, 2023

Revised May 30, 2023

Accepted June 03, 2023

## Keywords

Kahoot; Gamified; Mathematics learning.

## Abstract

The difficulty that teachers in Indonesia face is delivering engaging lectures to raise the level of academic accomplishment among their students. Incorporating elements of the game into the educational process is one way this can be accomplished. A platform such as Kahoot! gamification may be applied to the learning process in an effective and engaging manner. The purpose of this research is to evaluate Kahoot as a learning approach that is both helpful and enjoyable for students in Indonesia, particularly during the Covid-19 pandemic. The analysis of quantitative data was involved in this investigation. The enlisted participants were 242 students. The findings of this research can be applied to the question of whether or not Kahoot! should be utilized as a teaching strategy that incorporates gamification elements to raise students' academic accomplishment. Also, one of the potential solutions to the post-pandemic would be incorporating parts of gaming into the instructional process.

## INTRODUCTION

Gamification emerged alongside this new technology. Gamification—"the application of game design characteristics in non-gaming contexts"—has garnered attention from academics and industry professionals (Wirani et al., 2021). Gamification is "game design elements in non-gaming environments." Kahoot! is a gamified learning tool. This gaming platform lets users quickly create, share, and play learning and trivia games. They can even play these games. Kahoot! Shines with more players. Games require a unique PIN. The game host must use a large screen. Participants answer questions on a community screen using their gear (Eva et al., 2022).

The teacher can also send Kahoot! Challenges to players for homework or remote training. Kahoot!, a game-based learning tool, can help teachers in many contexts collect data and personalize lesson plans (Yu, 2021). Kahoot!, a game-based learning platform, may help Indonesian teachers deal with their students' unique traits. Also, Kahoot! is a gamified learning tool that may be used individually or in groups. It promotes lifelong learning, curiosity, and enjoyment. Several educational institutions have adopted gamification to improve their students' math education due to Kahoot! Many benefits. Many teachers believe traditional teaching methods fail to engage today's students (Özer & Şad, 2019). Due to this, teachers have been working hard to build engaging teaching tactics, deliver advantages, and support learning while satisfying student needs. Conventional education uses a learning model, which only allows one-way communication, leaving students feeling disengaged because they cannot contribute to learning discussions (Rahmi & Ariawan, 2022).

Thus, this type of education emphasizes lecturers and ignores student interaction. Boredom causes student dissatisfaction and academic decline. Boredom causes this. Remote

learning helps Indonesian students avoid boredom in class. Naturally, teachers may need help to provide engaging classroom topics. Several teachers adopted novel methods to boost student achievement and satisfaction. Gameplay can be used to teach the material in the classroom (Suryati et al., 2021).

In the 21<sup>st</sup> century, students must adapt to many skill changes. Meanwhile, they must adjust (Saraswati et al., 2022). Technology in classrooms nowadays encourages student and teacher participation. Mobile technology has allowed computer-assisted learning to grow in recent years. Academics also study how technology can help students learn math (Fadillah et al., 2022; Pratama et al., 2022; Wahyuni et al., 2021). Teachers and testing professionals like technology because it evaluates students' math skills more creatively and effectively than paper-based methods (Fadillah et al., 2022).

Gamification can be applied to marketing, education, and health activities, but user characteristics must be considered (Pratama et al., 2022). This research will extensively examine gamification in education. According to the study Field, gamification in education uses game mechanics to interest and engage students (Wahyuni et al., 2021). Specific components can make learning more like games. This will enable game-like actions. Gamification in education encourages students to enjoy studying while focusing on the long term (Helmy & Abdulaziz, 2020). Gamification in education encourages students to enjoy learning. One of the most popular platforms can help incorporate game elements into schooling. Gamification allows this. Kahoot! is designed for universities and colleges. Kahoot!, which blends play into learning, can motivate students, especially in distance learning (Mansur & Fadhilawati, 2019). Kahoot! may improve learning, participant engagement, and participant benefits. The participant's school, campus, or home may host these activities. Many US universities use Kahoot! to assess student comprehension or go further into the subject. Presenting may be fun! at the beginning of class, ask open-ended questions to check students' knowledge (Resmayani & Putra, 2020).

