

The Effectiveness of Word of Wonders in Improving Learning Outcomes and Critical Thinking in Elementary School Students

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Abstract

Purpose: The purpose of this study is to meet the educational needs of the 21st century, which emphasizes improving learning outcomes and critical thinking skills through the use of up-to-date learning resources. The online game Word of Wonders (WoW) is one of the media used. This objective Surakarta The objective of this study is to evaluate how well WoW helps third-grade students at SD Muhammadiyah 1 Surakarta improve their learning outcomes and critical thinking skills.

Methodology: With a one-group pretest-posttest design and 27 students, this study used quantitative methodology. This methodology was used to collect data. The post-test was administered using Word of Wonders after the treatment, while the pre-test was administered before the learning process. In order to use the t-test to assess the data, all instruments underwent validity, reliability, and normality tests.

Result: The average score increased significantly from 57.03 on the pretest to 65.18 on the posttest, according to the results. After using WoW, a paired-sample t-test produced a significant value of 0.004 (<0.05), indicating an improvement in language comprehension and critical thinking skills. Students' interest in higher-order thinking skills increased as a result of the game's assistance in vocabulary exploration, word pattern analysis, and logical relationship formation.

Applications/originality/value: These research findings provide practical contributions to the development of digital game-based learning as a medium to support Indonesian language learning in elementary schools.

Introduction

Education is the main foundation in preparing a generation that is capable of facing the dynamics of the 21st century. At the elementary school level, the function of education is not only to transfer knowledge, but also to foster higher-order thinking skills such as critical, creative, analytical, and reflective thinking. According to [Nurjanah et al. \(2020\)](#) emphasizes that education enables students to develop their potential and play an active role in social life. Critical thinking skills, as part of higher-order thinking skills (HOTS), help students analyze information, evaluate arguments, solve problems, and make decisions based on logical reasoning. [Doang et al. \(2022\)](#) mentioning that critical thinking is a structured cognitive process in making judgments, while Hasnan & Fitri (2020) interpret it as the ability to formulate responsible judgments about ideas or arguments.

However, learning practices in elementary schools still face various obstacles. Based on observations at SD Muhammadiyah 1 Surakarta, third-grade students still have difficulty understanding vocabulary, determining main ideas, and constructing sentences independently. Indonesian language learning is still dominated by the lecture method, resulting in less student interaction and a lack of critical thinking skills. [Ali \(2020\)](#) states that Indonesian language learning at the elementary level tends to emphasize memorization and procedures, which reduces opportunities for students to explore and reason deeply. As a result, learning outcomes and literacy skills have not developed optimally. [Budiarti & Airlanda \(2019\)](#) emphasize that vocabulary skills and critical thinking skills are important parts of building Indonesian literacy.

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Engaging digital media can help achieve learning objectives. According to [Rahman \(2021\)](#) learning outcomes are the skills that students possess after finishing their coursework. Learning outcomes are achievements attained by students in the form of assessments after participating in learning by evaluating their knowledge, attitudes, and skills ([Nurita, 2018](#)).

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He defines learning outcomes as the accomplishments of pupils following their participation in educational activities. The outcomes are the knowledge, attitudes, and participation of the students in the learning process. Learning outcomes are markers of students' knowledge, attitudes, and skill development, according to [\(Darmawan & Harjono., 2020\)](#). [Wibowo et al. \(2021\)](#) add that learning outcomes serve as indicators of the development of students' knowledge, attitudes, and skills. Students who are active in learning, challenged to think, and interact critically with learning media tend to achieve higher learning outcomes.

