

# CAN QUIZZIZ-ASSISTED GAME-BASED LEARNING MODEL IMPROVE MATHEMATICS LEARNING OUTCOMES

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## ABSTRACT

Learning outcomes are the main indicators of educational success, covering the abilities, knowledge, skills, and understanding acquired after the learning process. This research aims to improve student learning outcomes by applying the Game-Based Learning model using Quizziz on the topic of data presentation. The data were obtained from a classroom action research (CAR) that implemented the Game-Based Learning model assisted by Quizziz-based learning media, with the goal of improving student mathematics learning outcomes on the topic of Data Presentation. The research was conducted in Class VII-1 of SMP Negeri 1 Tilamuta. The findings show that using the Game-Based Learning model with Quizziz improves student learning outcomes. Teacher activity increased from 59.37% in Cycle I to 87.49% in Cycle II, while student activity increased from 46.9% in Cycle I to 81.24% in Cycle II. Meanwhile, the average student learning outcomes in the affective domain increased from 59.15% in Cycle I to 83.55% in Cycle II, in the psychomotor domain from 61.59% in Cycle I to 83.01% in Cycle II, and in the cognitive domain, through test results, from 47.67% in Cycle I to 85.86% in Cycle II. Thus, the success indicators for teacher activity, student activity, and student learning outcomes in the affective, psychomotor, and cognitive domains have been achieved in accordance with the expected standard of 80%.

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## INTRODUCTION

Mathematics is one of the basic sciences that plays a very important role in everyday life. In the 90s, students liked to read books and carry them everywhere, but now they only need one device to have everything at their fingertips. As a result, students become bored when studying in traditional classrooms. One way to reduce boredom while studying is to give students quizzes. In addition, since quizzes are conducted online, student motivation has certainly increased. One online quiz application is Quizziz. (Agustina & Martha Rusmana, 2019) Almost

all human activities, whether simple or complex, cannot be separated from the use of mathematical concepts. For example, we use arithmetic operations when shopping, we use the concepts of percentages and ratios when managing family finances, while in the fields of technology, science, and economics, mathematics is the main foundation for the development of various innovations. Thus, learning mathematics is not just about understanding numbers and formulas, but also training logical, analytical, and systematic thinking skills that are essential for solving real-life problems. New technological developments are advancing rapidly and can help students learn better. Mathematics learning in schools is very important. Quizizz is an interactive game-based learning platform designed to make classroom learning more interesting and enjoyable. As a quiz presented as a game, it can be used as a learning tool by both teachers and students. (Solikah, 2020). Quizizz is an application specifically designed for teachers to create interactive and engaging quizzes to increase student participation in learning. These quizzes can be taken on various types of devices, such as computers, tablets, or mobile phones. (Sunardi, 2020). With Quizizz, teachers can create quizzes that are both engaging and beneficial for learning. (Fitriana et al., 2023) The advantage of Quizizz is that students receive immediate feedback after completing the quiz, which helps them find mistakes and improve their understanding of mathematics. The use of appropriate educational media can prevent students from getting bored and make the learning process more interesting. A good learning process can attract students and provide feedback to improve their learning activities. (Diu et al., 2020) Quizizz is a website that aims to make learning more interesting and enjoyable. With this application, teachers can deliver lesson material in the form of quizzes and games. The display is better designed and faster, helping students learn more, become more active in learning, and compete healthily with their peers (Handayani et al., 2023).

Most students already understand the material on how to present data; however, some students still face difficulties due to their lack of mathematical ability. To make it easier for students to understand the concepts taught, the teacher explains the material again. Before and after the material is taught, quizzes are given to determine the students' level of understanding of the material and to encourage them to do more study work. These quizzes serve as pre-tests and post-tests that help assess students' progress after studying the subject. The quiz results also show students' learning abilities, which increases their desire to learn. Learning media plays an important role in influencing students' psychological aspects, fostering their interest and motivation, improving the learning process, and providing stimulation (Yanto, 2019).

The Game-Based Learning model emphasizes the use of game elements, such as competition, challenges, and rewards, to increase student motivation and engagement in learning. By using GBL in Quizizz, students can learn data presentation material in a more interesting and interactive way. They not only answer questions, but also participate in games that can gradually improve their understanding of concepts through a more enjoyable learning experience. In addition, this method can also improve students' memory, train critical thinking skills, and encourage independent learning. With score comparisons and other gamification elements, students are more motivated to understand the material well. Therefore, the application of Game-Based Learning in the interactive medium of Quizizz is a relevant solution to improve the effectiveness of learning data presentation material in seventh grade.

