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DIAGNOSTIC ANALYSIS OF THE UTILIZATION OF WORDWALL MEDIA IN DEVELOPING CRITICAL THINKING ABILITIES IN ELEMENTARY SCHOOL MULTIPLICATION LEARNING

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Abstract
The lack of student participation in multiplication learning in elementary schools is still a challenge for educators. One approach that can be used to increase student engagement and understanding is gamification, which is the integration of game elements in the learning process. This study aims to explore the effectiveness of the use of Wordwall media in multiplication learning through a case study in grade III UPT SD Negeri 30 Gresik. The study highlights how the Multiplication Balloon Burst game can increase student engagement, as well as develop their critical thinking skills in solving math problems. This study uses a qualitative approach with a case study method, where data is collected through observation of classroom activities, interviews with teachers and students, and analysis of student participation during digital game-based learning. The results show that the use of Wordwall games significantly increases student motivation, creates a more interactive learning environment, and improves understanding of multiplication concepts. In addition, the findings indicate that the integration of gamification elements, such as the scoring system and in-game challenges, can encourage students to participate more actively and think critically in solving multiplication problems. This study concludes that the use of digital-based educational games in mathematics learning can be an effective alternative in improving student learning outcomes. Furthermore, the game also facilitates collaborative learning and assists students in developing critical thinking skills. Therefore, educators are advised to consider the application of gamification in their teaching strategies to improve student engagement as well as their learning outcomes in various other mathematical concepts.
Keywords: critical thinking; Multiplication; Wordwall

Abstrak
Kurangnya partisipasi siswa dalam pembelajaran perkalian di sekolah dasar masih menjadi tantangan bagi pendidik. Salah satu pendekatan yang dapat digunakan untuk meningkatkan keterlibatan dan pemahaman siswa adalah gamifikasi, yaitu integrasi elemen permainan dalam proses pembelajaran. Penelitian ini bertujuan untuk mengeksplorasi efektivitas penggunaan media *Wordwall* dalam pembelajaran perkalian melalui studi kasus di kelas III UPT SD Negeri 30 Gresik. Studi ini menyoroti bagaimana game *Pecah Balon Perkalian* dapat meningkatkan keterlibatan siswa, serta mengembangkan kemampuan berpikir kritis mereka dalam menyelesaikan permasalahan matematika. Penelitian ini menggunakan pendekatan kualitatif dengan metode studi kasus, di mana data dikumpulkan melalui observasi aktivitas kelas, wawancara dengan guru dan siswa, serta analisis partisipasi siswa selama pembelajaran berbasis game digital. Hasil penelitian menunjukkan bahwa penggunaan game *Wordwall* secara signifikan meningkatkan motivasi siswa, menciptakan lingkungan belajar yang lebih interaktif, serta memperbaiki pemahaman konsep perkalian. Selain itu, temuan penelitian mengindikasikan bahwa integrasi elemen gamifikasi, seperti sistem skor dan tantangan dalam game, dapat mendorong didik untuk lebih aktif berpartisipasi dan berpikir kritis dalam menyelesaikan soal perkalian.Studi ini menyimpulkan bahwa pemanfaatan game edukatif berbasis digital dalam pembelajaran matematika dapat menjadi alternatif efektif dalam meningkatkan hasil belajar siswa. Lebih lanjut, permainan ini juga memfasilitasi pembelajaran kolaboratif serta membantu siswa dalam mengembangkan keterampilan berpikir kritis. Oleh karena itu, pendidik disarankan untuk mempertimbangkan penerapan gamifikasi dalam strategi pengajaran mereka guna meningkatkan keterlibatan siswa serta hasil belajar mereka di berbagai konsep matematika lainnya.
Kata Kunci: Berpikir kritis; Perkalian; Wordwall

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Introduction

Critical thinking skills are one of the important competencies that need to be developed in elementary school students to face challenges in the era of globalization.(Budget, 2022). This ability includes the skills of analyzing, evaluating, and solving problems logically, which are highly relevant in a variety of subjects, including mathematics.(Janah, 2020). However, the facts on the ground show that student involvement in mathematics learning, especially in multiplication material, is still relatively low. Students tend to feel bored and less motivated because the learning methods used are often monotonous and based on memorization without facilitating in-depth exploration.

