

# Application of Wordwall-Assisted Game Based Learning to Improve Science Learning Outcomes in Elementary Schools

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## Abstract

The low mathematics learning outcomes at State Elementary School Tanjungrejo 3 Malang are a concern in an effort to improve the quality of learning. One of the reasons is the lack of variety of learning models that are interesting and able to motivate students to actively engage in the learning process. To overcome this, this study aims to improve the mathematics learning outcomes of grade V students through the application of the *Game Based Learning* model assisted by *Wordwall media*. *Wordwall* is a digital platform that provides various types of interactive educational games that can be accessed online and offline. The research method used is Class Action Research (PTK) with two cycles, each consisting of planning, implementation, observation, and reflection stages. Data was collected through learning outcome tests and student activity observation sheets, then analyzed descriptively, quantitatively, and qualitatively. The results showed a significant increase in student learning outcomes, with the average score increasing from 69.63 in the pre-cycle to 88.89 in the second cycle. The percentage of student learning completeness has also increased from 41% to 93%. In addition, student involvement in learning also increases with the use of interactive *Wordwall game media*. These findings show that the application of the Wordwall-assisted Game Based Learning model is effective in improving students' mathematics learning outcomes.

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## Introduction

In the era of increasingly rapid digital transformation, the world of education faces great challenges in meeting learning needs that are relevant to the times (Wijaya et al., 2024). The current educational paradigm is no longer enough to focus on delivering material conventionally, but must be able to adapt to digital technology that has become part of students' daily lives (Rahmah et al., 2025). The development of information and communication technology encourages changes in the learning patterns of students who prefer interactive digital activities over traditional lecture methods (Prasetyo & Dewi, 2024). Therefore, innovation in learning strategies is an urgent need to ensure that the teaching and learning process runs actively, creatively, and fun according to the characteristics of the native digital generation (Setiawan et al., 2025).

One of the main problems facing the world of education today is the low learning outcomes and motivation of students at various levels of education (Fadillah & Hasanah, 2024). Data from the Ministry of Education and Culture in 2023 shows that the average numeracy literacy score of elementary school students in Indonesia is still below the national minimum standard (Ministry of Education and Culture, 2023). This condition is exacerbated by monotonous and less interactive learning methods so that students become passive and quickly lose interest in learning (Alfian et al., 2024). In fact, the characteristics of students today prefer learning activities that involve games, challenges, and digital technology (Yuliana & Lestari, 2025). This incompatibility of learning approaches has a direct impact on low student learning outcomes, especially in subjects that are considered difficult such as mathematics (Suryani et al., 2024).

One of the relevant approaches to overcome these problems is *Game Based Learning* (GBL). GBL is a learning model that integrates game elements into the learning process with the aim of increasing student motivation, involvement, and understanding of the material (Sianturi, 2024). Through game-based learning, students are encouraged to learn actively, think critically, and solve problems in a fun atmosphere (Ulimaz et al., 2024). Several research results show that the application of GBL can significantly improve student learning outcomes compared to conventional methods (Andika, 2025). In addition, GBL is considered to be able to accommodate various student learning styles and create a more dynamic and adaptive learning environment (Hidayati & Rachmadi, 2024).

In supporting the implementation of GBL, one of the digital media that is effectively used is *Wordwall*. *Wordwall* is an interactive online platform that provides various types of educational games such as quizzes, crossword puzzles, wheel of fortune, and word matching activities (Hasanah et al., 2024). The advantage of *Wordwall* lies in its flexibility in designing various types of questions and games that can be adjusted to the characteristics of the subject matter (Kasmawati et al., 2024). Several studies prove

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that the use of *Wordwall* in learning can increase student motivation, engagement, and learning outcomes in various subjects (Mar'atushaleha & Sayidiman, 2024). In addition, its attractive and easy-to-understand appearance makes *Wordwall* very suitable for application at the elementary school level (Widiarni et al., 2024).

However, in the field, there are still many teachers who have not made optimal use of interactive digital media in the learning process (Diah et al., 2025). Learning practices in most schools are still dominated by lecture methods and the assignment of written assignments that make students quickly feel bored (Suparmini et al., 2024). The gap between the potential of digital technology and conventional learning practices in the classroom is one of the causes of low student learning outcomes (Rahmi et al., 2024). In fact, interactive digital media such as *Wordwall* has been proven to be able to significantly increase student active participation and material understanding (Lestari et al., 2025). Therefore, there is a need for systematic efforts to integrate digital-based media in daily learning.

Similar conditions are also found at SDN Tanjungrejo 3 Malang, where student learning outcomes in several subjects are still relatively low (Teacher Observation Data of SDN Tanjungrejo 3 Malang, 2024). Based on the results of daily evaluations, most students have not reached the Minimum Completeness Criteria (KKM) in Mathematics subjects (Arifin et al., 2024). One of the factors that causes this is that teachers still tend to use lecture and practice methods without involving interactive digital media (Sappaile et al., 2024). In fact, the characteristics of elementary school students prefer playful, exploratory, and challenging learning activities (Mahmudah et al., 2024). This reinforces the need to innovate digital game-based learning strategies to improve student learning outcomes.

