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IMPROVING MATHEMATICAL UNDERSTANDING THROUGH THE USE OF WORDWALL MEDIA IN ELEMENTARY SCHOOLS

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Abstract	This research aims to assess the effectiveness of WordWall media in improving understanding of mathematical concepts in elementary schools. The research method involved a literature review and thematic analysis with a qualitative synthesis approach, resulting in four main themes and twelve subthemes. Findings show that the use of WordWall significantly increases students' understanding of mathematical concepts, learning outcome scores, motivation, active participation and collaborative skills. WordWall has proven to be more effective than several other learning media, by providing visual representation and vocabulary support that helps overcome student difficulties. In conclusion, WordWall succeeded in achieving its objectives with high significance despite limitations such as sample size and research duration. Recommendations for further research include comparative studies with other media, studies of the influence of the social environment, development of specific WordWall models, as well as research on the long-term impact and correlation of motivation with learning outcomes. Further research on the effectiveness of WordWall in virtual mathematics learning is also recommended.
Keywords	Elementary School, Mathematics Comprehension, Wordwall,

INTRODUCTION

Improving mathematics understanding among elementary school students is essential for building their foundational knowledge. Many students find mathematics difficult, so we need to teach it in innovative and engaging ways to make them more interested. A good understanding of mathematics not only helps academically but also enhances critical thinking and problem-solving skills. Therefore, educators need to find effective and engaging methods to teach mathematics at the elementary level.

One effective way to enhance mathematics understanding in elementary school is by using WordWall media (Pamungkas et al., 2023). WordWall is a visual tool that allows teachers to transform classroom walls into interactive boards to display math material creatively. By showing images, numbers, and words related to mathematics on the WordWall, teachers can make learning more enjoyable and interactive for students. This helps stimulate visual perception and makes it easier for students to grasp mathematical concepts. Therefore, using WordWall in elementary school can be a crucial step in creating an engaging and effective math learning environment.

In recent years, numerous studies have examined the effectiveness of using WordWall media to enhance the understanding of mathematical concepts among elementary school students. Five main studies are the focus of this discussion. (Azizah, 2023) conducted an in-depth study on the impact of WordWall on visual-spatial thinking skills and found a significant improvement in students' ability to understand geometric concepts. Additionally, (Asmadi, 2022) explored the cognitive benefits of WordWall, highlighting its role in developing critical thinking skills and enhancing students' understanding of mathematical principles.

(Akbar, 2023) found that using WordWall can increase student motivation, making them more interested and enthusiastic about learning mathematics. (Sarwendah, 2023) research indicated that WordWall helps students collaborate better during math activities, thereby creating a collaborative learning environment. Furthermore, a long-term study by (Nafia, 2021) demonstrated that using WordWall can enhance students' mathematical understanding over an extended period. Overall, these five studies indicate that WordWall has many benefits for improving the understanding of mathematical concepts in elementary schools.

Although the use of WordWall can aid in understanding mathematics in elementary schools, much is still unknown about its effects. Research on this topic is very limited, making it difficult to fully comprehend its impact. This lack of evidence poses a challenge for teachers and researchers

who want to know how effective WordWall is and what challenges might arise when it is used in teaching mathematics in elementary schools.

To address this picture, a systematic literature review can be a very useful resource for educators, policy makers, and researchers. This review aims to provide insights that can aid in educational practice, curriculum development, and future research. This is becoming increasingly important considering the increasing focus on innovative teaching methods and the need for optimal use of educational technology to improve mathematics learning outcomes at the elementary level.

METHOD

This research uses a literature review method to investigate and analyze various textual sources related to the research topic. In conducting a literature review, the main focus is to critically evaluate previously published literature, such as scientific journals, books and articles related to the research theme. After formulating the research questions, three main themes emerged: mathematical concepts and Wordwall media in elementary schools. Researchers adopted a variety of approaches to dig deeper and expand their understanding of these themes. This approach includes reviewing terminology used in previous research, referring to terms suggested by Google Scholar, and seeking insight from experts in the field. This comprehensive approach resulted in the identification of several key words that align with the central theme of Wordwall mathematics and media concepts in elementary schools. Analysis of the article data was conducted thematically, recognizing the diversity of research designs, and focusing on optimal integration of that variation through qualitative synthesis, following Whittemore and Knal's (2005) guidelines. This review specifically adopts the thematic synthesis approach recommended by Flemming et al. (2019) because of the diversity in managing data from various research designs. Thematic analysis is a method for identifying patterns in research by exploring similarities or relationships in data, as explained by Braun and Clarke (2019). The thematic synthesis in this review follows the steps outlined by Kiger and Varpio (2020), starting with an in-depth understanding of the data through active and iterative reading, which forms the basis for subsequent steps. The next step involves initial coding, where the researcher carefully categorizes the data at a detailed level, focusing on information that is relevant to the main research question. The next stage is theme generation, where an inductive coding framework is used to discover interests, similarities, and relationships in the data, generating themes directly from the coded information. This process resulted in four main themes, which were