Critical thinking skills themselves are one of the competencies that are the focus of the Merdeka Belajar curriculum. This competency includes the ability to analyze, evaluate, and make decisions based on logical thinking (Kemendikbud, 2022). In mathematics learning, especially in multiplication material, critical thinking helps students understand the relationship between numbers, recognize patterns, and find creative solutions to solve problems.(Afifah & Kusuma, 2021). However, this ability will not develop optimally without the support of relevant and challenging learning media.

One of the innovative learning media that can be used to increase student engagement is Wordwall, a digital platform that allows teachers to create various interactive educational games.(Arimbawa, 2021). This media not only attracts students' attention, but also provides space to develop critical thinking skills through activities such as solving problems, identifying patterns, and developing strategies.(Sumilah et al., 2023). Although many studies have proven the effectiveness of Wordwall in increasing learning motivation, studies that specifically analyze the influence of this media on critical thinking skills in multiplication material at the elementary school level are still very limited. Therefore, this study aims to fill this gap by conducting an initial needs analysis of the use of Wordwall media in multiplication material in elementary schools. The research hypothesis proposed is that the application of Wordwall media can increase student engagement while helping to develop their critical thinking skills in understanding the concept of multiplication. This study is expected to provide a significant contribution to the development of more effective and enjoyable mathematics learning strategies.

Various studies show that low student involvement in mathematics learning can be caused by teaching methods that are less varied and not relevant to students' learning needs.(Nurul Marlita et al., 2024). This is a big challenge for teachers, especially in teaching material that requires deep conceptual understanding such as multiplication.(Wiryanto & Nabila, 2022). Monotonous learning tends to make students only memorize formulas without understanding basic concepts, so that their critical thinking skills are not honed properly.(Syafmen, 2013). In this context, the development of interactive and interesting learning media becomes an urgent need to overcome these problems.

Digital learning media, such as Wordwall, have great potential to increase student engagement in learning. According to research conducted by Nurjanah and Anwari (2021), the use of interactive digital media can increase student learning motivation while providing a more

Jurnal Cakrawala Pendas Vol. 11, No. 1, January 2025, p. 211-225

enjoyable learning experience.(Anggriany & Rakhmawati, 2024). Wordwall Media offers a variety of educational game features, such as puzzles, quizzes, and matching games, designed to actively engage students.(Sumilah et al., 2023). Thus, this media can create a more dynamic learning environment and support the development of students' critical thinking skills.

One of the gaps found in the literature is the lack of research that specifically explores the influence of Wordwall media on elementary school students' critical thinking skills in multiplication material. Most previous studies have only focused on aspects of learning motivation or general learning outcomes (Pratiwi, 2021). In fact, critical thinking skills are an important indicator in assessing learning success, especially in facing the challenges of the digital era that demand high-level thinking skills.(Mas'ulah, 2014).

This study aims to address the gap by conducting an initial needs analysis of the use of Wordwall media in multiplication learning in elementary schools. With a needs-based approach, this study will identify the extent to which Wordwall media can support the development of students' critical thinking skills. It is hoped that the results of this study will not only provide practical recommendations for teachers, but also become the basis for further research related to the development of technology-based learning media.

Research Methods

This research was conducted in Class III of UPT SD Negeri 30 Gresik, East Java on October 2, 2024. Qualitative descriptive research was used in this study, to explain the meaning of a phenomenon in the form of text, images, sound, or non-numerical data which was then analyzed. (Niam, MF, Rumahlewang, E., et al., 2024). Students in the class that were the subjects of this study were class III of UPT SD Negeri 30 Gresik consisting of 18 male students and 16 female students. The purpose of this study was to determine how the use of the Pecah Balon online game as a medium to help students learn mathematics. This study collected data through observation and interviews. Learning activities related to the use of online game learning media in mathematics learning were observed directly through observation. While interviews were used to collect data on the use of the Pecah Balon online game as a medium for learning mathematics. Furthermore, data from observations and interviews were analyzed to provide an overview of the use of online games in mathematics learning. The researchers used methods to analyze qualitative data.(Wajdi et al., 2024).

