

LEARNING MATHEMATICS THROUGH QUIZIZZ GAME MEDIA TO IMPROVE STUDENT LEARNING OUTCOMES OF STATE MIDDLE SCHOOL 9 BATAM

Deswita Rosya^{1*}, Tri Tarwiyani², Nelly Hidayati³, Zaky Millano Deca⁴, Andi Saputra Mandopa⁵, Amelia Febrina⁶, Nita Rahma Putri⁷, Fitri Yenita⁸

^{1,2,6,7,8}Master of Educational Management Study Program, Postgraduate Program, Universitas Riau Kepulauan, Batam City, Indonesia

³Batam City Education Office, State Junior High School 9 Batam, Riau Islands Province, Indonesia

⁴Bachelor of Accounting, Universitas Andalas Padang, Sumatera Barat, Indonesia

⁵Mathematics Education Study Program, Faculty of Teacher Training and Education, Graha Nusantara University, Padangsidempuan City, Indonesia

*Corresponding author: 252210026@student.unrika.ac.id

ABSTRACT

Advances in science, information, and communication technology have positively impacted the advancement of education in the digital era, known as the Industrial Revolution 4.0. This era of rapid change demands innovative and engaging learning approaches that can sustain student interest and participation. The use of game-based learning applications, such as Quizizz, represents one promising strategy for improving student motivation and learning outcomes, particularly in mathematics a subject perceived as difficult and abstract by many students. This PKM research was conducted at State Junior High School 9 (SMPN 9) Batam, involving 46 students in Grade IX-1 during the first semester of the 2025/2026 academic year. The study aimed to determine whether the implementation of Quizizz game media could improve student learning outcomes in the topic of Exponents and Roots for Grade IX. A pre-test and post-test design was employed, with data collected through tests and classroom observations from September to October 2025.

Keywords: Mathematics learning, learning outcomes, quizizz

INTRODUCTION

The use of information technology in this era of globalization and the digital era cannot be ignored and has become a vital need for society, so that the development of information technology is growing rapidly and progressing and has received very good interest from the public. This development of information technology has a significant impact on various aspects of life. One of them has a positive impact on the field of education (Basori, 2013; Herlambang & Hidayat, 2016) which has resulted in an increase in the quality of education (Nasrullah, Ende, & Suryadi, 2017). The rapid advancement of science, information technology, and communication is expected to have a positive impact on the current world of education. It is hoped that it can become a highly effective and efficient medium to support the learning process. A variety of IT-based multimedia facilities, including various engaging learning applications, both free and paid, can be utilized to make the learning process more engaging and maximum.

Mathematics is a compulsory subject for all students, from elementary school to higher education. This helps students think logically, analytically, systematically, and critically. Mathematics is generally viewed as a difficult subject by students. Many students still struggle and fear learning mathematics, either due to monotonous learning or simply not enjoying it. This presents a challenge for teachers to create engaging and enjoyable learning. Enjoyable learning can be created through the use of various learning models or methods, as well as engaging learning media, which can motivate students to learn and facilitate their understanding of the material. One approach to developing learning media using computers, laptops, and mobile phones or smartphones is through the use of educational games. Although these educational games are still rare, their use in learning media is very limited. Games, as a learning medium integrated with materials or evaluation questions, are expected to make learning more engaging and enjoyable. This is in line with Henry (2010: 53-54), who discussed the positive impacts of using games, including fun and entertaining games and providing practice in problem-solving and logic. This study will discuss the Quizizz learning application that can be used by teachers as an alternative mathematics learning media.

The Quizizz game is a game-based educational application, which brings multi-player activities into the classroom and makes it an interactive and fun practice class (Purba. 2019: 5) used in classroom learning. The interactive quiz created has up to 4 answer choices including the correct answer and can be added to the background of the question. Once the quiz is complete, we can share the code with students so they can log in to the quiz. Quizizz also provides data and statistics on student performance. Teachers can track how many students answered the questions that have been created, questions that must be answered and more. Teachers can even download statistics in the form of Ms. Excel. Quizizz also provides a "homework" feature, so that students' homework can be done anytime and from anywhere. This allows students to be more flexible in doing homework and teachers can limit the time for homework. Unlike other educational applications, the Quizizz game has game characteristics such as avatars, themes, memes, and entertaining music in the learning process. Quizizz also allows students to compete with each other and motivates them to learn so that learning outcomes can improve.