Several previous studies have proven the effectiveness of using GBL and *Wordwall* in improving student learning outcomes (Ulimaz et al., 2024; Andika, 2025). However, most of these studies focus more on the secondary education level or quasi-experimental studies in experimental classrooms (Hidayati & Rachmadi, 2024). In addition, GBL-based classroom action research assisted by *Wordwall* at the elementary school level, especially in Mathematics, is still relatively limited (Suparmini et al., 2024). Therefore, more applicative, contextual, and classroom-based research is needed to prove the effectiveness of this approach in improving learning outcomes in elementary school settings (Diah et al., 2025).

Based on this background, this study aims to improve the mathematics learning outcomes of grade V students of SDN Tanjungrejo 3 Malang through the application of the Game Based Learning model assisted by *Wordwall* media. This research is expected to be a solution to low student learning outcomes and improve teachers' skills in designing technology-based learning (Rahmi et al., 2024). In addition, this research also aims to build an active, fun, and participatory learning atmosphere according to the

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characteristics of elementary school students (Fadillah & Hasanah, 2024). It is hoped that the results of this research can make a theoretical contribution to the development of learning models as well as practical contributions for teachers in creating more effective, innovative, and meaningful learning (Lestari et al., 2025).

## Method

This study uses a Classroom Action Research (CAR) approach referring to the Kemmis and McTaggart model, which consists of four stages in each cycle, namely planning, implementation of actions, observation, and reflection (Ruismain, 2020). The research was conducted at SDN Tanjungrejo 3 Malang with research subjects totaling 27 students of grade V, consisting of 8 male students and 19 female students. The selection of this location was based on the results of initial observations which indicated low mathematics learning outcomes and limited variation in learning models applied in the classroom. The study was carried out in the even semester of the 2024/2025 academic year, precisely in February 2024, with two meetings per cycle and a learning duration of  $2 \times 35$  minutes for each meeting. Activities began with a pre-cycle stage in the form of administering a pretest to determine students' initial abilities related to data material, followed by two cycles of action. In each cycle, the teacher implemented the Game Based Learning model assisted by Wordwall media with different materials and interactive game activities, concluded with a posttest to measure improvements in learning outcomes. In the planning stage, teachers prepared learning tools such as lesson plans, pretest and posttest questions, and student activity observation sheets. The implementation stage involved interactive Wordwall-based learning, where students participated in various quiz games adjusted to the lesson material. Observations were conducted by two observers who systematically recorded the activities of teachers and students using observation sheets of student involvement and learning implementation. Reflection was carried out at the end of each cycle to evaluate the action results and determine necessary improvements for the next cycle. Data collection techniques included learning outcome tests in the form of 10 multiple-choice objective questions and observation sheets of student activities. The data analysis technique applied quantitative descriptive methods to calculate the average score and the percentage of learning completeness using the formula  $(\text{number of completed students} / \text{total number of students}) \times 100\%$ , and qualitative descriptive analysis to assess student engagement during learning. The research was declared successful if the average student learning outcomes reached a minimum score of 80 and the classical completeness percentage reached at least 80%, referring to the achievement quality standard classification from Arikunto (2015).

## Results and Discussion

### Results

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This research aims to improve the mathematics learning outcomes of grade V students of SDN Tanjungrejo 3 Malang through the application of the Game Based Learning model assisted by Wordwall media. The minimum completeness standard (KKM) set for Mathematics subjects in the class is 80. To measure student learning outcomes, an instrument was used in the form of an objective test totaling 10 multiple-choice questions that had been validated through a content validity test with classroom teachers and subject matter experts. The test results are then converted into rating categories: excellent (85–100), good (70–84), fairly good (55–69), poor (40–54), and very poor (<40).

The research activity began with the provision of a pre-cycle test to find out the students' initial ability to the "Data" material. The results of the analysis showed that the average student score was 69.63, still below the KKM. Classically, 41% of students have achieved a score of  $\geq 80$ , while 59% of students have not completed. Details of the pre-cycle results are shown in Table 1.

**Table 1.** Hasil Tes Analisis Pra Siklus

KKM	Value Range	Number of Students	Presentase	Category
80	>85-100	6	22%	Very Good
	>70-84	11	41%	Good
	>55-69	5	19%	Good enough
	>40-54	3	11%	Not Good
	<40	2	7%	Not Very Good

As many as 38% of students scored below the category of doing well (score <70), indicating that most students had difficulty understanding the material. This is due to previous learning that is still conventional without interactive media.

After the implementation of actions in Cycle I using the Game Based Learning model assisted by Wordwall media during two meetings, the test results showed an increase in scores. The average student score increased to 79.26 and the percentage of classical completeness reached 70%, but still did not meet the minimum classical completeness target of 80%. Details of the results of Cycle I are presented in Table 2.