For data collection, the researcher first conducted observations of the learning activities of class III of UPT SD Negeri 30 Gresik, regarding the use of learning media.The researcher also observed how students' learning activities occurred during mathematics learning. The researcher also conducted interviews with class teachers and students regarding the learning media used in implementing mathematics learning activities in class III UPT SD Negeri 30 Gresik. This study used structured interviews. The researcher followed the question indicators that had been systematically arranged as a guideline.

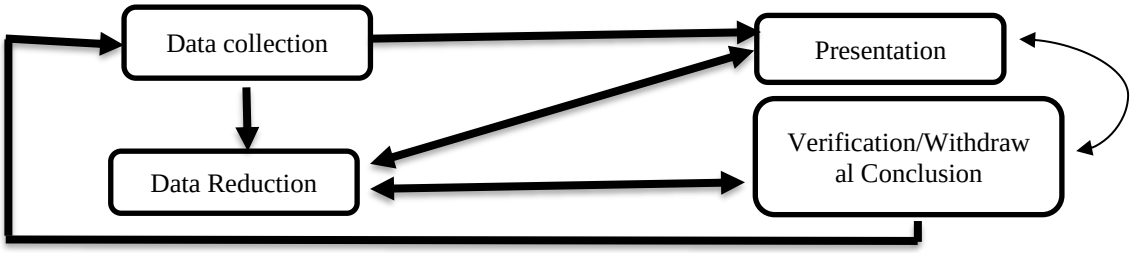

Figure 1. Shows the first step in the data analysis of the Miles and Hubermen model.

Based on the research flow shown in the figure, the approach used in the qualitative data analysis model from Miles and Huberman (1994), which consists of the stages of data collection, data reduction (data reduction), data presentation (presentation), and drawing conclusions/verification. The following are the steps taken at each stage in this study:

Data collection. The steps are collecting data through observations of classroom activities when students use Wordwall media in multiplication learning. Second, conducting interviews with teachers to understand their experiences in implementing this media and its impact on student engagement. Third, conducting interviews with students to find out their experiences in using the Pebur Balon Perkalian game and how it affects their understanding of multiplication concepts. Fourth, analyzing documents or learning notes related to the implementation of gamification in the classroom.

Data Reduction (Data Reduction). The steps are sorting the collected data based on relevance to the **research** objectives. Second, eliminating irrelevant or redundant data so that the analysis is more focused. Second, categorizing the data into main themes, such as student engagement, understanding of multiplication concepts, and the influence of gamification on critical thinking.

Data Presentation (Presentation)

The steps are to organize the data in the form of descriptive narratives, tables, and diagrams to facilitate analysis. Second, connecting the findings with related theories, such as gamification theory in education and critical thinking theory. Third, identifying patterns or trends that emerge from the categorized data.

Drawing Conclusions and Verification

The steps are to compile conclusions from the results of the analysis that has been carried out, focusing on the effectiveness of using Wordwall media on student engagement and critical thinking. Second, triangulating data by comparing the results of interviews, observations, and documents to ensure the validity of the findings. Third, verifying the conclusions by confirming the findings with teachers and students to ensure that the research results reflect the actual conditions.

The researcher conducted the research at UPT SD Negeri 30 Gresik as the research location to reduce the amount of data collected. Then, the researcher used the findings to draw conclusions. Data reduction was carried out to conduct data analysis. This process begins with understanding the data collected from sources and observations, carried out by collecting, directing, and summarizing key data with a focus on the research area. At this stage, the researcher sorts the data to increase their focus. about the integration of the Pecah Balon online game as a learning activity and mathematics learning media for students in schools.

The next step of this research is data dissemination. The results of data acquisition about the online game Pecah Balon are used as a learning tool to improve student learning activities. The results will be presented in the form of narrative or descriptive text. In presenting data, to clarify the description of the data, therefore it can be presented through data visualization, which includes images and tables. Based on the data, which is collected and analyzed, then interpreted with the main purpose of the results of this study is from interviews and observations about how learning media is used for student learning activities. The point is that the data collected is easy to draw conclusions.