The development of digital technology presents a great opportunity to improve the quality of learning through interactive media that is attractive and suited to children's characteristics. Game-based learning is growing and showing positive results in terms of student motivation, engagement, and conceptual understanding. A meta-analysis by [Iskandar & Prastowo \(2022\)](#) shows that the use of educational games is very effective in improving critical thinking skills, with an impact of up to 86%. In Indonesian language learning, word puzzle games such as Word of Wonders (WoW) have great potential to improve language and critical thinking skills. Another problem that arises is the lack of learning media that is relevant to the characteristics of the digital generation. Meanwhile, many students today grow up in an environment familiar with technology, so conventional monotonous learning is no longer effective. The lack of innovative teaching methods and strategies hinders the development of critical thinking skills and student learning outcomes [\(Sari et al., 2023\)](#). The use of game-based learning media such as Word of Wonders can meet this need. [Ajisoko \(2020\)](#) also explains that language game applications such as Duolingo are effective for improving vocabulary mastery because they are interesting and encourage exploration through challenges. The applications mentioned above are very interesting, enjoyable, and entertaining for students. These games facilitate exploration- and challenge-based learning, where students are encouraged to find answers through critical thinking and collaboration with peers [\(Rendra & Wulantari., 2019\)](#).

WoW requires students to arrange words from random letters, analyze patterns, evaluate possible answers, and connect the meaning of words in a specific context. Elementary school students can use the Word of Wonders (WOW) app, a digital word game, as a teaching aid to help them develop critical thinking skills [\(Nurdin, 2024\)](#). Students are required to select words from letters provided at random to create vocabulary consistent with the crossword puzzles demonstrated in class. According to [Putra et al. \(2022\)](#) the use of Word of Wonders can improve students' language skills and comprehension. In addition, [Afifah et al \(2019\)](#) explain that tasks that support meaningful analysis, evaluation, and production support the development of students' critical thinking skills, which are consistent with the skills developed from Word of Wonders. Other studies, such as [Aulia et al. \(2024\)](#) dan [Imran et al. \(2024\)](#) also confirm that interactive media and digital games increase students' motivation, creativity, and persistence in problem solving.

However, there is a research gap that needs to be addressed. Most studies on WoW have been conducted on English language learning or higher education levels, so they do not yet describe the effectiveness of WoW in Indonesian language learning in elementary schools. In addition, according to [Mayasari \(2024\)](#) previous studies tended to focus on vocabulary mastery without directly linking it to the development of students' critical thinking skills. Some studies also still use a descriptive approach, thus failing to provide strong empirical evidence regarding the impact of WoW on measurable learning outcomes. Highlighting this gap, there is an urgent need to conduct a comprehensive evaluation study of WoW's overall success in Indonesian language acquisition, particularly in relation to improving the learning outcomes and critical thinking skills of elementary school students.

Based on the above description, this study needs to be conducted to analyze the effectiveness of the Word of Wonders game in improving the learning outcomes and critical thinking skills of third-grade students at Muhammadiyah 1 Elementary School in Surakarta. This research is also expected to provide scientific and practical support in developing a more creative and enjoyable digital-based learning model that supports the achievement of the Merdeka Curriculum. [Ihwan & Rusnilawati \(2025\)](#) state that 21st-century competencies include creativity, critical thinking, communication, collaboration, and other skills that need to be developed in students.

Method

Type and Design

This study employed a pretest-posttest pre-experimental design with a one group and a quantitative methodology. This approach was selected because it aligned with the study's goal, which was to ascertain how much the Word of Wonders (WoW) game affected students' learning outcomes particularly their critical thinking abilities while they were studying Indonesian. Using a pretest and posttest method on a single group, the researcher was able to compare student performance before and after the intervention without the need for a control group. Procedurally, the study began with administering a pretest to students to determine their initial understanding of Indonesian language material. Next, the treatment took the form of learning using the Word of Wonders (WoW) game integrated into Indonesian language learning activities. After the treatment process was complete, students were given a posttest to measure changes in learning outcomes and critical thinking skills after using the game. The difference between the pretest and posttest results was used to determine the effectiveness of the Word of Wonders game in improving student learning.

Table 1. Research Design Structure

Group	pretets	treatment	posttest
Eksperimen	O ₁	X	O ₂

Data and Data Sources

The data in this study consists of students' critical thinking test results both before and after the intervention. Twenty-seven students from class IIIA of SD Muhammadiyah 1 Surakarta in the 2024/2025 academic year were the subjects of this study. All students in class IIIA were selected as samples in accordance with the research requirements using non-probability sampling techniques. To provide an overview of student learning behavior, supporting data was collected through observation and documentation during the learning process, while the main data came from pretest and posttest scores.