The online quiz app Quizizz can be used by teachers to assess students' learning progress. Its ease of use and rapid assessment results make it a suitable learning tool to support the 4.0 learning revolution, fostering students' strong interest and motivation to learn. Teachers must have a question bank. This app can be used to store questions and then analyse them to create valid, reliable questions with a good level of differentiation and difficulty. This makes learning more enjoyable (Lasia Agustina, Sesiomadika 2019, pp. 1-7). This study was conducted to determine students' learning outcomes and process skills by implementing the Quizizz game. This study used four stages: planning, organizing, implementing, controlling, and evaluating. This study was conducted at SMP Negeri 9 Batam. The subjects were 46 students in grade IX-1.

Literature Review

Mathematics Learning and Student Learning Outcomes

Learning outcomes are a central concept in educational research and practice. According to Sudjana (2010), learning outcomes represent the changes in a student's behaviour as a result of the learning process, encompassing cognitive, affective, and psychomotor dimensions. In the context of mathematics education, learning outcomes are typically assessed through students' ability to understand, apply, and communicate mathematical concepts and procedures. Bloom's taxonomy provides a useful framework for classifying learning objectives and outcomes across

six levels of cognitive complexity: remembering, understanding, applying, analysing, evaluating, and creating (Dimiyati & Mudjiono, 2009).

Low learning outcomes in mathematics are a pervasive problem in Indonesian schools, including at the junior high school level. Factors contributing to this problem include insufficient mastery of foundational concepts, inadequate instructional approaches, and low student motivation (Hamalik, 2011). The traditional lecture-based instructional model, in which teachers deliver information while students passively receive it, has been widely criticized for its failure to engage students and promote deep understanding. In contrast, constructivist approaches to teaching and learning in which students actively construct knowledge through experience and interaction have been shown to be more effective in fostering understanding and long-term retention (Trianto, 2010).

Learning Media and Educational Technology

Learning media plays a crucial role in the instructional process by serving as a bridge between abstract concepts and concrete understanding. Arsyad (2014) defines learning media as any tool or resource that can be used to convey instructional messages and stimulate students' thinking, feelings, and interests, thereby facilitating the learning process. A wide variety of learning media are available to teachers, ranging from conventional tools such as textbooks, charts, and manipulatives, to digital tools such as educational software, multimedia presentations, and online platforms.

The integration of digital technology into learning media has expanded the possibilities for creating interactive, personalized, and engaging learning experiences. Rusman (2012) emphasizes that the selection of appropriate learning media must consider the characteristics of the students, the nature of the learning objectives, and the available technological infrastructure. Digital learning media, in particular, offers several advantages over traditional media, including the ability to provide immediate feedback, support differentiated instruction, and track student progress over time (Sadiman et al., 2014).

Game-Based Learning and Quizizz

Game-based learning (GBL) is an instructional approach that incorporates game elements and game design principles into educational activities. Henry (2010) argues that well-designed educational games can foster deeper engagement with learning content by tapping into students' intrinsic motivation, providing meaningful challenges, and offering immediate rewards and feedback. Research on GBL has consistently shown positive effects on student motivation, engagement, and learning outcomes across a range of subjects and educational levels (Djamarah, 2011).

Quizizz is a game-based learning platform that has gained significant traction in Indonesian schools, particularly since the COVID-19 pandemic, which accelerated the adoption of digital learning tools. The application allows teachers to create custom quizzes or access a large library of ready-made questions, which can be assigned as in-class activities or homework (Purba, 2019). Key features of Quizizz include real-time leaderboards that display student rankings, customizable avatars and themes, memes and music that appear between questions, and detailed analytics on student performance. These features create a playful and competitive atmosphere that many students find motivating and enjoyable (Agustina, 2019).