Table 1. Shows the question text used, with respondents being grade III teachers.

Question	Objective
How do you usually teach multiplication material to students?	Knowing the methods or approaches commonly used in learning multiplication
What are the obstacles you often face when teaching multiplication?	Identifying challenges that impact student engagement

Jurnal Cakrawala Pendas Vol. 11, No. 1, January 2025, p. 211-225

In your opinion, to what extent do students show involvement and enthusiasm during mathematics learning, especially in multiplication material?	Get an idea of the level of student engagement
Have you ever used interactive digital media such as Wordwall in learning? If yes, how was your experience? If not, what are the reasons?	Assessing teachers' experience or openness to Wordwall media
In your opinion, how can media such as Wordwall help students understand multiplication material while developing their critical thinking skills?	Knowing teachers' perceptions of the potential of interactive media in supporting learning
What criteria do you think are important for assessing students' critical thinking skills in multiplication material?	Identifying relevant critical thinking indicators in the context of mathematics learning

Based on the table above, an observation rubric can be compiled for student involvement and critical thinking skills as follows:

Table 2. Observation rubric

Aspect	Indicator	Score 1 (Low)	Score 2 (Medium)	Score 3 (High)
Student Engagement	Students show attention to the material presented.	Not focused and often daydreaming.	Focus part of the time.	Focus part of the time.
	Students actively ask or answer questions related to the material.	Neither asking nor answering.	Ask/answer questions occasionally.	Actively ask/answer consistently.
	Students are enthusiastic about using Wordwall media in learning.	Show no interest.	Interested but inconsistent.	Very enthusiastic and actively involved.
Critical thinking	Students are able to analyze patterns or relationships between numbers in multiplication.	Unable to recognize patterns..	Able to recognize simple patterns.	Able to recognize and explain complex patterns.
	Students can evaluate the answers or solutions given, either by themselves or others.	Does not provide evaluation.	Provide evaluations occasionally.	Consistently provide evaluations with logical explanations.
	Students demonstrate creativity in finding multiplication solutions (e.g., using alternative strategies).	Doesn't show any new strategy.	Using one alternative strategy.	Using several alternative strategies with explanations.

From the table above, it can be seen that the total score can be used to measure success with wordwall media, both in terms of student involvement and the development of critical thinking skills according to the scores obtained. In addition to conducting interviews with teachers, interviews with students are also needed, the following is the interview text:

Table 3. Interview text

Question	Objective
How do you feel when learning multiplication in class?	Exploring students' general impressions of mathematics learning
What difficulties do you often experience when learning multiplication?	Identifying obstacles experienced by students in understanding the material
What makes multiplication lessons interesting or boring?	Knowing the factors that influence students' learning motivation
Have you ever learned using games or interactive media like Wordwall? How was your experience?	Getting students' views on interactive media if they have ever used it
In your opinion, what could make learning multiplication more fun and easier to understand?	Identifying students' needs for more engaging learning.
How do you usually solve multiplication problems? Do you have a special strategy?	Assessing students' critical thinking patterns in solving multiplication problems

Based on the table above, an observation rubric can be compiled for student involvement and critical thinking skills as follows:

Table 4. Observation rubric with students

Aspect	Indicator	Score 1 (Low)	Score 2 (Medium)	Score 3 (High)
Student Transparency	Students provide honest and open answers to interview questions.	Answers are very short or unclear.	The answer is quite open but lacks detail.	The answers are very open and detailed.
Understanding the Material	Students are able to explain the difficulties they experience regarding multiplication material.	Unable to identify difficulties.	Identifying some common difficulties.	Identify specific difficulties with logical reasoning.
Motivation to learn	Students convey factors that influence their motivation to learn multiplication material.	Unable to name factors.	Mention 1–2 common factors.	Mention some factors with real examples.
Learning Experience	Students are able to explain their experiences related to the use of learning media such as Wordwall.	No experience or not explaining clearly.	Mentioning experiences in general.	Provides a detailed explanation of the experience and its impact.
Problem Solving Strategy	Students can explain their strategies in solving multiplication problems.	Having no strategy or being very passive.	Using a simple strategy.	Using creative or logical strategies with detailed explanations.
Ideas or Suggestions	Students provide ideas or suggestions to make multiplication learning more interesting.	Does not provide ideas or suggestions.	Provides simple ideas but is not specific.	Provides concrete and creative ideas with logical explanations.