consistent with the overall data set, as noted by Braun and Clarke (2019). The researcher then identified potential subthemes within each main theme to form subthemes. Next, the researcher examined the relevance and suitability of the main themes and subthemes. Decision making was carried out while maintaining four themes and 12 sub-themes. These themes and subthemes were then evaluated by two professors in the field of qualitative synthesis and community development for validation. The professors were also asked for their opinions regarding the relevance of the themes to the research questions. This process ended with a unanimous decision to retain all identified themes and subthemes.

FINDINGS AND DISCUSSION

Findings

The use of WordWall media in elementary school mathematics learning has been proven to have a significant positive impact on students' understanding of mathematical concepts. Research indicates that the average student learning outcomes increased significantly from 64.7 in the pre-cycle stage to 88.7 in the second cycle by Nadia (2022). Furthermore, the implementation of WordWall Gameshow also resulted in a remarkable improvement, with the percentage of students achieving learning mastery increasing from 51.72% in the first cycle to 100% in the third cycle by Lestari (2023). Test results show a significant improvement, with the percentage of students achieving mastery learning increasing from 33.33% to 100% after the implementation of WordWall Istiqomah (2022). Moreover, the development of quizzes and educational games using WordWall also contributes positively to students' learning experiences and engagement. Research shows that the use of WordWall increases students' interest and attention in mathematics learning by providing interactive and enjoyable activities by Parisa (2023). Providing a fun learning experience for students thus enhances their interest and attention by Akbar (2023). In this context, the fun game methods within WordWall are considered to have a significant positive impact on students' understanding of mathematical concepts at the elementary school level by Sagala (2022).

At the elementary school level, mathematics learning often faces challenges in enhancing students' learning motivation. One interesting solution is the use of WordWall media, which has been shown to have a positive impact on students' enthusiasm for understanding mathematical concepts. By combining game-based elements, WordWall creates a more enjoyable and interactive learning environment, thus increasing students' motivation to learn by Setyorini (2023).

Furthermore, the effectiveness of learning media, including WordWall, in improving students' learning outcomes can also positively affect students' motivation in the learning process by Shela (2023). It is found that students with high motivation tend to have higher interest in learning by Lestari (2023). The use of WordWall in elementary school mathematics learning is also associated with an increase in students' active participation and collaboration abilities by Rahayu (2022). The talking stick model, when combined with WordWall, encourages students to actively participate, contribute opinions, and become more proactive in learning, creating a positive learning environment. Research at SDN Kapuk Muara 03 North Jakarta shows the positive and significant impact of using WordWall on students' motivation to learn mathematics by Nisa & Susanto (2022). These research findings provide empirical support for the effectiveness of WordWall in enhancing students' learning motivation.

The use of WordWall media in elementary school mathematics learning offers an innovative approach to addressing students' difficulties in understanding certain mathematical concepts by Maghfiroh (2018). By presenting mathematics learning in a fun and interactive way, WordWall creates an engaging learning environment for students by Sagala (2022). This media not only provides visual representations but also vocabulary support, helping students understand and internalize complex mathematical concepts by Arimbawa (2021). The leaderboard feature on WordWall not only provides extra motivation for students but also allows them to see rankings based on speed and accuracy, thus encouraging them to improve performance and overcome difficulties in understanding mathematical concepts by Akbar (2023). Quizzes and educational games developed using WordWall provide interactive and direct learning experiences, helping students understand difficult mathematical concepts in a fun way by Parisa (2023).