Several studies conducted in Indonesia have examined the effectiveness of Quizizz as a learning medium in various subjects and educational contexts. Nasution & Syaiful (2020) found that the use of Quizizz in junior high school science classes significantly improved student learning outcomes and reduced learning anxiety. Similarly, Purba (2019) reported a moderate

increase in student learning concentration when Quizizz was used for formative assessment in a university physical chemistry course. These findings suggest that Quizizz can serve as an effective tool for enhancing student engagement and improving learning outcomes in the Indonesian educational context.

MATERIAL AND METHODS

Research Design

This research employed a pre-experimental design with a one-group pretest-posttest approach. The study was conducted within the framework of the PKM (Pengabdian Kepada Masyarakat) program, which is a community service activity aimed at applying academic knowledge and expertise to address real educational challenges in the community. The research was carried out at SMPN 9 Batam during the first semester of the 2025/2026 academic year, from September 1 to October 5, 2025. The subjects of the study were 46 students in Grade IX-1, consisting of 22 male students and 24 female students.

The research followed a four-stage learning management cycle adapted from the general management framework: (1) Planning, (2) Organizing, (3) Implementing, and (4) Controlling and Evaluating. This cyclical approach ensured systematic preparation, structured implementation, and rigorous evaluation of the learning intervention.

Stage 1: Planning

In the planning stage, the researcher prepared all the necessary materials and resources for implementing the Quizizz-based learning activity. This included: (a) identifying and reviewing the relevant Grade IX mathematics curriculum standard for the topic of Exponents and Roots; (b) preparing a set of test questions aligned with the learning objectives, covering both basic and application-level competencies; (c) inputting the prepared questions into the Quizizz application and configuring the game settings, including time limits, question randomization, and leaderboard display; and (d) generating and distributing the unique game join code to students in advance. Additionally, the teacher prepared a lesson plan (RPP) that integrated the Quizizz activity as the primary assessment and learning reinforcement tool.

Stage 2: Organizing

The organizing stage involved preparing the classroom environment and briefing the students on the research procedure. Seating arrangements were carefully organized to minimize the possibility of cheating and to facilitate the teacher's monitoring of individual student activity. Students were reminded to bring fully charged smartphones or other internet-enabled devices to class. For students who did not have personal devices, arrangements were made for device sharing, although this was identified as a logistical constraint (Arikunto, 2013). The teacher also provided a brief orientation on how to access and navigate the Quizizz application, including how to enter the game code, select an avatar, and submit answers.

Stage 3: Implementation

The implementation stage comprised two test sessions—a pre-test and a post-test—conducted within the observation period. In the pre-test session, students participated in the Quizizz quiz without prior review of the material, allowing the researcher to assess baseline levels of understanding. The quiz consisted of 20 multiple-choice questions covering key concepts in Exponents and Roots, with each question assigned a time limit of 30 seconds.

Following the pre-test, the teacher conducted a structured review lesson on the relevant material, addressing common misconceptions and difficulties identified during the pre-test. Visual aids, worked examples, and collaborative problem-solving activities were incorporated to

reinforce understanding. The post-test was then administered using a new Quizizz session with questions of similar difficulty and scope. The post-test aimed to assess the degree of improvement in student understanding following the instructional intervention.

Stage 4: Controlling and Evaluation

During and after each test session, the researcher employed two forms of monitoring. Direct physical monitoring involved observing students' behaviour in the classroom, noting their level of engagement, any instances of off-task behaviour, and the degree of enthusiasm shown during the game. Digital monitoring was conducted through the Quizizz teacher dashboard, which provides real-time data on individual student performance, including the number of correct and incorrect answers, response times, and overall rankings.

The evaluation stage involved analysing the performance data generated by Quizizz to compare pre-test and post-test results. Descriptive statistics, including frequency distributions and percentage comparisons, were used to summarize the data. The improvement in learning outcomes was assessed by comparing the proportion of students achieving various score ranges across the two test sessions.

Data Collection and Analysis

Data were collected through two primary instruments: (1) the Quizizz-based test, which measured students' cognitive learning outcomes on the topic of Exponents and Roots; and (2) structured observation, which assessed students' process skills and engagement levels during the learning activity. The observation instrument included indicators such as student attention, active participation, cooperation, and enthusiasm. Data analysis was conducted using descriptive statistical methods, with results presented in frequency tables and percentage comparisons (Sugiyono, 2018).