Technology has been used in other aspects of education, although it has yet to be common practice in all parts of the township. Technology may be optional in schools. Investigate this. This inquiry will focus on the previously reported phenomenon, which is affected by many factors, including the recent rise in media prices (Nasikhah et al., 2021). The internet is developing today, and this planet is improving. Mobile schooling is improving due to consumer access to low-cost cellular technologies. Teachers are interested in it since it can play games, movies, music, and other media. Even while many apps encourage technological adoption, the problem remains. Teachers rarely use classroom computers and other technologies. Students also use phones and other technology that could hurt their grades for fun and socializing (Liberna et al., 2021).

In light of Indonesia's classroom, this research assesses if Kahoot! is a practical, user-friendly, and engaging instructional tool for students. This research can help determine whether Kahoot!, a learning platform that uses game-based learning to improve student performance, should be used in the classroom. Kahoot! uses game-based learning to improve student performance. Teachers need more usage evaluation to see if Kahoot! improves student performance. This evaluation suggests that teachers include gaming in instruction. This ensures that students are interested in and able to apply the material.

Mathematics comes into everyday life; it plays a significant part. It can be observed that when learning mathematics, a person will learn to plan, determine, and foresee the issues they will face (Hidayati et al., 2020). Using cognitive skills to solve math problems, including recognizing symbols and comprehending phrases, is essential. Students' mastery of mathematical concepts and skills must be investigated. Its purpose is to determine how students comprehend the information presented (Heinze et al., 2018).

Several story problems in mathematics are strongly connected to real-world situations (Fitri, 2022; Pomalato et al., 2020). The story problem is a type of challenge that can assist students in applying mathematical concepts to real-world situations. Story questions are mathematical questions that take the shape of narratives relevant to everyday life and can be solved using mathematical terms (Fei, 2018). As a result, story questions are narrative questions that can be solved by employing mathematical statements that are relevant to everyday life and can be answered. Comprehending questions and reason is required to complete story problems successfully.

There are a variety of challenges that students typically confront concerning stories (Priyani & Ekawati, 2018). Even in mathematics, many students need help to solve story problems. According to Yanuarto and Romadona (2021), students' challenges in learning mathematics are caused by the fact that students memorize formulas more than they do the concepts. Students make mistakes due to the obstacles they encounter when solving story problems. This occurs as a result of students' inability to apply mathematical principles. As previously mentioned, student mistakes can also be caused by a lack of knowledge. It is also possible that students' failure to grasp the nature of the problem contributes to errors (Johar & Lubis, 2018).

Therefore, this research aims to identify mistakes produced by students and increase student learning achievement by employing Kahoot! series. Furthermore, by understanding students' errors, the teacher can determine how much students comprehend the information taught, particularly in mathematics. Additionally, teachers can pay close attention to needy students (Makonye, 2019). In addition to describing the location of student errors, understanding the location can also reflect students' abilities to master the material.

## **METHODS**

This research involved quantitative data analysis (Creswell, 2014). This research recruited Indonesian teachers and students. The researcher sampled participants for this research. One teacher and four students from each school were randomly assigned. Due to this, the researcher was able to recruit 242 students (12.8%) mean participation rate, 0.5 standard deviation. The field will present this research in three stages (Cohen et al., 2013). First, the questionnaire sought students' and teachers' views on Kahoot!'s use in online training. Second, a test determined whether Kahoot! addressed students' cognitive abilities. Asking game questions did this. All participants received a comparable questionnaire to gather the necessary data. The researcher did the survey using a public online questionnaire.

The first half of this questionnaire asked students' opinions, while the second asked teachers. The student impression questionnaire has two parts: five open statements and ten closed statements. The teacher perspective questionnaire had two sections: ten closed-ended questions and seven open-ended questions (open-ended). These questions employ a Likert scale approved by industry experts. Treatment followed. The study has only used two students so far. The online learning environment splits students into experimental and control groups. The lecturer taught the control group how to use the internet and smartphones to understand their material. During the shift, experimental students used Kahoot!, a game-based learning application, for online instruction. To conduct the final examination, the researchers selected students to participate in the study project. Exams were used at this point. The pre-test assessed students' ability (knowledge), and the post-test assessed their mastery of the content following the class. The post-examination consisted of a thinking exam (75 points) and a numerical test (25 points) (score maximum 75). This test has 0,87 reliability.