Jurnal Cakrawala Pendas Vol. 11, No. 1, January 2025, p. 211-225

From the table above, we can calculate the scores obtained by students, then group them based on the following criteria:

Table 5. scores of interview results with teachers and students

Score	Interpretation
1–6 (Low)	Students are less open or have limited insight regarding multiplication learning.
7–12 (Moderate)	Students have a basic understanding and can provide sufficient insight, although not yet in-depth.
13–18 (High)	Students demonstrate openness, deep understanding, and rich insights into multiplication learning.

In conclusion, at this stage the research data is evaluated to achieve good research results. Conclusions are made in the form of descriptions to obtain analysis results that are in accordance with field conditions. After the information is provided, qualitative data conclusions are drawn in narrative text by reviewing data reduction and delivery. These steps are taken to ensure that the conclusions produced are accurate and in accordance with the data analyzed, including the use of the Pecah Balon online game as a learning tool and mathematics education activities for students in class III UPT SD Negeri 30 Gresik.

Results and Discussion

The use of learning media in mathematics learning is still monotonous. This is one of the problems in implementing learning activities because it easily causes boredom for students to follow the learning. Students are not enthusiastic, sometimes do not listen to the teacher's explanation. However, students are more interested in talking about something unimportant with their friends. This is what has an impact on students' learning efforts. From observation activities, the results of the initial learning activities of grade III students tend to be passive. This is shown in Table 6.

Table 6. Shows the results of initial observations of learning activities of class III students

Observation	Early Learning Activities
Active Students	16
Passive Students	18
% Active	47.05%
% Passive	52.94%

Of the 34 students, only 16 managed to actively participate in mathematics learning, according to Table 1. With a percentage of 47.05%, while the other 18 students did nothing with a percentage of 21.94 percent of students just kept quiet when the teacher asked, they thought the answer given was wrong. Students also often talk to their deskmates outside the context of the subject matter which results in inappropriate learning in class. Therefore, there needs to be

a new idea for learning methods. to increase student activity. When student activity decreases, the task of an educator is to revive the enthusiasm and learning activities of students. One approach that can be used is to use variation

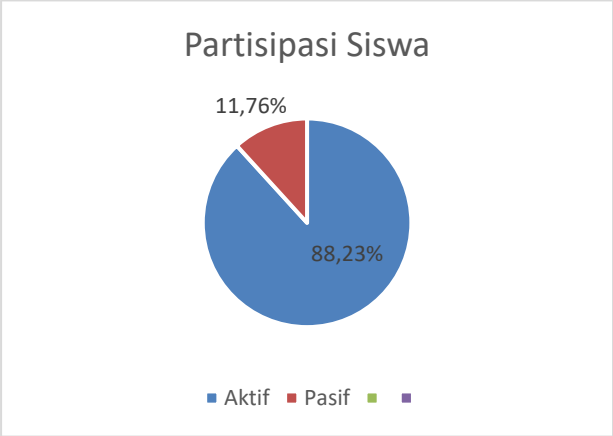

Figure 2. Student Participation Pie Chart After Using Balloon Popping Wordwall Game

Based on the Student Participation pie chart, it can be seen that the majority of students (88.23%) showed active participation in learning, while 11.76% of students were classified as passive. These results indicate that most students have good involvement in the learning process, but there are still a small number of students who are less active. To strengthen this claim, statistical analysis can be done by comparing data before and after the use of Wordwall media using the paired t-test or Wilcoxon test, depending on the distribution of the data. If the data before the intervention shows a lower level of active participation, then the percentage increase can be calculated using the following formula:

In addition, these results need to be further contextualized by considering various factors that may influence student participation. One factor that needs to be analyzed is students' readiness to use technology and their previous experience with digital-based learning media. Not all students have the same access to technology, so these differences in background can be a factor that influences their level of participation. In addition, individual learning style preferences can also influence the effectiveness of using Wordwall in increasing student participation.