RESULT AND DISCUSSION

Result



Figure 1. Learning Process Situation

The pre-test was administered to 36 students who were present on the day of the first session (out of a total class enrolment of 46 students). The results showed that only 1 student (2.8%) achieved a score of 80 or above, which is the minimum mastery threshold (Kriteria Ketuntasan Minimal/KKM) set by the school. Nine students (25.0%) scored between 60 and 79, reflecting partial understanding of the material. The majority of students 26 individuals (72.2%) scored below 60, indicating a significant gap in prior knowledge of Exponents and Roots.

These results are consistent with the general pattern of low prior performance in mathematics observed at the school level in Indonesia. The high proportion of students scoring below the mastery threshold underscores the need for effective instructional interventions that can bridge knowledge gaps and build conceptual understanding. The use of Quizizz as a pre-test tool also provided valuable diagnostic data, helping the teacher identify specific questions and concepts where students struggled the most.

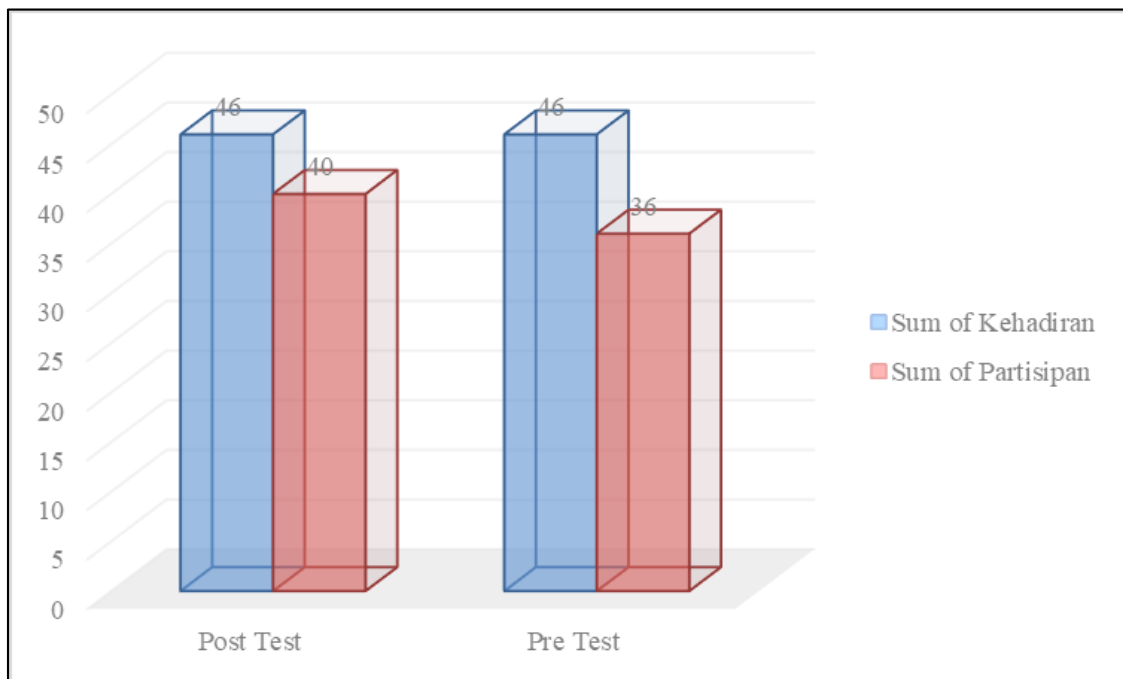


Figure 1. Attendance and Participation

The post-test was administered after the instructional intervention and was attended by 40 students. The results showed a clear improvement across all score categories compared to the pre-test. Twelve students (30.0%) achieved scores of 80 or above, representing a tenfold increase from the pre-test. Nineteen students (47.5%) scored between 60 and 79, while 9 students (22.5%) scored below 60 a substantial decrease from the 72.2% recorded in the pre-test.

The overall pattern of improvement is summarized in Table 1 below. The data demonstrates a clear positive shift in the distribution of scores, with a higher proportion of students achieving mastery and a lower proportion scoring below the minimum threshold.

