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OPTIMIZATION OF SCIENCE LEARNING ON THE WATER CYCLE MATERIAL USING WORDWALL IN ELEMENTARY SCHOOLS

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Abstract

This study aims to optimize the learning of Natural and Social Sciences (IPAS), particularly on the topic of the water cycle, through the use of a digital learning medium, namely Wordwall, in elementary schools. The background of this research is based on the low level of students' interest and understanding of the water cycle concept, which tends to be abstract when delivered through conventional methods. This study employed a quantitative approach with a simple experimental design (pretest-posttest). The research subjects were elementary school students participating in IPAS learning. Data collection techniques included learning outcome tests, observations, and documentation. The results showed that the use of Wordwall significantly improved students' learning outcomes, as indicated by the increase in average scores from pretest to posttest. In addition, this medium enhanced students' engagement and motivation due to its interactive, attractive, and user-friendly features. Therefore, Wordwall can be considered an effective alternative learning medium to optimize IPAS learning, especially on the topic of the water cycle in elementary schools.

Keywords: learning optimization; IPAS; water cycle; Wordwall; elementary school.

Abstrak

Penelitian ini bertujuan untuk mengoptimalkan pembelajaran Ilmu Pengetahuan Alam dan Sosial (IPAS) pada materi siklus air melalui pemanfaatan media pembelajaran berbasis digital, yaitu Wordwall, di sekolah dasar. Latar belakang penelitian ini didasari oleh rendahnya minat belajar dan pemahaman siswa terhadap konsep siklus air yang cenderung abstrak jika disampaikan secara konvensional. Metode penelitian yang digunakan adalah pendekatan kuantitatif dengan desain eksperimen sederhana (pretest-posttest). Subjek penelitian adalah siswa sekolah dasar yang mengikuti pembelajaran IPAS. Teknik pengumpulan data dilakukan melalui tes hasil belajar, observasi, dan dokumentasi. Hasil penelitian menunjukkan bahwa penggunaan Wordwall mampu meningkatkan hasil belajar siswa secara signifikan, ditunjukkan dengan adanya peningkatan nilai rata-rata dari pretest ke posttest. Selain itu, media ini juga meningkatkan keterlibatan dan motivasi belajar siswa karena bersifat interaktif, menarik, dan mudah digunakan. Dengan demikian, Wordwall dapat menjadi alternatif media pembelajaran yang efektif dalam mengoptimalkan pembelajaran IPAS, khususnya pada materi siklus air di sekolah dasar.

Kata kunci: optimalisasi pembelajaran; IPAS; siklus air; wordwall; sekolah dasar.

INTRODUCTION

Current learning challenges in elementary schools still demonstrate a gap between expectations and reality. Various studies indicate that student learning outcomes in Natural and Social Sciences (IPAS) remain low, particularly in abstract subjects like the water cycle. These low learning outcomes are linked to a lack of student engagement in the learning process and the relatively conventional methods used by teachers. Lecture-dominated learning methods result in students being less active and acting solely as recipients of information. As a result, students struggle to grasp concepts that require visualization and a comprehensive understanding of processes.(Marlensi, 2024).

This problem is also evident in the more specific context of elementary schools, where limited use of instructional media is a major factor affecting the quality of learning. Teachers still rarely utilize technology-based learning media, which could help explain abstract concepts more concretely.(Ali et al., 2024). Furthermore, low student motivation and interest in learning are also indicators that ongoing learning is not fully effective. This demonstrates the urgent need for innovation in learning, particularly through the use of interactive, technology-based learning media.

Theoretically, effective learning is learning that actively engages students in the learning process. Constructivism theory states that knowledge is constructed by students through meaningful learning experiences. Therefore, learning focuses not only on delivering material but also on how students understand and construct that knowledge independently. In this context, the use of interactive learning media is crucial to support this knowledge construction process.

Furthermore, multimedia learning theory explains that the use of media that combines text, images, and animation can improve students' understanding of the material. This is due to the involvement of more than one sense in the learning process, making the information received easier to understand and remember. In science lessons, particularly in the water cycle, the use of visual media is essential to help students understand processes that cannot be directly observed.