**Table 2.** Hasil Analisis Tes Siklus I

KKM	Value Range	Number of students	Presentase	Category
80	>85-100	10	37%	Very Good
	>70-84	13	49%	Good
	>55-69	2	7%	Good enough
	>40-54	2	7%	Not Good
	<40	-	-	Not Very Good

Completeness increased by 29% from pre-cycle to Cycle I. However, there are still 4 students (14%) who are under the KKM. Inhibiting factors include the lack of

optimal use of the Wordwall game feature as a whole and limited time for individual guidance.

Improvements are made by increasing the intensity of guidance for students who have not yet completed it, adding a variety of types of Wordwall games, and optimizing classroom management so that the learning atmosphere is more conducive. The results in Cycle II showed a very significant improvement. The average student score reached 88.89 and the percentage of classical completeness reached 93%, exceeding the minimum target of 80%. Details of the results of Cycle II are presented in Table 3.

**Table 3.** Hasil Tes Analisis Siklus II

KKM	Value Range	Number of students	Presentase	Category
80	>85-100	24	89%	Very Good
	>70-84	3	11%	Good
	>55-69	-	-	Good enough
	>40-54	-	-	Not Good
	<40	-	-	Not Very Good

The increase in completeness from Cycle I to Cycle II was 23%. This significant increase is due to the optimization of the use of Wordwall interactive features and the Game Based Learning approach which is able to increase student motivation, focus, and participation in learning.

## Discussion

This research aims to improve the learning outcomes of Mathematics students in grade V of SDN Tanjungrejo 3 Malang through the application of the Game Based Learning (GBL) model assisted by Wordwall media. The research process was carried out in two cycles, two meetings each, starting with the pre-cycle stage to measure students' initial abilities.

In the pre-cycle stage, the results of the pretest showed an average student score of 69.63, still below the Minimum Completeness Criteria (KKM) of 80. Of the 27 students, only 41% achieved grades above the KKM. These findings show that there is a need for more interesting and interactive learning interventions. These results are in line with the findings of Vetriyanti (2022) which affirms the importance of preliminary activities to motivate students before core learning begins.

In the first cycle, after applying the GBL model assisted by Wordwall, the average score of students increased to 79.26 with 70% completeness. Although there was an increase of 10% compared to the pre-cycle, there were still 30% of students who had not reached the KKM. This increase is allegedly influenced by the integration of game elements that are able to increase student learning motivation, as explained by Mairyam



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et al. (2024) that game-based learning is effective in facilitating students' cognitive needs and encouraging active participation.

However, the results of observations show several obstacles, including the lack of intensive guidance for low-ability students and irregularities when playing Wordwall. This is reinforced by the findings of Lestari et al. (2023) who stated that the success of Wordwall as an interactive learning medium is highly dependent on teacher management during activities.

In cycle II, after improvements were made in the form of special assistance for students with low scores and strengthening the rules of Wordwall, learning outcomes experienced a significant increase. The average student score reached 88.89 with 93% completeness. Only 7% of students have not reached KKM. This improvement not only shows the success of the intervention, but also proves the effectiveness of the Wordwall-assisted GBL model in supporting the understanding of mathematical concepts, in line with the findings of Agung et al. (2025) who stated that the Wordwall-based Team Games Tournament model has a positive impact on the mathematics learning outcomes of elementary school students.

Visually, the trend of improving learning outcomes from pre-cycle to cycle II can be seen through Figure 2, which shows a graph of significant increases from 41%, to 70%, and finally 93% completeness.

This increase in learning outcomes is also closely related to increased student motivation and participation during learning. The observation results showed that students were more active in asking questions, answering questions, and enthusiastically participating in the game. This is strengthened by the findings of Nurhikmah and Nurdin (2024) that game-based interactive learning media has proven to be effective in increasing student motivation and learning activities.

In addition to the cognitive aspect, the GBL approach also contributes to students' thinking skills. A study by Saidiya et al. (2023) found that Wordwall is able to improve critical and analytical thinking skills, especially in concept-based subjects such as mathematics. A similar condition was also found in this study, where students understood abstract concepts faster through visualization of questions on Wordwall.

Overall, the results of this study are in line with and strengthen various previous studies (Putra et al., 2024; Rohmawati et al., 2024), as well as providing new empirical evidence that digital game-based learning models are not only able to improve cognitive learning outcomes, but also an active, fun, and motivating learning environment.

## Conclusion

The application of the Game Based Learning model assisted by Wordwall media has proven to be effective in improving the learning outcomes of Mathematics students in grade V at SDN Tanjungrejo 3 Malang. The results of the study showed a significant

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increase in the average score and level of student learning completeness from pre-cycle to cycle II. In addition, the learning atmosphere becomes more interactive, fun, and able to increase students' motivation and active participation during the learning process. Therefore, the use of game-based digital media such as Wordwall can be used as one of the innovative alternatives in learning strategies to achieve more optimal learning outcomes at the elementary school level.

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### Authors' Note

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