Although the results show the dominance of active students, it is important to consider potential challenges and biases in this study. One challenge that may arise is the possibility of observer bias in measuring the level of student participation, especially if observations are conducted without objective measuring tools. Therefore, the use of a clear observation rubric will help reduce subjectivity in assessment. In addition, external factors such as the learning environment, availability of digital devices, and students' intrinsic motivation also need to be further analyzed to obtain a more comprehensive picture.

A deeper analysis can also be done by looking at the relationship between student participation and their critical thinking skills. If data on students' critical thinking skills have been collected, then a correlation test can be used to determine whether there is a significant relationship between student involvement in multiplication learning and the development of their critical thinking skills. Thus, this study not only highlights the participation rate, but also provides broader insight into the effectiveness of using Wordwall media in supporting mathematics learning in elementary schools.

Jurnal Cakrawala Pendas Vol. 11, No. 1, January 2025, p. 211-225

Here's a look at the balloon burst wordwall

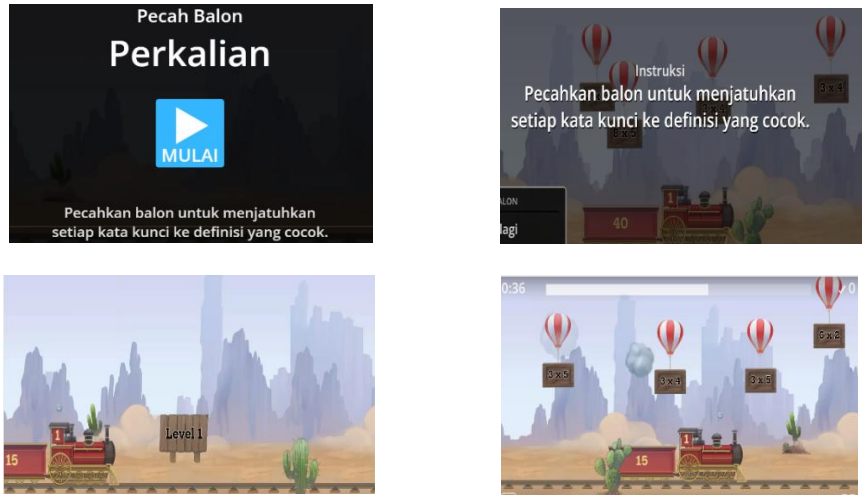

Figure 3. Online Learning Media Game Exploding Balloons

Based on Figure 1, the appearance of the online balloon bursting game is colorful, attractive templates. Each game has different images and versions, encouraging students to learn. As expressed by BLN, MHF, and KPT through interview results, the appearance is attractive like games in general. In addition, this online balloon bursting game has various levels of questions. The next level, To make learning not boring, there is a sound or voice that accompanies it and an attractive color display. As shown by this display, students see the questions in the game as if they were common puzzle questions in the game, so that students feel brave and confident to try to answer questions during the game.

Documentation during learning activities using Balloon Burst Wordwall media.

Figure 4. Students carry out learning using word walls

Based on Figure 2, it can be seen that students are enthusiastic when participating in learning about the basic concept of multiplication using a digital wordwall application with a balloon bursting template, all children are given the opportunity to try this game, if they succeed in their mission they feel happy, expressing their happiness by shouting happily. Activities that involve physical manipulation improve understanding of numbers and provide direct experience that improves understanding of the concept of counting.(Putri et al., 2024)

Online hacking game media is used by teachers during mathematics learning for grade III at UPT SD Negeri 30 Gresik. Teachers first prepare teaching materials which are then applied in the form of media or teaching aids when carrying out learning activities. Teachers do not forget to choose the right learning syntax. In addition, teachers also observe student learning activities using online hacking games during learning.

The following are the steps of learning activities carried out by Table 3 which shows information about teachers and students.