**Table 1** Average Student Learning Outcomes in Class VII-1 Presentation of Data SMP Negeri 1 Tilamuta

No.	Year	Number of Students	Minimum Competency	Presentation of Mastery	Achieved	Not Complete
1.	2021/2022	31	75	67.74%	21	10

2.	2022/2023	30	75	60	18	12
3.	2023/2024	34	75	58.82%	20	14

**(Source: List of Learning Outcomes for the Even Semester on Data Presentation in Class VII-1 at SMP Negeri 1 Tilamuta)**

67% of the objectives have been met. Students still have low motivation to learn, especially in mathematics, which is often considered boring and difficult. As a result, teachers continue to look for ways to increase their students' motivation to learn. You can give students quizzes to do before class starts. The seventh-grade mathematics teacher suggests using more interesting learning media as an innovation in the learning process because conventional learning methods do not involve interaction. This is because students tend to be more interested in learning methods that use images. In addition, students are usually more interested in learning basic statistical concepts such as tables, bar graphs, and limited circle diagrams. As a result, student learning often falls short of expectations. Learning outcomes are changes in students' attitudes, understanding, and skills after they have studied a lesson. These changes can be measured by calculating the value of their efforts (Pauweni et al., 2022).

To ensure that mathematics learning is enjoyable and interesting for students, teachers must create more creative and innovative learning methods. This greatly depends on how well a teacher plans and prepares lesson materials to help students develop their skills. To achieve this goal, teachers must create more innovative and creative learning methods to help students learn in a way that suits them. (Arifah, 2022) One way to do this is by using a learning model that encourages all students to actively participate in the learning process. This model is designed to make students feel more comfortable and motivated to learn mathematics, which can have a positive impact on their understanding and learning outcomes (Arham et al., 2023).

Another theory proposed by Sudjana (2011) states that learning outcomes are the abilities possessed by students after they have completed the learning process. Student progress in learning can be measured by tracking the successful outcomes they achieve during the learning process. (Budiana et al., 2021) According to another theory proposed by Sudjana (2011), learning outcomes are the abilities possessed by students during the learning process. Successful learning outcomes can be used as a tool to measure student progress in learning. (Manurung et al., 2020) Another theory proposed by Sudjana (2011) states that learning outcomes are the abilities possessed by students during the learning process. Students' learning progress can be measured by observing their learning outcomes after studying diligently. (Wahyuning, 2022). Teachers are currently trying to find new and innovative ways to make learning more interesting and enjoyable for their students. Schools can now use more engaging learning media, which allows students to actively participate in the learning process, increases student engagement, and improves their learning process. (Damayanti, 2025) One of them is Quizizz, an online quiz tool that makes learning more fun. However, the game-based learning (GBL) approach helps students learn better. The learning process must be supported by good experiences, both inside and outside of students. Good experiences will make students excited to learn, keep them focused on their lessons, and accept criticism to improve their lessons. All of this has an impact on students' ability to learn. (Laknasa et al., 2021) This shows that advances in technology and learning media through various electronic devices help people carry out their daily activities more efficiently and effectively. Therefore, educators must create the right learning approach to provide their students with abilities and skills (Al Mawaddah et al., 2021).

## **METHOD**

The type of research used in this study is classroom action research (CAR). SMP Negeri 1 Tilamuta is located in Limbato, Tilamuta District, Boalemo Regency, Gorontalo Province. It is

located at Jalan Abas Macmoeld Number 1. This classroom action research (CAR) involved 28 students in class VII-1 of SMP Negeri 1 Tilamuta, consisting of 15 females and 13 males. The aim was to improve students' mathematical abilities, especially in data presentation, through the use of the Quizizz game-based learning model. The classroom action research (CAR) will take place from May to June 2025 in the 2024/2025 academic year. According to Suharsimi Arikunto et al. (2017:42), classroom action research is carried out in several stages:

### 1. Planning Stage

This research was conducted in the following stages:

- a) Requesting permission from the school principal to conduct the research.
- b) Contacting and asking mathematics teachers, for example, to participate in the research and assist researchers in observing the teaching and learning process.
- c) Conducting preliminary observations on how learning is conducted in the classroom.
- d) Identifying mathematical problems and the actions taken.
- e) Create various learning tools, such as teaching materials and learning resources.
- f) Creating evaluation tools to measure student learning outcomes.
- g) Action Implementation Stage

### 2. To conduct this research, there are several steps that must be followed:

- a) Introduction
  - Preparing learning media
  - Explaining how to teach students with Quizizz
- b) Action

Students are asked to follow the Quizizz link and complete the quiz questions.