## RESULTS AND DISCUSSION

This section discusses the students' questionnaire's quantitative and qualitative data analysis. Students' questionnaire responses revealed these conclusions. The questionnaire results were tallied to record each respondent's answers to every question. Before using Kahoot! for online learning, the researcher collected student data. The researcher better understood their needs. Data showed that students needed help finding the online learning method. Students found the material monotonous since the teacher employed fewer media kinds. Table 1 shows that textbooks and worksheets were the most effective teaching methods for most teachers (56.9% and 24.6%, respectively). While students used game-based online learning, professors rarely did. Due to the textbook's availability and usefulness, teachers relied on it to teach students. The government has enabled students and teachers to benefit from Curriculum 2013 by including textbooks. Teachers found that game-based learning platforms are excellent for online education.

**Table 1.** Media Used in Online Learning and the Types of Entertainment in Educational Media

| No. | Statements  | Type of Statements and Percentages |                                |                               |                 |
|-----|---|------------------------------------|--------------------------------|-------------------------------|-----------------|
| 1.  | In the course of the online learning process, what different kinds of media do the teachers use?  | Textbook<br>(56.7%)                | Students' Worksheet<br>(21.4%) | Presentation Slide<br>(13.6%) | Game<br>(8.3%)  |
| 2.  | Which of the following form of amusement, in your opinion, was the most appropriate choice to be incorporated into the instructional materials? | Game<br>(51.2%)                    | Comic<br>(27.4%)               | Video<br>(14.2%)              | Music<br>(7.2%) |

A lack of teaching methods and forms of enjoyment can severely hamper online learning. Thus, a modern platform like Kahoot! is necessary. The students' enthusiastic responses to questions about educational media's preferred amusement showed it. According to Table 1, 51.2% of online learners choose gaming as entertainment. However, something other than this is needed to satisfy student needs. The issue is caused by teachers' need for knowledge, experience, and the notion that edutainment media will raise money outlays (Oktaria et al., 2021). The academic community has produced many educational platforms over the years (Daryanes & Ririen, 2020; Liberna et al., 2021). Educational games can also help students learn better (Daryanes & Ririen, 2020).

After Kahoot! based online learning, students were asked to complete another questionnaire on their experience. This questionnaire assessed students' platform satisfaction. 94.6% of the 242 students surveyed felt online education needs engaging and fun elements. This shows that adding joy to the classroom helps students stay engaged. The student replied, "Would learning media placed on entertainment (such as the Kahoot! platform) inside of it has a major impact on losing your learning concentration?" this support this idea (Students were asked). However, 5.03 percent of the 242 students disliked the question. Previous research by Daryanes and Ririen (2020) shows that students believe media-enhanced learning is more engaging. This matches the research. "Even though I use Kahoot!, which delivers fun, I still have a harder time understanding the subject matter," was rejected by 73.21 percent of 242 students. Thus, Kahoot!-based learning is crucial for Indonesian students.

**Table 2.** Students' Four Most Essential Justifications for Selecting Kahoot! in the Online Learning Process

| Statements   | Type of Statements and Percentages   |  |   |   |
|--|--|--|---|---|
| I was wondering why you decided to use Kahoot! For the many online learning activities | Assisting the students so that they can better comprehend the material (17,5%) | Bringing excitement and variety to the experience of studying online (44,7%) | Increasing the students' ability to concentrate on their studies (6,4%) | Increasing the student's motivation to learn by assisting (31,4%) |

Due to several factors, Kahoot! may become essential to the educational activity. The statistics show that most students think adding at least one game to their online education will make it more fun. Students think Kahoot!'s entertainment can help them learn and make learning fun. Students also think Kahoot! might help them learn. Table 2 shows that most students believe in integrating Kahoot! into online instruction will minimize boredom. Students also think the game-based Kahoot! A platform might help them study faster and enjoy it more. Based on the survey results, most students support using Kahoot! for online learning and think it should be required. Student survey. This research shows that online students want to learn to avoid boredom. Thus, the game-based Kahoot! The platform may assist students in avoiding online learning monotony, depending on their perspectives.

Meanwhile, students' problem-solving skills are being compared to Kahoot!'s. The comparison begins by summarizing the experimental and control groups' normality and homogeneity tests. Then, the student's math skills before and after treatment are examined. The experimental and control groups took a pre-test to assess their mathematical problem-solving skills. After getting therapy, students in the experimental and control groups were compared on their post-test scores to see how well they could solve mathematical problems. The following sections (Table 3) report statistics data test results.