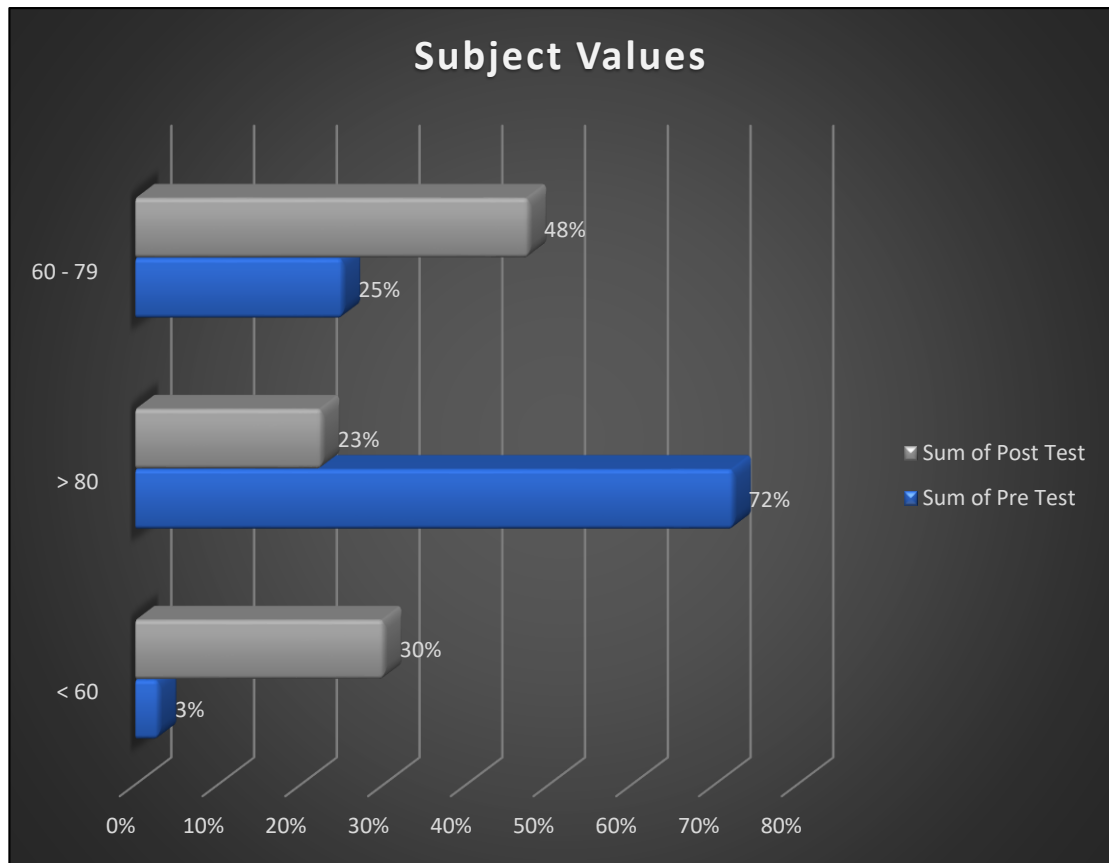


Figure 2. Comparison of Posttest and Pretest

Discussion

The results of this study provide compelling evidence that the use of Quizizz as an interactive learning medium can positively impact student learning outcomes and engagement in mathematics. The significant increase in the proportion of students achieving mastery scores (from 2.8% to 30.0%) and the substantial decrease in the proportion of students scoring below the minimum threshold (from 72.2% to 22.5%) suggest that the combination of instructional intervention and game-based assessment was effective in improving student understanding of Exponents and Roots.

These findings are consistent with those of Purba (2019), who reported a moderate but meaningful increase in student learning concentration when Quizizz was used for formative assessment in a physical chemistry course. They are also aligned with the broader literature on game-based learning, which consistently documents positive effects on student motivation, engagement, and learning outcomes (Henry, 2010; Djamarah, 2011). The competitive and game-like features of Quizizz including the leaderboard, avatars, and immediate feedback appear to be key drivers of these positive outcomes, as they tap into students' intrinsic motivation and desire for achievement (Agustina, 2019).