### 3. Observation and evaluation stage

At this stage, researchers and observers analyze the data collected through observation and testing. After that, improvements are made so that the implementation of actions in the next cycle can achieve more optimal and maximum results.

The type of data in this study is quantitative data. Quantitative data consists of a collection of numbers which are then analyzed using statistical formulas (Sutisna, 2020). Quantitative data is analyzed by finding the minimum value, maximum value, average, and percentage of minimum mathematics learning completeness reaching  $KKM = 75$  with 80% learning completeness as an indicator of research success.

During classroom observation, the reflection stage begins. At this point, all data collected from tests and observations are analyzed by researchers and observers. After that, improvements are made to obtain the best results in the next stage. The following are some of the techniques used by researchers to collect data in this study: (1) Observation was used to observe activities that took place in the classroom during learning. The purpose of this observation was to collect information about the conditions of the research subjects, which included the circumstances and activities of the students and the researchers themselves during learning. (2) Testing is a process of assessing ability, according to Arikunto (2013:266). This study used a Quizizz-based evaluation tool, an interactive learning tool, to measure students' knowledge of data presentation material. To conduct this examination, established models and procedures were used.

Various statistical formulas were used to analyze the quantitative data in this study (Sutisna, 2020). To analyze the data, the lowest score, highest score, average, and student learning pass rate were calculated. In mathematics, the research success indicator must reach a minimum of 80% learning pass rate, and the minimum passing grade must reach 75 percent.

**Table 2.** Categories of Success Indicators

Criteria Range	Description
91 – 100	Very Good
81–90	Good
70–80	Fair
< 70	Needs Guidance

Data analysis in this study was conducted after data was obtained from samples through selected instruments and will be used to answer questions in the study or to test hypotheses proposed through data presentation.

Data obtained from observations, tests, and student learning outcomes will be analyzed. The selected data will then be presented and conclusions will be drawn.

1. Empirical validity testing

To test the level of validity, a product moment correlation test is used, namely

$$r_{xy} = \frac{n \sum xy - (\sum x)(\sum y)}{\sqrt{(n \sum x^2 - (\sum x)^2)(n \sum y^2 - (\sum y)^2)}}$$

Explanation:

$r_{xy}$  : correlation coefficient

$\sum x$  : sum of item scores

$\sum y$  : total score sum

n : number of respondents

source: (Supriadi, 2021)

2. Reliability testing

Reliability testing is a measure that shows whether an instrument can be trusted to be used as a data collection tool. Reliability testing is carried out to obtain a research data measurement tool (instrument) that is reliable in terms of validity so that it produces data that is truly relevant to the research objectives (Soesana et al, 2023). For descriptive (essay) measurement tools, Cronbach's Alpha formula (Arikunto, 2010) is used as follows:

$$r_{11} = \left[ \frac{k}{(k - 1)} \right] \left[ 1 - \frac{\sum \sigma_b^2}{\sigma_t^2} \right]$$

Explanation :

$r_{11}$  : instrument reliability coefficient (total test)

k : number of valid questions

$\sum \sigma_b^2$  : sum of item variance

$\sigma_t^2$  : total score variance

**Table 3.** Reliability Coefficient Classification

Reliability Coefficient ( r )	Criteria
$0,00 \leq r < 0,20$	Very low
$0,20 \leq r < 0,40$	Low
$0,40 \leq r < 0,60$	Moderate
$0,60 \leq r < 0,80$	High
$0,80 \leq r < 1,00$	Very high

## RESULTS AND DISCUSSION

### *Results*

During the first cycle, teaching and learning activities did not go well. Analysis of the data on the implementation of the teaching and learning process at each meeting showed an average learning success rate of between 46.9% and 61.59%. One of the reasons for this was the adaptation of teachers and students to the learning model used. Switching from a conventional learning approach to an innovative approach takes time because game-based learning is still considered new by many teachers and students. Teachers were unable to create fully interactive and game-based classes. Instead, students continued to try to adapt to a competitive and technology-based learning environment.

In addition, the Quizizz digital platform has not been fully utilized. During the first cycle, students were less engaged in the evaluation. This could be due to technical problems or the students' inability to understand how to use the media to answer questions. As a result, affective, psychomotor, and cognitive learning outcomes have not shown significant improvement. Another influential factor is the lack of motivation and active participation of students in each phase of learning. Although this model is intended to be both fun and challenging, if the teacher does not control the class well, students can become confused. This can be seen from the lack of student activity in answering questions, speaking, or showing enthusiasm while playing games.