**Table 3.** The Statistics Data Result of Students Worksheet in Mathematics Learning

| No. | Type of Test | Group                    | Statistics Test | df | Sig. Value |
|-----|--------------|--------------------------|-----------------|----|------------|
| 1   | Pre-Test     | Kahoot! Learning process | 0,87            | 90 | 0,084      |
|     |              | Online learning process  | 0,84            | 90 | 0,090      |
| 2   | Post-Test    | Kahoot! Learning process | 0,86            | 90 | 0,068      |
|     |              | Online learning process  | 0,83            | 90 | 0,075      |

The Kahoot! platform outperforms online learning, according to a study. Learning efficacy differs between the two. Table 3 shows that the 9.36-point post-test score difference between the experimental and control groups caused the interaction. Comparing findings shows this. Previous research found that Kahoot! can close the achievement gap between online and in-person students. The study found that Kahoot! supports Indonesian online students. Despite learning online, students outperformed students who used textbooks and those who learned in general. This invests in values in Kahoot!'s learning environment (Lisnani & Emmanuel, 2020). This confirms earlier research. Fauzan et al., (2020) state that Kahoot! The platform includes entertainment content. This integration enhances students' learning experience without compromising content. This research found that students enjoy learning using Kahoot! and progress significantly. Indonesia prioritizes online education and Kahoot! The platform is well-received. However, the Kahoot! The platform must improve how students learn and react to varied online learning environments. The Kahoot! platform must be adaptable enough to

accommodate each student's learning strategy. Therefore, students' learning preferences must be studied to advance online education.

This limited study described researchers' experiences using Kahoot! as a gamified formative assessment tool in a fictional teacher education program. Initial quantitative findings showed that most participants had never used a computerized response system for in-class assessment, that they found it fun and educational, and that all teachers should try it. Preliminary results showed that most participants had never used a computerized response system for in-class assessment. As a result, participants' pedagogical and affective attitudes toward using Kahoot! as a gamified formative assessment tool were positive. Previous research on electronic response systems like Kahoot! supports these findings. Frisnoiry et al., (2020) reported that 96% of 127 preservice teachers who took Moodle e-exams found them beneficial, 94% thought they supported their learning, and 92% wanted to utilize them in other sessions. Preservice teachers' e-exam replies informed our conclusions. Preservice teachers who took electronic tests reported these conclusions. According to Prieto et al. (2019), Kahoot! formative evaluation using gamification improved student attendance, intrinsic motivation, and attentiveness. Kahoot! is also the most popular digital response system. Saraçoğlu and Kocabatmaz (2019) found that Kahoot! increased students' cognitive, affective, and behavioral engagement more than ClassDojo, Facebook, Survey, and Padlet.

This research incorporates game-playing with student education during a pandemic. Kahoot! is a gamification platform you can use. Lecturers can use the gamification app Kahoot! to engage students in the lecture material. Gamification combines fun, challenge, and competition. Gamification in the learning platform was found to affect Perceived Usefulness and Satisfaction. Gamification may improve academic achievement and subject comprehension, according to one study. Gamification can offer students comfort and satisfaction, which may affect them individually. This research found that students' evaluations of Kahoot!

Effectiveness can influence their utilization of the site. This research shows that Individual Impact can affect the desire to continue using Kahoot! as students increase their grades and comprehend the course content. This investigation has yielded some empirical findings. To predict whether a student will continue using Kahoot!, teachers must figure out how to integrate it advantageously and efficiently into the classroom. Teacher using Kahoot! must consider facility and infrastructure conditions. These factors include internet bandwidth and student access to phones and laptops. Infrastructure and amenities might affect students' happiness. The teacher may give questionnaires before class to assess student amenities and infrastructure. This research also advises teachers on how to use Kahoot! points in grading. This research recommends these. Students must grasp how this affects their performance for this reason. This research also helps teachers predict exam time by considering question difficulty and student resources and infrastructure.