The increase in student participation between the pre-test and post-test sessions (from 36 to 40 students) is also noteworthy, suggesting that the positive experience of the first Quizizz session motivated more students to attend the second session. This finding highlights the potential of game-based learning tools to improve not only academic performance but also student attendance and commitment to the learning process (Rusman, 2012).

An important observation from the study is the greater variation in scores observed in the post-test compared to the pre-test. In the pre-test, the majority of students clustered in the below-60 category, reflecting a relatively uniform low baseline. The post-test showed a more distributed pattern, with students spread across all three score categories. This greater variation may reflect the differential impact of the instructional intervention on students with different prior knowledge levels, learning styles, and engagement patterns. Students who were more engaged during the Quizizz activities and who paid closer attention during the review lesson tended to show greater improvement, while those who remained disengaged showed less progress (Hamalik, 2011).

One constraint that was identified during the study was the lack of personal devices for some students, which required them to share devices with classmates. This logistical challenge may have reduced the effectiveness of the intervention for device-sharing students, as it limited their ability to respond quickly and independently to the quiz questions. Future implementations of Quizizz in similar settings should address this issue by coordinating with school administration and parents to ensure that all students have access to appropriate devices (Arsyad, 2014).

Overall, this study contributes to the growing body of evidence supporting the use of game-based learning technologies in Indonesian mathematics classrooms. It demonstrates that even a brief exposure to Quizizz-based learning activities can produce measurable improvements in student outcomes and engagement, particularly when combined with effective instructional review. The findings have important implications for mathematics teachers at the junior high school level, suggesting that the strategic integration of digital learning tools like Quizizz can help address persistent challenges related to low motivation and poor performance in mathematics (Nasrullah, Ende, & Suryadi, 2017).

CONCLUSION

This study investigated the effectiveness of Quizizz game media as a learning tool for improving mathematics learning outcomes among Grade IX students at SMPN 9 Batam. The findings demonstrated that the implementation of Quizizz within a structured four-stage learning management cycle planning, organizing, implementing, and controlling/evaluating resulted in a significant improvement in student learning outcomes and engagement. The proportion of students achieving mastery scores (≥ 80) increased from 2.8% in the pre-test to 30.0% in the post-test, while the proportion of students scoring below the minimum threshold decreased from 72.2% to 22.5%. Additionally, student participation increased from 36 to 40 students between the two sessions, and observation data confirmed higher levels of engagement, attention, and motivation during the Quizizz-based learning activities.

These results support the conclusion that Quizizz is an effective and feasible learning medium for mathematics education at the junior high school level in Indonesia. Its game-like features create a positive and competitive learning environment that motivates students to engage more deeply with mathematical content, ultimately supporting improved learning outcomes. This study provides a strong foundation for further research on the long-term effects of game-based learning tools in Indonesian schools and for the development of practical guidelines for their effective integration into the mathematics curriculum.

Based on the findings and observations of this study, the following recommendations are offered for practitioners and future researchers: (1) teachers at SMPN 9 Batam and other Indonesian junior high schools are encouraged to consider integrating Quizizz and similar game-based learning platforms into their regular instructional practice, particularly for formative assessment and review activities in mathematics. The platform is accessible, user-friendly, and

can be adapted to a wide range of topics and learning objectives. (2) School administrators should take steps to ensure that all students have equitable access to internet-enabled devices for use during Quizizz-based learning activities. This may involve collaborating with parents, exploring school device loan programs, or utilizing school computer laboratories. (3) Teachers are encouraged to use the detailed performance analytics provided by Quizizz to inform their instructional decisions, identifying students who require additional support and adjusting their teaching strategies accordingly.

Future research should explore the long-term effects of Quizizz integration on student learning outcomes and motivation, using more rigorous experimental designs, larger and more diverse samples, and multiple measurement points. Comparative studies examining Quizizz alongside other digital learning tools would also be valuable. Further studies should investigate the moderating role of student characteristics such as prior mathematical ability, digital literacy, and learning style in determining the effectiveness of game-based learning interventions, in order to develop more personalized and differentiated instructional approaches.

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