One learning medium that aligns with these principles is Wordwall. Wordwall is a digital learning platform that provides various interactive activities such as quizzes and educational games. This medium integrates game elements into learning, thereby increasing student motivation and engagement. Using Wordwall allows learning to be presented in a more engaging and enjoyable format, preventing students from getting bored during the learning process.(Suseno et al., 2025).

However, while the theoretical advantages of using digital media like Wordwalls are numerous, their implementation in practice remains suboptimal. Many teachers have not yet utilized this medium to its full potential in their teaching. This is due to teachers' limited knowledge and skills in using technology, as well as a lack of supporting facilities such as devices and internet access. This situation demonstrates a gap between theory and practice in the use of technology-based learning media.

Previous research has shown that the use of interactive learning media can improve student learning outcomes. However, most of this research has been conducted on other subjects or at different levels of education. Research specifically examining the use of wordwalls in science learning, particularly on the water cycle in elementary schools, is still relatively limited. This indicates a research gap that requires further study.(Maria, 2025).

Furthermore, some research focuses solely on student learning outcomes without examining the aspects of student engagement and motivation in depth. In fact, engagement and motivation are crucial factors influencing learning success. Therefore, research that examines these three aspects simultaneously is crucial to provide a more comprehensive picture of the effectiveness of learning media use.

The relevance of this research is further strengthened by the curriculum's demands that teachers integrate technology into their learning. The curriculum emphasizes the importance of student-centered learning and the use of innovative and creative media. Therefore, the use of Wordwall as a learning medium is highly relevant for implementation in science lessons in elementary schools.(Arifin &

Fadillah, 2025).

Furthermore, the increasingly rapid development of digital technology also requires the education sector to adapt to these changes. Students, as part of the digital generation, require learning tailored to their characteristics. The use of digital-based learning media such as Wordwall is expected to meet this need, making learning more effective and relevant to current developments.

The significance of this research lies in its contribution to the development of more innovative and effective science and science learning. This research not only provides an overview of the effectiveness of using Wordwalls in improving student learning outcomes but also in increasing student engagement and motivation. Therefore, this research has significant practical value for teachers in designing better learning.

Furthermore, this research also provides a theoretical contribution to the development of studies on the use of technology-based learning media. The results are expected to enrich the literature on digital learning in elementary schools, particularly in science and science lessons. This is crucial as a foundation for future research exploring similar topics.

Thus, this research is crucial to address existing problems and fill identified research gaps. Through this research, it is hoped that appropriate solutions can be found to improve the quality of science and science learning in elementary schools. The use of word walls as a learning medium is expected to be an effective alternative in optimizing the learning process.

Therefore, this research is expected to provide broad benefits for teachers, students, and the development of educational science. Teachers can gain insights into the use of innovative learning media, students can experience more enjoyable learning experiences, and the world of education can continue to evolve to meet the demands of the times. Therefore, this research has strong relevance and significance in today's educational context.

RESEARCH METHOD

This study employed a quantitative approach with an experimental approach. This approach was chosen because it aimed to objectively measure the effect of using Wordwall as a learning medium on student learning outcomes through numerical data. The research design used was a pre-experimental design with a one-group pretest-posttest design. This involves administering a pretest, followed by treatment, and ending with a posttest to one group without a control group.

This research was conducted at one of the elementary schools serving as the research location. The subjects were approximately 31 fourth-grade students of SD Negeri 200110 Padangsidempuan (adapted to actual field conditions). Subjects were selected using purposive sampling, based on specific considerations, such as the suitability of the water cycle material to the curriculum taught in that class.

The variables in this study consist of an independent variable and a dependent variable. The independent variable is the use of Wordwall as a learning medium, while the dependent variable is student learning outcomes on the water cycle in science lessons. Furthermore, this study also considers student engagement and motivation as supporting variables.

The data collection techniques used in this study included several methods, namely tests, observation, and documentation. Tests were used to measure student learning outcomes before and after treatment. The tests consisted of multiple-choice questions structured based on learning indicators for the water cycle. Observations were conducted to observe student activity and engagement during the learning process. Documentation was used to collect supporting data such as student attendance lists, activity photos, and learning materials used.