Data Collection Techniques

Tests, observations, and documentation are some techniques for collecting data. Tests are given twice, before learning to assess students' initial skills and after learning to measure their progress. Critical thinking skill indicators serve as the basis for multiple-choice questions, such as analytical skills, logical reasoning, inference, and drawing conclusions. In addition, direct observation of student behavior during the learning process is conducted to assess their level of engagement, enthusiasm, problem-solving skills, and teamwork while playing Word of Wonders. The results of the observations are recorded using an assessment sheet compiled based on critical thinking skill indicators. To complement these two techniques, documentation is also used in the form of attendance lists, photos of activities, student work results, and teacher notes during the learning process. This documentation serves as evidence of the implementation of the treatment and strengthens the validity of the research results. All research instruments, tests, and observation sheets underwent validity and reliability testing beforehand. Suitability is measured using Cronbach's Alpha formula, and instruments are considered suitable if the α value is greater than 0.70. Validity is measured using Pearson's Product Moment formula with a significance criterion of $p < 0.05$. All instruments are considered valid and suitable based on the test results, thus meeting the requirements for use in the main investigation.

Data Analysis

Standard deviation, highest and lowest scores, and pretest and posttest averages were all analyzed descriptively. An summary of how students' learning outcomes and critical thinking abilities changed following the intervention was given using descriptive analytic data. To make sure the research data was normally distributed, a normality test was performed before inferential analysis. Since the sample size was smaller than 50, the Shapiro-Wilk test was utilized to evaluate normality. If the significance value (Sig.) was higher than 0.05, the data was deemed to be regularly distributed. Descriptive analytical data was used to provide an overview of how students' learning outcomes and critical thinking skills improved after the intervention. Prior to inferential analysis, a normality test was conducted to ensure that the research data was normally distributed. The Shapiro-Wilk test was used to assess normality because the sample size was less than 50. The data was considered normally distributed if the significance value (Sig.) was greater than 0.05. The results of the observation were analyzed qualitatively and descriptively as well as quantitatively to provide an overview of how students behaved and participated during the learning process. In the context of Indonesian language learning, this analysis provides empirical justification for how Word of Wonders media significantly improves students' motivation, engagement, and critical thinking skills.

Results

This study involved 27 third-grade students at Muhammadiyah 1 Elementary School in Surakarta. The instrument used was an Indonesian critical thinking test consisting of 10 questions. A pretest was administered to determine the students' initial abilities before the treatment, while a posttest was conducted after the use of the Word of Wonders (WoW) learning media to see the improvement in learning outcomes.

Table 2. Descriptive Statistics of Pretest and Posttest Scores

Variable	N	Total Score	Mean
Pretest	27	1.540	57.03
Posttest	27	1.760	65.18

As shown in Table 2, the average pretest score of students was 57.03, while the average posttest score increased to 65.18. The minimum score obtained by students was 30, and the maximum score was 90. This increase indicates that the

application of Word of Wonders learning media improved students' understanding and critical thinking performance in Indonesian.

Instrument Validity and Reliability Testing

To ensure that each item accurately measures critical thinking skills, the test instrument was verified before being used in the data collection procedure. Validity testing was conducted using SPSS 22 and the Pearson Product Moment correlation method. Because the calculated *r* value was higher than the table *r* value (0.381) at a 5% significance level, the analysis results showed that all 10 items were valid. As a result, each item was deemed suitable for use in the study and representative of recognized signs of critical thinking. The critical thinking skills of elementary school students were then evaluated using 10 questions in pre- and post-tests. To verify the internal consistency of the instrument, a reliability test using Cronbach's Alpha coefficient was conducted after the validity test.

Table 3. Reliability Test Result

Cronbach's Alpha	N of item
0,767	11

Cronbach's Alpha value of 0.767, which is higher than the minimum criterion of 0.6, indicates that this measuring instrument has good reliability. Therefore, it can be concluded that this measuring instrument is reliable and suitable for use in this study.