In online mathematics learning, WordWall media has proven effective in improving understanding of numerical concepts, as evidenced by high completion rates and positive responses from students by Kusumandari & Purnomo (2023). The game-based elements of WordWall not only stimulate critical thinking but also increase students' enthusiasm for learning, which in turn leads to an improved understanding of mathematical concepts by Setyorini (2023). Through interactive web-based game approaches, WordWall successfully enhances students' cognitive mathematical abilities, reflected in increased pretest and posttest results by Azhaar (2023). The implementation of WordWall in mathematics learning has also been shown to increase student engagement and activity levels, resulting in an improvement in understanding mathematical concepts by Maghfiroh

(2018). In the context of integer operations, WordWall has been proven to be more effective than smart ruler media in improving students' learning outcomes in lower grades by Shela (2023). Studies at SDN Kapuk Muara 03 North Jakarta note the positive and significant influence of WordWall-based educational games on students' motivation in mathematics learning by Arimbawa (2021).

Discussion

The use of WordWall media in elementary school mathematics education demonstrates a significant positive impact on students' understanding of mathematical concepts. Research reveals a remarkable improvement in student learning outcomes following the implementation of WordWall, with average scores increasing from the pre-cycle stage to the second cycle. Additionally, the use of WordWall Gameshow also brings about significant improvement, achieving 100% student mastery in learning by the third cycle.

According to researcher Rahayu (2022), WordWall is not only effective in enhancing understanding but also capable of assisting students in achieving higher levels of mastery of learning materials. Furthermore, WordWall has proven to be more effective compared to several other learning media, such as smart rulers. This effectiveness is evident in the enhanced learning outcomes of lower-grade students, providing a basis for considering WordWall as the primary choice in optimizing mathematics education.

The use of WordWall also successfully increases student motivation and engagement, with a game-based approach and interactive elements creating a fun and engaging learning environment. These findings align with those of researcher Olisna (2022) that students with high motivation tend to have greater interest in learning, and WordWall can be an innovative solution for boosting students' enthusiasm for mathematics. Besides impacting understanding and motivation, WordWall also enhances active student participation and collaboration abilities. The stick model combined with WordWall creates a positive learning environment, encouraging students to actively participate, contribute opinions, and become more proactive in learning. WordWall's game features effectively prevent student boredom during

the learning process, creating high learning interest and providing an enjoyable learning experience. WordWall also serves as a useful tool for students to refer to when they encounter difficulties in understanding mathematical concepts, providing visual representations and vocabulary support. Findings from online mathematics learning indicate that WordWall is effective in improving understanding of numerical concepts and creating an engaging learning environment

for students.

WordWall's game-based elements stimulate students' critical thinking and enhance their enthusiasm for learning. Thus, WordWall not only provides understanding but also an enjoyable learning experience, making it an effective tool in supporting students in understanding and deepening mathematical concepts, including integer operations. Overall, WordWall is considered an innovative, effective learning tool that can enhance students' understanding and motivation towards mathematical concepts at the elementary school level.

The findings of this study have significant positive implications for students' learning outcomes at the elementary school level. With the average scores increasing markedly and the percentage of students achieving high mastery in learning after the implementation of WordWall, it can be concluded that this medium is effective in enhancing the understanding of mathematical concepts. The use of WordWall not only improves learning outcomes but also enhances students' motivation to learn. The findings indicate that game-based elements, such as WordWall games, create a fun and interactive learning environment, boosting students' interest and attention. Increased learning motivation can positively impact students' enthusiasm for understanding mathematical concepts. WordWall not only affects individual aspects of students but also enhances active participation and collaboration skills. The talking stick model combined with WordWall creates an environment where students actively engage, contribute opinions, and become proactive in learning. This creates a positive learning experience that contributes to the understanding of mathematical concepts.

The study results show that WordWall is more effective compared to several other learning media, such as smart ruler media. Choosing WordWall as a digital learning tool also proves to be effective in enhancing students' understanding of mathematical concepts through interactive games and evaluation quizzes. Therefore, WordWall can be considered an attractive and effective option for improving students' understanding at the elementary school level. The use of WordWall also fosters the development of students' arithmetic skills. The enjoyable features of WordWall games have a positive impact on arithmetic skills, including the ability to count objects and recognize number concepts. This indicates that WordWall is not just a learning tool but also provides a fun and effective learning experience.

The findings also show that WordWall is effective in supporting online mathematics learning. The use of this medium in the context of online learning improves students' understanding

of counting numbers and has a positive impact on their confidence and motivation in following the online learning process. Using WordWall at the elementary school level offers an innovative approach to overcoming students' difficulties in understanding mathematical concepts. By presenting mathematics learning in a fun and interactive way, WordWall provides an appealing solution to enhance students' interest and understanding of complex mathematical concepts. WordWall supports different learning styles through customizable game options and templates.