Table 7. Mathematics Learning Activities for Grade III Students of UPT SD Negeri 30 Gresik

Learning Activities	Teacher Activities	Student Activities
Preliminary Activities	1. The teacher greets the students and checks their attendance and says a prayer at the beginning of the lesson. 2. The teacher gives motivation to students, 3. Providing apperception about learning 4. The teacher explains the learning objectives.	1. Students greet each other and pray before the lesson begins. 2. Students prepare themselves to take lessons. 3. Students listen to the teacher's instructions. 4. Students provide answers to the initial questions. 5. Students pay attention to the learning objectives they want to achieve.
Core activities	1. The teacher provides information about the learning material. 2. The teacher divides students into groups based on their learning styles. 3. Guiding discussion activities 4. The teacher invites students to take part in an exciting game using the online game media of exploding balloons.	1. Students pay attention to the explanation of the learning material 2. Students form and sit together with their groups. 3. Students hold discussions with their respective groups 4. Students ask questions about things they don't understand yet. 5. Students participate using online game media in mathematics learning by taking turns between groups to move forward.
Closing Activities	1. The teacher gives evaluation questions as training to be completed math problems related to multiplication 2. The teacher gives confirmation regarding this chapter. 3. The teacher ends the lesson with prayer and greetings.	1. Students complete the evaluation questions one by one. 2. Students conclude and reflect on the learning material by answering questions given by the teacher which are only intended to guide and explore understanding. 3. Students perform a final prayer at the end of the lesson and say hello.

Based on Table 3, learning is more student-centered. Students are very enthusiastic and actively involved in using online hacking games in answering several quizzes in it. Each teacher and student has an active role in implementing learning based on the learning syntax that has been designed. This makes the atmosphere of learning activities in the classroom fun because students' curiosity to try and enthusiasm for playing while learning is high.

Students do fun games after doing group discussion and presentation activities. Students try to answer game questions in turns online bursting balloons until all groups get a part to play and try it. In starting the teacher opens a quiz in the online bursting balloon game by simply clicking the Start button, the game will start. Students are also active and very involved in answering math questions. The use of online media for this balloon bursting game is able to support student learning activities so that it can support student learning outcomes. In addition,

the use of online learning media that bursts balloons makes students more active in learning, asking questions when faced with difficult questions to answer, especially in learning mathematics, and students are active in enthusiastically playing games.

The Need to Use Wordwall Media to Improve Critical Thinking in Multiplication Learning.

Based on the results of observations and interviews conducted in class III of UPT SD Negeri 30 Gresik, it was found that most students still have difficulty in understanding the basic concepts of multiplication. This can be seen from the low level of student participation in class discussions and their low ability to solve multiplication problems without assistance. In addition, the results of observations show that conventional learning methods, such as lectures and exercises on the board, make students less interested and tend to be passive in participating in learning. Data collected from observations show that 88.23% of students showed active involvement, while 11.76% of students were still passive in learning. Although the majority of students were active, this involvement occurred more in students who had a stronger understanding of mathematics, while students who had difficulty in multiplication tended to be more passive. This shows the need for more interactive and interesting learning methods, so that all students, including those who had difficulties, could be optimally involved in learning.

From interviews with teachers, it was revealed that many students only memorized the results of multiplication without really understanding the concept. Teachers also stated that students often had difficulty solving multiplication problems in the form of stories or problems that required deeper understanding. This indicates that students' critical thinking skills in mathematics still need to be improved, especially in recognizing multiplication patterns, connecting number concepts, and developing problem-solving strategies independently.

In response to this problem, Wordwall media was chosen as an alternative learning method that can increase student engagement and develop their critical thinking skills in understanding the concept of multiplication. The use of game-based media is believed to be able to overcome student boredom with conventional learning methods and provide a more enjoyable and challenging learning experience.

The Effectiveness of Wordwall in Enhancing Students' Engagement and Critical Thinking

After the implementation of the Wordwall media with the Pebur Balon Perkalian game, further observations were conducted to assess changes in student engagement in learning. The results showed that students were more enthusiastic, actively asked questions, and were quicker in understanding multiplication patterns compared to the previous method. In addition, students who were previously passive in learning began to show an increase in their participation, both in answering teacher questions and in group discussions. Teachers who observed the learning process also reported positive changes in student behavior. Before the use of Wordwall, students tended to be passive, waiting for answers from friends or just memorizing multiplication tables. However, after being introduced to the interactive game, students were more motivated to find multiplication patterns independently. They began to develop more creative problem-solving strategies, for example by looking for relationships between numbers in multiplication or using alternative ways to find more complex multiplication results.