The first cycle of game-based learning with Quizizz as can be seen in Figure 1, the photo depicts the delivery of learning materials using the Quizizz application. Teachers present the material in the form of interactive quizzes that students can access through their respective devices. In this way, the process of delivering material is no longer one-way, but more engaging because students are actively involved. revealed several areas for improvement, such as student guidance, planning, time management, and command delivery. This provided a basis for reflection and refinement in the next cycle so that the game-based learning model could be used to improve student achievement.



**Figure 1.** Delivery of material through Quizizz

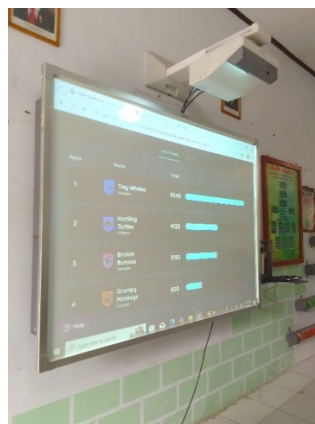
All components of the study did not meet the success criteria, so the study continued into the second cycle. During the second cycle, we found that the average percentage of teacher activities ranged from 81.24% to 87.49%.

In addition, students gain an understanding of how fun and competitive lessons are conducted. Game-based learning models have been proven to increase student focus and enthusiasm for learning, especially in answering questions related to data presentation material. Quizizz is an entertaining and enjoyable tool for testing students' understanding directly, figure 2 shows a learning activity that uses Quizizz-based games. In this activity, students take part in interactive quizzes that are designed like games. Each student can access the questions through their own devices, then answer quickly to get the highest score. The use of Quizizz makes the learning atmosphere more lively because students not only focus on the correct answers, but also enjoy the visual display, point system, and leaderboard, which encourage healthy competition. Thus, learning activities are no longer monotonous, but more enjoyable and motivate students to participate actively.



**Figure 2.** Quizizz-based game

The first cycle averaged 77.5%, but the second cycle rose to 84.2%. This is the result of a group quiz model that uses multiple-choice, short-answer, and essay questions. As can be seen in Figure 3, the image shows the quiz results from the Quizizz-based game that the students participated in. The results display each student's score, response speed, and ranking. These results provide an overview of the extent of students' understanding of the material studied. Through these quiz results, teachers can easily identify which students have mastered the material well and which ones still need further guidance. Meanwhile, for students, the quiz results displayed in the form of scores and rankings motivate them to study harder in order to achieve better results next time.



**Figure 3.** Quizizz result in Quizizz-Based learning

Consequently, the results of cycle II show that the use of Quizizz media for the Game-Based Learning model successfully improved overall learning outcomes and the quality of learning.

These results support the belief that innovative learning approaches can overcome the weaknesses of traditional learning approaches that are uninteresting and do not motivate students if they are designed and implemented correctly.

The results of the second cycle of research show that students' affective, psychomotor, and cognitive abilities have improved, and they have met the graduation standards, as indicated by the results of the second cycle of classroom action research. As a result, this investigation did not proceed to the more complex third stage. Therefore, the research hypothesis regarding learning data presentation material through a game-based learning model supported by an interactive learning platform called Quizizz is valid and scientifically acceptable.

**Table 4.** Student Learning Outcomes for Data Presentation Material Cycle I

Number of Students		Percentage	
Complete	Not Mastered	Proficient	Not Completed
13	15	47.67	52.33
28 Students		100	

This test was given to 28 students and consisted of 8 questions, comprising 5 multiple-choice questions and 3 essay questions. The maximum score was 100, and the general learning completeness level for each student had to be at least 80%.

**Table 5.** Student Learning Outcomes on Data Presentation Material Cycle II

Number of Students		Percentage	
Achieved	Not Proficient	Proficient	Unfinished
23	5	85.86%	14.14
28 Students		100	

This test was given to 28 students and consisted of 8 questions, including 5 multiple-choice questions and 3 essay questions. Each student had to obtain a minimum score of 75, and all students had to pass with a minimum score of 80%.

**Table 6.** Results of Cycle I Action Implementation

No	Source	Achievement Results
1	Teacher Activity Observation Sheet	59.37%.
2	Student Activity Observation Sheet	46.9%.
3	Attitude Assessment Observation Sheet	59.15%.
4	Practical Assessment Observation Sheet	61.59%.
5	Learning Achievement Test	47.67

Based on the observation results of the teacher's learning methods, student activities, and cognitive, affective, and psychomotor learning achievements, it appears that the success indicators have not been achieved in cycle I. Therefore, for cycle II, learning based on the Gamel model with Quizizz must be continued.