Normality Test

Before conducting hypothesis testing, it is necessary to check the assumption of normal distribution as a requirement for using parametric tests, such as the paired sample t-test. To assess whether the data meets these criteria, the Shapiro–Wilk test is used, given that the sample size is less than 50 people. This test serves to see whether the distribution of pretest and posttest values shows a deviation from the normal distribution.

Table 4. Normality Test

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	,181	27	,024	,925	27	,051
Posttest	,196	27	,009	,932	27	,076

Table 4 indicates that both the pretest (0.051) and posttest (0.076) had significant values larger than 0.05. This shows that the data are regularly distributed, which satisfies the normality assumption and permits the application of parametric tests for additional investigation.

Hypothesis Testing (Paired Sample t-Test)

After confirming that the data was normally distributed, the study proceeded with a paired sample t-test to ascertain whether there was a significant difference between the pretest and posttest average scores for students' critical thinking abilities.

Table 5. Results of Paired Sample t-Test

	Paired Differences					t	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 pretest posttest	-8.148	13.598	2.617	-13.527	-2.769	-3.114	26	.004

The above table's paired sample t-test results show that the Sig. (2-tailed) value is $0.004 < 0.05$. This implies that there is a substantial difference between the students' pretest and posttest scores. As a result, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_a) is accepted. These results verify that students' learning outcomes significantly improved after receiving the treatment. The posttest score rose to 65.18, which is 8.15 points higher than the starting score. Additionally, a rise in scores from the pretest to the posttest is shown by the average difference of -8.148. Thus, it can be said that the pupils' abilities improved significantly as a result of the treatment. These findings demonstrate how students'

comprehension and critical thinking abilities when learning Indonesian can be enhanced by using the Word of Wonders (WoW) game.

Discussion

This study was conducted at SD Muhammadiyah 1 Surakarta with the aim of determining the effectiveness of using Word of Wonders (WoW) learning media in improving the learning outcomes and critical thinking skills of third-grade students in Indonesian language learning. Thus, the research results obtained were then interpreted by relating them to the research objectives, relevant educational theories, and previous research findings to see their suitability, differences, and contributions in the field of digital media-based education studies.

1. Effectiveness of Word of Wonders on Improving Learning Outcomes

The results of the study show an increase in scores from 57.03 on the pretest to 65.18 on the posttest with a significance of 0.004, so it can be concluded that Word of Wonders (WoW) media has a positive impact on improving student learning outcomes. This interpretation means that playing Word of Wonders (WoW) helps students understand Indonesian language concepts, especially in recognizing words, language structures, and sentence contexts better. This proves that games not only serve as a means of entertainment but can also be an effective learning tool. Theoretically, game-based learning theory states that game media can encourage conceptual understanding through elements of challenge, repetition, and structured visualization ([Rahman, 2021](#)). Additional research by [Dewi et al. \(2020\)](#) and [Perdinna et al. \(2020\)](#) shows that problem-based learning and educational games that require students to evaluate, make hypotheses, and find logical answers can improve critical thinking skills. These elements facilitate learning experiences that allow students to independently review concepts and retain information longer in their long-term memory. Furthermore, based on Piaget and Bruner's constructivist theory, students learn better when they are directly involved in challenging learning experiences that encourage active interaction with the material, rather than just receiving verbal information. This can help individuals solve problems more effectively by enabling them to identify problems, analyze their causes, and develop creative solutions [Mustofiyah et al. \(2024\)](#). Thus, Word of Wonders can be used as an innovative learning medium that encourages students to become active, reflective learners who are adaptable to developments in modern educational technology.

This study is reinforced by [Putra et al. \(2022\)](#), who proved that WoW effectively improves the vocabulary of elementary school students. These results are also in line with the research by [Haslinda et al. \(2025\)](#), which shows that crossword puzzles improve students' reading and language comprehension skills through logical thinking stimulation. However, this study makes a broader contribution because it measures not only vocabulary, but overall Indonesian language learning outcomes, including understanding of meaning, relationships between words, and the application of words in context. Thus, these findings reinforce the argument that digital game-based media can be a strategic alternative for improving the academic achievement of elementary school students.