Here are some aspects of critical thinking that developed after the implementation of Wordwall: Analytical skills, namely students are better able to recognize number patterns in multiplication and distinguish the most effective strategies for finding answers. Second, making conclusions, namely students can develop strategies for solving multiplication problems based

on the patterns they have found. Third, comparing information, namely students understand the relationship between numbers in multiplication and are able to explain the differences between various ways of solving problems. Fourth, expressing opinions, namely students are more confident in explaining their answers and dare to ask questions to teachers and classmates. Fifth, solving problems, namely students develop more varied problem-solving strategies, such as using fast multiplication methods or estimating results before doing direct calculations.

The results of interviews with students also showed that they felt happier learning mathematics with a gamification approach. One student said that the Pebur Balon Perkalian game made them more enthusiastic about learning because there were elements of challenges, scores, and virtual prizes that made learning feel like a fun game.

Challenges in Implementing Wordwall as Learning Media

Although the results of the study indicate that the use of Wordwall has a positive impact on student engagement and critical thinking, there are several challenges in its implementation. These challenges include: Limited access to technological devices, where not all students have access to digital devices at home, so they cannot repeat the exercises independently after learning at school. Second, the diverse digital capabilities of teachers, where some teachers still feel less familiar with technology and need additional training to maximize the use of Wordwall in learning. Third, limited time in learning, because digital-based games require additional time to prepare and integrate them with the existing curriculum.

However, these challenges can be overcome with the following strategies: Alternating use of school devices, so that all students can still participate in technology-based learning. Second, Training for teachers on educational technology, so that they can optimize the use of Wordwall media in the classroom. Third, Integrating Wordwall with conventional learning methods, so that the use of digital media remains effective without disrupting the allocation of other learning time.

Implications of Using Wordwall Media on Mathematics Learning

Based on the research results, Wordwall media has proven to be an effective alternative in increasing student engagement and developing their critical thinking skills in learning multiplication. With a gamification-based approach, students not only memorize multiplication, but also understand the basic concepts and solving strategies better.

More broadly, the results of this study support the idea that educational technology has an important role in improving the effectiveness of mathematics learning. This finding is also in line with the research of Sailer & Homner (2020) which states that gamification in education can increase motivation, engagement, and conceptual understanding in students. Therefore, the use of interactive media such as Wordwall can be an innovative strategy for educators in improving student learning outcomes, especially in mathematics subjects.

As a recommendation for further research, further exploration needs to be carried out regarding the impact of using Wordwall in the long term, as well as how this media can be adapted for other materials in the elementary school curriculum. Apart from that, there needs to be a more in-depth study regarding the influence of gamification media on students' cognitive and affective aspects, so that the benefits can be applied in a wider learning context.

Conclusion

Based on the results of the analysis, it can be concluded that the use of Wordwall media in elementary school multiplication learning has great potential in increasing student participation. As an actionable recommendation, educators can implement gamification

learning strategies with a more varied and inclusive approach. First, educators can combine Wordwall with other methods, such as group discussions or project-based games, so that students with various learning styles can still be optimally engaged. Second, educators should ensure that all students have adequate access to technology and understand how to use digital media effectively. If access to technology is a constraint, then the use of non-digital-based gamification, such as interactive card or board games, can be an interesting alternative.Third, to increase the effectiveness of gamification in learning, educators need to adjust the difficulty level of the game according to the students' abilities so that it remains challenging but not too difficult. Fourth, it is important for educators to periodically evaluate the effectiveness of the use of gamification media, either through observation, interviews, or student reflection, to ensure that the methods applied really support the improvement of their critical thinking skills. By implementing these strategies, it is hoped that gamification-based learning can be applied more effectively in various educational contexts, not only in multiplication learning, but also in other subjects. These steps will help create a more interactive, fun, and meaningful learning environment for students, so that they can develop better critical thinking and problem-solving skills in the future.

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