**Table 7.** Results of the learning process in Cycle II

No	Source	Achievement Results
1	Teacher Activity Observation Sheet	87.49
2	Student Activity Observation Sheet	81.24
3	Attitude Assessment Observation Sheet	83.55
4	Practical Assessment Observation Sheet	83.01
5	Learning Outcome Test	85.86

### **Discussions**

The results of this study indicate that the application of the Quizizz-assisted Game-Based Learning model can improve students' conceptual understanding and learning motivation. In cycle I, the learning outcomes were only in the range of 46.9%–61.59%, which did not meet the success indicators. However, after improvements were made in cycle II, the success rate increased significantly to more than 80%. This shows that improvements in the planning and implementation stages, particularly in classroom management, time management, and student assistance in using Quizizz, contributed significantly to the improvement in learning outcomes.

These findings are in line with the research by Chaterine et al. (2023), which states that the application of the Game-Based Learning model in mathematics learning has been proven to significantly improve students' conceptual understanding compared to conventional methods. The similarity between these studies lies in the use of a game-based approach to create a more interactive and enjoyable learning atmosphere so that students can understand the material more easily. The difference is that Chaterine's study emphasizes the comparison between conventional methods and Game-Based Learning, while this study uses a cycle design (PTK) to observe gradual improvement from cycle I to cycle II.

In addition, the results of this study also support the opinion of (Handayani et al., 2023), which confirms that the use of Quizizz makes classroom learning more creative, interesting, and less boring. The similarity with Handayani's study lies in the use of Quizizz as the main medium to support interactive learning processes. The difference is that Handayani's research focuses more on the aspects of creativity and classroom activity in general, while this study focuses on improving the achievement of learning success indicators, namely a minimum of 80% achievement of learning aspects in cycle II.

The results of this study indicate that the use of Quizizz in mathematics learning can significantly improve student motivation, concentration, and learning outcomes. In cycle I, learning outcomes did not meet the good category, but in cycle II, all aspects of learning, including cognitive, affective, and psychomotor, improved to achieve the success indicators. This is demonstrated by an increase in teacher activity from 59.37% in cycle I to 87.49% in cycle II, as well as an increase in student learning outcomes from an average of 59.15% to 83.55% and from 47.67% to 85.86%.

These findings are consistent with the opinion of (Eka & Nugraha, 2021), who stated that the use of Quizizz in mathematics learning has a positive impact, particularly in increasing student motivation and learning outcomes. The similarity can be seen in the use of Quizizz as an interactive evaluation medium that is not boring, while the difference in this study lies in the classroom action design that emphasizes gradual improvement from cycle I to cycle II.

These findings also support (Stohlmann, 2022) opinion that student-centered game-based learning can foster a growth mindset, which is the belief that abilities can be developed through

effort. In this study, this was reflected in the increased activity of students and teachers, as well as the willingness of students to be more active in the learning process even though they initially experienced difficulties. Furthermore, the results of this study are also in line with the research by (Fadhlorrohan et al., 2020), which found that the use of Quizizz can increase students' interest and concentration in learning. The similarity lies in the positive impact of Quizizz on student engagement, while the difference is that this study used a classroom action research (CAR) approach to show significant changes from one cycle to the next.

Finally, the findings of this study are reinforced by (Dewi et al., 2024), who confirm that Quizizz can change students' perceptions of mathematics, which is considered difficult and boring, to be more enjoyable and motivating. The similarity lies in the motivational effect and improvement in learning outcomes, while the difference is that this study specifically shows measurable improvements in teacher activity, student activity, and learning outcomes through the PTK cycle instrument.

## CONCLUSION

The results of the study and discussion show that the game-based learning model supported by Quizizz helps students in class VII-1 of SMP Negeri 1 Tilamuta learn more about data presentation. This is indicated by an increase in teacher activity, which increased from 59.37% in cycle I to 87.49% in cycle II, and an increase in student activity from 46.9% to 81.24%. In addition, student learning outcomes increased significantly in each assessment domain, namely the affective domain from 59.15% to 83.55%, the psychomotor domain from 61.59% to 83.01%, and the cognitive domain from 47.67% to 85.86%. The success criteria were met, namely a minimum of 80% success in each component. These results show that the study hypothesis is scientifically acceptable because it shows that game-based learning with Quizizz has a positive and effective impact on student learning outcomes.

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