2. The Impact of Word of Wonders in Developing Critical Thinking Skills

In addition to improving learning outcomes, the findings also show that the use of WoW has an effect on the development of students' critical thinking skills. Activities such as arranging words from random letters, analyzing possible answers, comparing alternative words, and choosing the most logical answer are a series of higher-order thinking processes. This shows that WoW is not just a mechanical game, but involves the activation of complex cognitive functions related to reasoning and problem solving. Theoretically, critical thinking skills are part of Higher Order Thinking Skills (HOTS), which consist of the ability to analyze, evaluate information, and draw logical conclusions ([Ihwan & Rusnilawati, 2025](#)). In the context of 21st-century learning, this ability is important because it enables students to process information independently, verify the truth, and develop insights reflectively and logically. The results of this study are also consistent with the meta-analysis by [Iskandar & Prastowo \(2022\)](#), which shows that digital game-based media has a significant influence on the development of critical thinking skills in elementary school students.

The research by [Afifah et al. \(2019\)](#) reinforces this finding by stating that challenge-based and exploration-based learning allows students to practice thinking systematically and strategically. These findings support the view of Aini et al. (2022), who explain that critical thinking is a higher-order cognitive reasoning skill that involves analyzing, evaluating, and making decisions based on reasoning and rational evidence. What distinguishes this study is the application of WoW to lower grade students, thus providing a new contribution that critical thinking skills can be developed earlier through technological media that is appropriate for the students' level of development. Thus, WoW not only has an academic impact but also on the development of essential thinking skills for students in the digital age.

3. The Effect of Word of Wonders on Student Motivation and Engagement

In addition to its academic impact, this study also shows that WoW increases student motivation and engagement during the learning process. Observations show that students appear more enthusiastic, participate actively, and show a high level of curiosity to complete challenges in the game. This indicates a transformation in the dynamics of learning from a previously passive nature to a more participatory and interactive one. Gamification theory explains that providing challenges, points, levels, and rewards in games can increase students' intrinsic motivation, so that they learn not only because of task demands, but also because of the desire to achieve targets ([Ghofur & Youhanita, 2020](#)). [Imran](#)

et al. (2024) also reported that digital media such as Wordwall can increase students' confidence and engagement in learning. Research by Aulia et al. (2024) added that the use of puzzle media in learning helps build positive social interactions between students through cooperation in problem solving. This shows that WoW not only has an impact on the cognitive domain but also on the affective and social domains of learning.

These findings answer the research question that the use of Word of Wonders contributes significantly to improving learning outcomes and critical thinking skills of elementary school students. These results indicate that WoW not only functions as a game but can also be used as an effective learning medium because it involves the processes of analysis, word exploration, and independent problem solving. Practically speaking, this study provides an alternative innovative learning solution that is in line with 21st-century learning needs, which emphasize active and student-centered learning. These findings are also supported by the results of Putra et al. (2022) research, which shows that the use of WoW can improve students' motivation and language skills. Thus, this study strengthens the empirical evidence that game-based digital media can be integrated into Indonesian language learning as a fun yet meaningful learning strategy.

Conclusion

The study's findings show that while primary school children are learning Indonesian, using the Word of Wonders (WoW) game-based learning resource might enhance their critical thinking abilities and academic performance. According to statistical studies that show a significant difference between pretest and posttest results, the use of interactive digital games can improve students' conceptual knowledge, analytical skills, and problem-solving ability. The use of Word of Wonders increases students' interest and engagement in class in addition to their cognitive abilities. In line with the constructivist learning concept, interactive game features allow students to engage, think critically, and collaborate with classmates. Theoretically, these findings support previous studies suggesting that game-based learning can promote the development of higher-order thinking skills (HOTS). In practice, WoW can be used as an innovative and cutting-edge educational tool that complements the Merdeka Curriculum by promoting enjoyable, relevant, and 21st-century skills-focused learning.

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