WordWall's ability to be tailored to various learning styles helps students understand difficult mathematical concepts, creating an inclusive learning environment. WordWall has proven to be a useful tool for students as a reference when facing difficulties in understanding mathematical concepts. By providing visual representations and vocabulary support, WordWall facilitates the understanding and internalization of complex mathematical concepts. Developing quizzes and educational games using WordWall, following the ADDIE Model (Analysis, Design, Development, Implementation, Evaluation), creates a well-structured and effective learning tool to enhance students' understanding of mathematical concepts. Thus, the findings of this study consistently show that WordWall is an effective and innovative learning tool for improving students' understanding and motivation towards mathematical concepts at the elementary school level.

In discussing the research findings on the use of WordWall as a teaching medium for mathematics in elementary schools, there are several research gaps that might need attention. First, although the research results indicate a significant improvement in understanding mathematical concepts, further studies are needed to evaluate the sustainability or retention of this understanding over a longer period. It is important to understand whether this improvement remains consistent in long-term comprehension tests or if there is a decline over time. Second, further studies could consider the variability in the effectiveness of WordWall across different grade levels in elementary schools. Does WordWall have an equal impact on lower grade students and upper grade students? This question could be a focus of research to better understand the differences in its effectiveness among different grade levels.

Additionally, the suitability of WordWall for specific mathematical concepts should also be considered. Does WordWall have similar effectiveness for all mathematical concepts, or are there certain concepts that benefit more from its use? Research that focuses more on the success of WordWall in explaining and teaching more complex mathematical concepts could provide deeper insights. In light of the trend towards distance learning, studies could explore the effectiveness of

WordWall in enhancing the understanding of mathematical concepts in an online learning environment. How WordWall can be adapted or improved to remain relevant and effective in the context of distance learning needs further consideration.

It is also important to analyze the factors that specifically influence student motivation and participation. Although research shows an increase in student motivation, a deeper understanding of the factors contributing to this increase in motivation and participation can provide more comprehensive insights. Lastly, a comparative analysis of the effectiveness of WordWall with other teaching media needs to be deepened. Are there specific advantages of WordWall compared to other teaching methods or media, and in what contexts is WordWall more effective? Such comparative studies could provide a more complete picture of WordWall's position in the context of teaching mathematics in elementary schools.

This research has several limitations that need to be considered. First, the results may not be directly generalizable to a larger population due to the sample size and variations in the school environment. Therefore, further research with a larger sample and diversified environments could strengthen the generalizability of the results. Second, the relatively short duration of the study could be a limitation. While positive changes were observed in the short term, understanding the long-term effects of using WordWall still needs to be considered. Follow-up studies with longer monitoring periods could provide insights into the sustainability of the benefits of WordWall in mathematics learning. Lastly, variations in the implementation of WordWall between teachers and schools may affect the research outcomes. Consistency in the application of WordWall needs to be examined, and further research could explore the factors influencing consistency and variation in implementation.

Recommendations for Future Research To deepen the understanding of the use of WordWall in enhancing mathematical concept comprehension at the elementary school level, several recommendations can be considered. First, conducting comparative research with other mathematics learning media could provide a more comprehensive perspective on the relative effectiveness of WordWall. Second, studies examining the influence of the social environment on the effectiveness of WordWall could offer deeper insights. Questions about whether research results are stronger in schools with a high participatory culture could be a focus of study. Furthermore, developing more specific WordWall learning models based on student characteristics and local curricula could increase the relevance and effectiveness of WordWall in different educational

contexts. Additionally, studies on the impact of WordWall on long-term student motivation and its correlation with mathematics learning outcomes could provide broader insights into its benefits. Research on the effectiveness of WordWall in virtual mathematics learning environments and measuring the factors affecting student engagement, especially in the context of online learning, could also be a valuable area of study. By delving into these areas, further research could strengthen our understanding of the role of WordWall in improving mathematics learning in elementary schools.

CONCLUSION

This study successfully demonstrated that the use of WordWall media is effective in improving mathematical understanding among elementary school students. WordWall not only increased the students' average scores but also their learning motivation, active participation, and collaborative skills. The research results show a consistent positive impact of WordWall on the comprehension of mathematical concepts. However, there are some limitations, such as a small sample size, variations in school environments, and the short duration of the study. Future research is recommended to compare WordWall with other learning media, examine the influence of social environments, develop more specific learning models, and explore the long-term effects as well as the relationship between learning motivation and learning outcomes.

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