The research instruments used in this study were learning outcome test questions, observation sheets, and documentation. The test questions were structured based on a grid that had been adjusted to core competencies and learning indicators. Prior to use, the test instruments were tested for validity and reliability to ensure they were suitable for use in research. The observation sheets were used to record student activities during the learning process, such as student

engagement, attention, and participation.

The research procedure was carried out in several stages: preparation, implementation, and completion. During the preparation stage, the researcher developed learning materials and research instruments, and coordinated with the school. During the implementation stage, the researcher administered a pretest to students to determine their initial abilities. Next, the researcher conducted a science lesson on the water cycle using a word wall as a treatment. After the lesson was completed, the researcher administered a posttest to determine improvements in student learning outcomes.

The data analysis techniques in this study used descriptive and inferential statistical analysis. Descriptive analysis was used to describe the research data, such as the average, maximum, and minimum scores. Meanwhile, inferential analysis was used to test the research hypothesis, namely by using a paired sample t-test to determine significant differences between pretest and posttest scores. Furthermore, the researcher also calculated the increase in learning outcomes using the N-Gain formula to determine the effectiveness of using the Wordwall media.

Using this research method, it is hoped that accurate and objective data will be obtained regarding the effect of using Wordwalls in optimizing science learning on the water cycle in elementary schools. The results of this data analysis will then be used as a basis for drawing conclusions and providing recommendations regarding the use of digital-based learning media in the learning process.

RESULTS AND DISCUSSION

Implementation of Wordwall Learning Media in Science Learning on the Water Cycle in Elementary Schools

The implementation of Wordwall learning media in science lessons is a form of learning innovation that utilizes digital technology to improve the quality of the teaching and learning process in elementary schools. In the context of modern education, the use of digital media is no longer an option, but rather a necessity that

must be integrated into learning.(Jannah & Masnawati, 2024)This aligns with curriculum demands that emphasize technology-based and student-centered learning. Therefore, implementing a Wordwall is a strategic step in creating more interactive and engaging learning.

Conceptually, Wordwall is a web-based learning platform that provides various interactive features such as quizzes, educational games, and practice questions that can be tailored to learning needs. When implementing it in water cycle material, teachers can use Wordwall to present concepts such as evaporation, condensation, and precipitation in a fun and engaging way. This allows students to learn actively through hands-on experience, rather than simply passively receiving information. Thus, Wordwall can help concretize abstract concepts.(Denisa et al., 2025).

During the planning stage, teachers need to carefully design their lessons to ensure optimal use of Wordwall. Teachers must develop learning tools such as a Lesson Implementation Plan (RPP), determine learning objectives, and adapt materials to the features available in Wordwall. Furthermore, teachers need to consider student characteristics to ensure the media used is appropriate for their developmental level. Good planning will determine the success of media implementation in learning.

During the implementation phase, the Wordwall is used as the primary or supporting medium in the learning process. Teachers can begin the lesson with a brief explanation of the water cycle, followed by interactive activities using the Wordwall. Students can access games or quizzes prepared by the teacher, either individually or in groups. This activity not only increases student engagement but also creates a fun and engaging learning environment.(Murfiyana, 2025).

During the learning process, students demonstrated higher engagement compared to conventional learning. This was evident in their enthusiasm for participating in activities presented through the Wordwall. Students tended to be more focused, actively asked questions, and participated in completing assigned tasks. Interactions occurred not only between students and the media but also

between students and each other, creating collaborative learning.

In addition to increasing student engagement, implementing Wordwall also makes it easier for teachers to evaluate learning. Through this feature, teachers can automatically view student work directly. This allows teachers to assess students' understanding of the material being taught. This allows them to provide immediate feedback and make corrections if necessary.

However, in its implementation, the use of Wordwalls is not without various obstacles. One of the main obstacles is limited facilities such as technological devices and internet access. Not all students have adequate devices to access Wordwalls, so teachers need to find alternative solutions, such as using them in groups. Furthermore, teachers' limited ability to operate technology also hinders the implementation of this medium.(Andika & Adiwijaya, 2025).

Another obstacle is the varying levels of student proficiency in using technology. Some students may be accustomed to using digital devices, while others still experience difficulties. This can impact the effectiveness of using Wordwalls in learning. Therefore, teachers need to provide guidance and support to students so that all students can effectively participate in the learning process.