An in-depth analysis of students' replies to open-ended questions showed that Kahoot!'s essential feature was its ability to retain information in addition to its formative evaluation function. Both of these factors make Kahoot! Formative valuable assessment for students' education. Gamified formative assessment with Kahoot! for five weeks improved students' mid-term exam scores. These students participated in the five-week gamified formative evaluation. This was shown by comparing these students' grades to others. Previous research shows this boost to academic success. They use student self-reports or experimental studies. However, the results were positive. Pais et al., (2018) found that 86.5% of 139 university students said Kahoot! Helped them conceptualize. The survey found this. A similar study by Rajendran and Shah (2020) found that 74% of 127 students said e-exams helped them detect and fill knowledge gaps. The study used the same procedure. Kahoot! also helped 74% of students prepare for exams (Sagala & Rezeki, 2022). According to Field Umboh et al. (2021), 75% of respondents

extended their study time to prepare for a pre-lesson Kahoot! Quiz. Also, Oktaria et al. (2021) found that Kahoot! helped aspiring mathematics teachers learn computer topics. Making the material more accessible, enhancing retention, and expediting learning achieved this. Daryanes and Ririen (2020) found that Kahoot! Increased science terminology test scores for all six learning-disabled students.

According to the current study, Kahoot! was often described as fun/funny, or entertaining (Lisnani & Emmanuel, 2020; Wahyuni et al., 2021; Yu, 2021). Meanwhile, Pratama et al. (2022) observed that Kahoot! players, recognized for their friendly competition, had a higher intrinsic drive. Resmayani and Putra (2020) found that Kahoot! gamification sustainably motivates learners, reducing absenteeism from classroom lectures and seminars. Rahmi and Ariawan (2022) stated that competitive Kahoot!-based gamification exercises increased student engagement with class material. Assert that Kahoot! Gamification creates an engaged, social learning environment. Therefore, Kahoot! Formative evaluation greatly impacted participants' sense of fun. As a game, Kahoot! stimulates healthy competition, which may explain this phenomenon. However, each system saw competitiveness differently. Kahoot! Atmospheres of healthy competition encouraged students to play or study more to succeed.

## **CONCLUSIONS**

This investigation aims to determine the extent to which students continue using Kahoot! According to the findings of this research, the ideas of perceived utility and individual effect each have a substantial part in determining whether or not an individual would continue to use Kahoot! In addition, the findings of this research indicate that an individual's level of contentment does influence their impacts. In the interim, it has been shown that the characteristics of gamification, known as Competitiveness and Enjoyment, affect Perceived Usefulness. It has also been proven that the component of enjoyment influences the level of satisfaction that students feel. In light of the findings of this research project, one potential solution to the post-pandemic would be to include gaming elements in the educational process.

The findings of this research provide information regarding the application of Kahoot!, which is helpful for various applications, including those in the academic and professional spheres. This research integrates the gamification components available in Kahoot! with various theoretical frameworks to analyze students' continued usage! This research has real-world implications since it provides suggestions for teachers who want to use Kahoot! as a learning platform for their students. One of the problems with this research is that its geographical locations need to be evenly spread across all of Indonesia; this is one of the study's limitations. In subsequent research, it's feasible that respondents will be comprised of students attending one of Indonesia's many universities. In addition, the limitation of this research is that the only platform utilized was the one evaluated, Kahoot! Platform. We strongly recommend that future investigations use additional media such as Mentimeter, Quizizz, Quizlet, and Schoology.

## **ACKNOWLEDGMENT**

We want to thank the faculty members for the various elements of this research. We would also like to thank anonymous reviewers for their helpful comments and insight into the manuscript.

## **AUTHOR CONTRIBUTIONS STATEMENT**

KN completed the entire fieldwork; however, she and WN had equal input into writing the manuscript. WN analyzed the data and prepared the figures. Also, ES and WN contributed to different parts of the data analysis. WN provided critical insight into writing the manuscript. All authors reviewed the manuscript.