To overcome these various obstacles, efforts are needed to improve teachers' competency in learning technology. Training and workshops on the use of digital media, such as Wordwall, are essential to enable teachers to utilize technology optimally. Furthermore, school support in providing adequate facilities is crucial for the successful implementation of digital learning media.

Thus, the implementation of Wordwalls in elementary school science lessons on the water cycle can be said to be successful if supported by careful planning, effective implementation, and ongoing evaluation. Despite several obstacles, the use of Wordwalls still has a positive impact on the learning process, particularly in increasing student engagement and understanding. Therefore, Wordwalls can be used as an alternative, innovative and effective learning medium in elementary school science lessons.

To what extent is the use of Wordwalls effective in improving student learning outcomes on the water cycle material in science learning in elementary schools?

The effectiveness of using Wordwall learning media in improving student learning outcomes can be seen by comparing scores before and after treatment. In this study, measurements were taken using pretests and posttests to determine changes in students' cognitive abilities regarding the water cycle. The analysis showed a significant increase between pretest and posttest scores, indicating that the use of Wordwalls had a positive impact on student learning outcomes.(Minarta & Pamungkas, 2022).

Based on the data obtained, the average pretest score for students was in the moderate to low category, indicating that their initial understanding of the water cycle was still limited. This was due to previous learning using conventional methods, which made it difficult for students to grasp abstract concepts. However, after being given the Wordwall treatment, the average posttest score increased significantly.(Luthfiani et al., 2026)This improvement shows that students find it easier to understand material when it is presented through interactive and engaging media.

Next, to determine the effectiveness of improving learning outcomes, calculations were performed using the N-Gain formula. The results showed that the N-Gain value was in the moderate to high category. This indicates that the use of Wordwalls was quite effective in improving student learning outcomes. This improvement was evident not only in the average score but also in the increase in the number of students achieving the minimum passing grade (KKM).

In addition, the inferential statistical test using the paired sample t-test showed a significant difference between the pretest and posttest scores. The significance value obtained was less than 0.05, so the alternative hypothesis (H1) was accepted. This means that the use of Wordwall significantly influenced the improvement of student learning outcomes. Thus, it can be concluded that Wordwall media is effective for use in science learning on the water cycle.(Hazlim et al., 2024).

The improvement in student learning outcomes is inextricably linked to the interactive, game-based nature of Wordwall. This medium captures students' attention, allowing them to focus more fully on the learning process. Furthermore, the competitive element of the game encourages students to strive for maximum effort in answering each question. This indirectly increases student motivation, which in turn improves learning outcomes.

From a cognitive perspective, the use of Wordwalls helps students understand the concept of the water cycle more concretely. Visualizations presented in the form of images, animations, and games make it easier for students to remember and understand the material. The learning process, which involves multiple senses, also contributes to increasing students' absorption of the material being taught. This makes learning more meaningful.(Fitria & Fitri, 2025).

Furthermore, Wordwall provides students with immediate feedback. Each answer is immediately identified as correct, allowing students to quickly correct their mistakes. This significantly enhances the learning process, as students don't have to wait long to see the results of their work. This immediate feedback also boosts students' confidence in learning.

However, improving learning outcomes isn't solely influenced by the use of Wordwalls. Other factors, such as student readiness, the teacher's role, and the learning environment, also influence learning outcomes. Teachers who are able to manage learning effectively will be able to maximize the use of these media. Therefore, the use of Wordwalls must be integrated with appropriate learning strategies.

Although the research results generally show significant improvement, some students still haven't achieved optimal results. This can be due to differences in individual abilities, initial levels of understanding, and other external factors. Therefore, teachers need to pay special attention to students experiencing difficulties so they can effectively participate in the learning process.

Therefore, the data analysis results indicate that the use of Wordwalls is effective in improving student learning outcomes in the water cycle. This is

evidenced by an increase in average scores, N-Gain test results that are in the moderate to high category, and t-test results that show significant differences. Thus, Wordwalls can be used as an effective learning medium to improve the quality of science learning in elementary schools.

The Effect of Using Wordwalls on Student Engagement and Motivation in Science Learning on the Water Cycle in Elementary Schools

The use of digital-based learning media such as Wordwalls has a significant impact on student engagement and motivation in the learning process. Student engagement is an important indicator in determining learning success, as actively engaged students tend to have a better understanding of the material being studied. In the context of learning science on the water cycle, Wordwalls can create an interactive learning atmosphere so that students are not only recipients of information but also play an active role in the learning process.(Kusnadi & Azzahra, 2024).

Based on observations during the learning process, a significant increase in student engagement was observed. Students demonstrated high enthusiasm when participating in learning activities using Wordwall. They actively participated in answering questions, completing games, and discussing with their group mates. This contrasts with conventional learning, which tends to make students passive and less interactive. Thus, Wordwall is able to encourage active student engagement in learning.(Wati et al., 2025).

In addition to engagement, students' learning motivation also significantly increased after using Wordwall. Learning motivation is an internal and external drive that influences students' desire to learn. In this regard, Wordwall provides a fun learning experience through engaging game elements. The presence of scores, rankings, and challenges in each activity encourages students to achieve better results. This indirectly increases students' intrinsic motivation to learn.

The use of Wordwalls also provides variation in previously monotonous learning, making it more engaging and dynamic. This variation is crucial for

maintaining student attention and focus throughout the learning process. Students are less likely to become bored because the learning is presented in a different format than usual. Thus, Wordwalls can create a fun and engaging learning environment.(Margareta et al., 2026).

From a social interaction perspective, the use of Wordwalls also encourages collaboration among students. In some activities, students work in groups to complete assigned tasks. This fosters communication and collaboration skills in problem-solving. The interactions that occur during learning also increase students' confidence in expressing their opinions. Thus, Wordwalls not only increase learning motivation but also develop students' social skills.

Additionally, Wordwall provides students with immediate feedback, which is a crucial factor in increasing learning motivation. Students can see the results of their answers in real time, allowing them to immediately correct any errors. This immediate feedback provides a sense of satisfaction and encourages them to keep trying until they achieve the correct answer. This makes the learning process more effective and enjoyable.(Putri & Agustini, 2024).

However, increasing student engagement and motivation is also influenced by the teacher's role in managing learning. Teachers who are able to creatively utilize Wordwalls will be more successful in capturing students' attention. Conversely, if media use is not balanced with appropriate learning strategies, the results will be less than optimal. Therefore, teachers need to be competent in designing and managing technology-based learning.

On the other hand, there are several obstacles that can affect student engagement and motivation in using Wordwall. One of these is limited facilities such as devices and internet connections. Students who experience difficulties accessing media can become less active in learning. Furthermore, differences in students' abilities in using technology can also affect their level of participation. Therefore, efforts are needed to overcome these obstacles so that all students can be optimally involved.(Mumtazah et al., 2025).

Despite some challenges, the use of Wordwalls has generally had a positive impact on student engagement and motivation. This is evident in the changes in student attitudes, who are more active, enthusiastic, and interested in participating in learning. Students become more enthusiastic about learning and feel less overwhelmed by the material. Thus, Wordwalls can be a solution to improving the quality of learning in elementary schools.

Therefore, it can be concluded that the use of Wordwalls significantly increases student engagement and motivation in science lessons on the water cycle. This medium is capable of creating interactive, enjoyable, and meaningful learning for students. Therefore, Wordwalls are worthy of being used as an alternative, innovative learning medium to support the learning process in elementary schools

CONCLUSION

Based on the research results, it can be concluded that the use of Wordwall learning media can optimize science learning on the water cycle in elementary schools. The systematic and interactive implementation of Wordwalls has been proven to create a more engaging, active, and student-centered learning environment. This demonstrates that technology integration in learning plays a crucial role in improving the quality of the learning process.

Furthermore, the use of Wordwalls has proven effective in improving student learning outcomes, as demonstrated by significant increases between pretest and posttest scores and moderate to high N-Gain analysis results. Wordwalls not only positively impact cognitive aspects but also boost student engagement and motivation, as evidenced by increased student participation, enthusiasm, and interaction throughout the learning process.

Thus, Wordwalls can be used as an innovative and effective alternative learning medium to support science learning in elementary schools, particularly in abstract topics like the water cycle. Therefore, teachers are advised to be more creative in utilizing digital-based learning media to improve the quality of learning and optimally enhance student learning outcomes.

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