## REFERENCES

- Cohen, L., Manion, L., & Morrison, K. (2013). [Research methods in education sixth edition](#). In *Routledge Taylor & Francis Group*. 658-671.
- Creswell, J. W. (2014). [Research design: Qualitative, quantitative, and mixed method](#). In *Research design Qualitative quantitative and mixed methods approaches*.
- Daryanes, F., & Ririen, D. (2020). [Efektivitas penggunaan aplikasi kahoot sebagai alat evaluasi pada mahasiswa](#). *Journal of Natural Science and Integration*, 3(2), 172.
- Dos Santos Teotônio, L., Alves de Araújo, A., & Soares dos Santos, J. (2021). [usability analysis of kahoot in mathematics education](#). *Renote*, 18(2), 31–39.
- Eva, K., Adnyani, K., Adnyana, I. W., Murniasih, N. N., Komang, N., & Suwastini, A. (2022). [Implementing kahoot! for japanese language learning in Indonesian High School](#). *Journal Basic of Education*, 6(2), 217–225.
- Fadillah, I. N., Susilawati, W., Sugilar, H., & Kariadinata, R. (2022). [Efektivitas kahoot sebagai media pembelajaran matematika terhadap hasil belajar masa pandemi covid-19 the effectiveness of kahoot as a mathematics learning media on learning outcomes during the covid-19 pandemic](#). *Jurnal IPA & Pembelajaran IPA*, 12(3), 86–90.
- Fauzan, A., Safira, M. C., & Sulisty, E. N. (2020). [Inisiasi kahoot! sebagai variasi pembelajaran kalkulus bagi mahasiswa teknik lingkungan](#). *Jurnal Riset Pendidikan Matematika*, 7(2), 118–131.
- Fei Lai, C. (2018). [Error analysis in mathematics Cheng- Fei Lai University of Oregon University of Oregon](#). *Behavioral Research and Teaching*, 32(2), 1–9.
- Fitri, M. (2022). [Analysis of student errors in working mathematical problems in calculated operation materials fractions based on newman stages from adversity quotient \(Case study in SMP Negeri 2 Sekampung\)](#). *Journal Research of Social Science, Economics, and Management*, 1(7), 754–758.
- Frisnoiry, S., Siregar, T. M., & Taufik, I. (2020). [E-Learning technology: Kahoot application as a learning evaluation tool](#). *Solid State Technology*, 3(4), 134–146.
- Heinze, Aiso & Reiss, K. (2018). [Mistake-handling activities in the mathematics classroom: Effects of an in-service teacher training on students' performance in geometry](#). *Uma Ética Para Quantos?*. XXXIII(2), 81–87.
- Helmy Nadeem, N., & Abdulaziz Al Falig, H. (2020). [Kahoot! quizzes: A formative assessment tool to promote students' self-regulated learning skills](#). *Journal of Applied Linguistics and Language Research*, 7(4), 1–20.
- Hesti Cahyani , Hardi Suyitno, I. J. (2020). [The student ' s errors in mathematical problem solving based on nea judging from the self-efficacy on learning core](#). *Unnes Journal of Mathematics Education Research*, 9(1), 69–77.
- Hidayati, V. R., Subanji, S., & Sisworo, S. (2020). [Students' mathematical connection error in solving PISA circle problem](#). *JIPM (Jurnal Ilmiah Pendidikan Matematika)*, 8(2), 76.
- Johar, R., & Lubis, K. R. (2018). [The analysis of students' mathematical representation errors in solving word problem related to graph](#). *Jurnal Riset Pendidikan Matematika*, 5(1), 96.
- Liberna, H., Bhakti, Y. B., & Astuti, I. A. D. (2021). [The innovation of learning mathematics on introduction of number for pre-school students](#). *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 11(1), 71–82.



- Lisnani, L., & Emmanuel, G. (2020). Analisis penggunaan aplikasi KAHOOT dalam pembelajaran IPA. *Jurnal IPA & Pembelajaran IPA*, 4(2), 155–167.
- Makonye, J. P. (2019). Learner mathematical errors in introductory differential calculus tasks: A study of misconceptions in the senior school certificate examinations. *Journal for Research in Mathematics Education*, 3(4), 285–298.
- Mansur, M., & Fadhilawati, D. (2019). Applying kahoot to improve the senior high school students' vocabulary achievement. *VELES Voices of English Language Education Society*, 3(2), 164.
- Nasikhah, M., Dewi, A. N., Yulanta, A. W., Tasbihah, N., & Rahmawati, F. (2021). Efektivitas metode speed test dengan menggunakan media kahoot! pada pembelajaran dimensi tiga. *Journal of Authentic Research on Mathematics Education (JARME)*, 3(1), 1–9.
- Oktaria, A. A., Rohmayadevi, L., & Murwantono, D. (2021). Online game quiz “kahoot” in teaching english for students of SMP Muhammadiyah Yogyakarta. *PROJECT (Professional Journal of English Education)*, 4(2), 290.
- Özer, N., & Şad, S. N. (2019). Using Kahoot! as a gamified formative assessment tool: A case study. *International Journal of Academic Research in Education*, 5(September), 43–57.
- Pais, S., Pires, A., & Chagas, L. (2018). Enhancing student motivation with kahoot! - a case study in english and mathematics. *Edulearn18 Proceedings*, 1(1), 5518–5522.
- Pomalato, S. W., Ili, L., Ningsi, B. A., Fadhilaturrehmi, Hasibuan, A. T., & Primayana, K. H. (2020). Student error analysis in solving mathematical problems. *Universal Journal of Educational Research*, 8(11), 5183–5187.
- Pratama, L. D., Faizah, E., Putra, M., & Ramadhan, D. (2022). Kahoot: Is it effective for online learning in indonesia? *Journal of Advanced Research Design*, 6(1), 35–49.
- Prieto, M. C., Palma, L. O., Tobías, P. J. B., & León, F. J. M. (2019). Student assessment of the use of kahoot in the learning process of science and mathematics. *Education Sciences*, 9(1), 443–458.
- Priyani, H. A., & Ekawati, R. (2018). Error analysis of mathematical problems on TIMSS: A case of Indonesian secondary students. *IOP Conference Series: Materials Science and Engineering*, 296(1), 22–36.
- Rahmi, A. Y., & Ariawan, R. (2022). Development of mathematics learning media using kahoot application. *Jurnal Prinsip Pendidikan Matematika*, 4(1), 65–72.
- Rajendran, T., & Mohd Shah, Dr. P. (2020). Students perception on Gamification: The use of Kahoot. *International Journal of Scientific and Research Publications (IJSRP)*, 10(05), 773–783.
- Resmayani, N. P. A., & Putra, I. N. T. D. (2020). Gamification: Using Kahoot! to Make students love the class from the very beginning. *Linguistics and ELT Journal*, 7(1), 10–18.
- Sagala, R. W., & Tri Indah Rezeki. (2022). Utilization of MOOCs using kahoot and student engagement in digital learning during covid-19 pandemics. *SALTeL Journal (Southeast Asia Language Teaching and Learning)*, 5(1), 01–07.
- Saraçoğlu, G., & Kocabatmaz, H. (2019). A study on kahoot and socrative in line with preservice teachers' views. *Educational Policy Analysis and Strategic Research*, 14(4), 31–46.

- Saraswati, S., Rodliyah, I., & Rahmawati, N. D. (2022). [Higher order thinking skills: The process of developing questions with kahoot asisted.](#) *Journal for Research in Mathematics Education*, 4(2), 119–128.
- Setiawan, A., & Soeharto, S. (2020). [Kahoot-based learning game to improve mathematics learning motivation of elementary school students.](#) *Al-Jabar: Jurnal Pendidikan Matematika*, 11(1), 39–48.
- Suryati, I., Permatasari, R., Rofiana, A. P., Miftah, R. N., & Musthofa, W. S. (2021). [Game based assessment untuk pembelajaran di masa pandemi: Kahoot!](#) *Jurnal Terapan Abdimas*, 7(1), 60.
- Umboh, D., Tarusu, D., Marini, A., & Sumantri, M. S. (2021). [Improvement of student mathematics learning outcomes through Kahoot learning games application at elementary school.](#) *Journal of Physics: Conference Series*, 1869(1), 135–149.
- Wahyuni, M., Fauziddin, M., & Rizki, L. M. (2021). [The effects of using Kahoot! on understanding the concept of mathematical symbols in higher education.](#) *AL-ISHLAH: Jurnal Pendidikan*, 13(3), 1539–1545.
- Wirani, Y., Nabarian, T., & Romadhon, M. S. (2021). [Evaluation of continued use on Kahoot! As a gamification-based learning platform from the perspective of Indonesia students.](#) *Procedia Computer Science*, 197(2021), 545–556.
- Yanuarto, W. N., & Romadona, F. (2021). [Analysis of students' mathematical errors based on newman error analysis \(NEA\) in terms of learning style.](#) *Jurnal Pendidikan Matematika*, 3(1), 1–10.
- Yu, Z. (2021). [A meta-analysis of the effect of Kahoot! on academic achievements and student performance.](#) *Research Square*, 42(3), 553–568.