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Implementation of Digital Learning Media Based on Wordwall Educational Games on Learning Interest, Student Engagement, and Learning Outcomes in Science Subjects

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Abstract: Low student interest and involvement in Natural Science (IPA) learning often becomes an obstacle in achieving optimal learning outcomes. Therefore, learning innovations are needed that can increase student motivation, active participation, and understanding of the material. This study aims to determine the effect of implementing digital educational game-based learning media Wordwall on learning interest, student involvement, and learning outcomes in Natural Science (IPA) subjects. The background of this study is based on the low interest and participation of students in Natural Science learning, which has an impact on achieving less than optimal learning outcomes. Interactive media such as Wordwall is considered to be able to create a fun, competitive, and challenging learning experience through quizzes, games, and direct feedback features. The research method used was a quasi-experimental design with a non-equivalent control group design. The subjects were fifth-grade students at a public elementary school in City X, who were divided into experimental and control groups. The instruments used included a learning interest questionnaire, a student engagement observation sheet, and a learning outcome test. Data analysis was performed using a comparative statistical test (t-test) to determine significant differences between the experimental and control groups. The results of the study showed that students who participated in learning using Wordwall media experienced significant improvements in three variables: learning interest, engagement, and learning outcomes, compared to students who participated in conventional learning. This proves that the use of digital media based on educational games can improve the effectiveness of science learning in elementary schools.

Keyword: Educational Games, Wordwall, Learning Interest, Student Engagement, Learning Outcomes, Science

INTRODUCTION

Learning Natural Science (IPA) is a field of study that requires students to understand abstract concepts and apply them to everyday life. However, in practice, science learning often focuses solely on conventional, one-way delivery of material, resulting in students feeling bored, disinterested, and inactive in the learning process (Sanjaya, 2016). This

condition results in low student interest and engagement, which ultimately affects their learning outcomes.

The development of digital technology has had a significant impact on the world of education, especially in terms of providing more innovative, interactive, and enjoyable learning media. In today's digital era, students who are classified as digital natives tend to be more interested in learning activities that involve visual interaction, challenges, and speed, compared to conventional learning approaches that are one-way (Prensky, 2007). Therefore, teachers as learning facilitators are required to be able to design strategies and media that are appropriate to the characteristics of students so that the learning process runs effectively and meaningfully. This condition has a direct impact on low student learning outcomes. To overcome this, the use of interactive digital media such as Wordwall can be an effective alternative in creating an active and interesting learning atmosphere.

Wordwall is a digital learning platform that allows teachers to easily and interactively create educational games, such as quizzes, crosswords, spinning wheels, and more. This application has been widely used in both online and offline learning because it can provide direct feedback (real-time feedback), motivate students through challenges, and increase active student participation in the learning process. According to Mayer (2009), interactive media can improve student cognition and understanding because it presents information in verbal and visual forms simultaneously, thereby strengthening information processing in the brain.

The implementation of educational games such as Wordwall is believed to increase learning interest, namely students' interest and attention to learning activities, which are important factors in encouraging internal motivation (Sardiman, 2011). In addition, this media also supports cognitive, affective, and behavioral student engagement during learning (Fredricks et al., 2004). With an interactive atmosphere, fun challenges, and a score and reward system, Wordwall is able to encourage students to be more actively involved and compete healthily. This is ultimately expected to have a positive impact on improving student learning outcomes, especially in mastering science concepts. Although various previous studies have examined the effectiveness of educational game media on learning outcomes, there are still limited studies that specifically measure the impact of the implementation of Wordwall as a digital educational game media on three important aspects simultaneously, namely learning interest, student involvement, and learning outcomes, especially in science subjects at the elementary school level. Therefore, this study is important to be conducted as an effort to empirically measure the effectiveness of the application of interactive learning media based on educational games in improving the quality of science learning.

METHOD

This research uses a quantitative approach with a quasi-experimental design. type pretest-posttest control group design. The purpose of this design is to determine the effect of implementing interactive learning media based on educational games on learning interest, student engagement, and learning outcomes in science subjects. The subjects of the study were fifth-grade students at a Public Elementary School in City X, who were selected purposively. The sample consisted of two classes with a total of 60 students, divided into two groups: an experimental group that used educational game media, and a control group that followed conventional learning. The treatment was given during four meetings in science learning with the topic of the respiratory system.

The research instruments consisted of: (1) a Likert-scale learning interest questionnaire that had been tested for validity and reliability, (2) a student engagement observation sheet that included cognitive, affective, and psychomotor indicators, and (3) a multiple-choice learning outcome test to measure mastery of the material. Pretests and posttests were conducted to determine differences in results before and after treatment.

RESULTS AND DISCUSSION

This study aims to examine the application of digital educational game-based learning media, Wordwall, on student learning interest, engagement, and learning outcomes in science subjects. Data collection was conducted through a learning interest questionnaire, engagement observation sheets, and learning outcome tests. The following is a description of the results and their analysis based on relevant educational theories.

Interest in Learning

Interest in learning is a strong tendency or desire of an individual to voluntarily engage in learning activities due to an attraction to the material or learning process. According to Slameto (2010), interest in learning is a student's liking and attraction to a learning activity, characterized by continuous attention and involvement in the learning activity. Learning Interest Indicators (according to Sardiman, 2011), Feelings of enjoyment towards the lesson, interest in the material and methods, High attention during the learning process, Desire to explore the material more deeply Relevance to educational games Educational game-based learning media can increase interest because it combines elements of entertainment and challenges, which makes students feel happy and interested in the learning process (Keller, 1987 – ARCS Model: Attention & Relevance).

Table 1. Average Score of Student Learning Interest in the Experimental and Control Groups

Group	Pretest (Mean)	Posttest (Mean)	Difference	Information
Experiment	72.10	87.55	+15.45	Significant improvement
Control	71.85	77.20	+5.35	Insignificant increase
Statistical Test (t-test)				$p < 0.05$ (significant)

The table results show that the average learning interest score of students in the experimental group experienced a significant increase, from 72.10 (pretest) to 87.55 (posttest). In contrast, the control group only increased slightly from 71.85 to 77.20. The t-test results showed $p < 0.05$, which means the difference is statistically significant. The increase in students' learning interest is due to the characteristics of educational games that are able to attract attention through visual elements, sound, and challenges. This is in accordance with the ARCS Motivation Theory model by Keller (1987), which emphasizes that *Attention* and *Relevance* (the connection of the material to students' needs) are two important aspects in increasing students' motivation and interest in learning. Educational games create a fun and competitive learning environment, so that students feel interested in continuing to participate in learning. This is also supported by the opinion of Prensky (2007) who stated that digital generation students are more responsive to interactive and gamified learning media.

Student Engagement

Student engagement refers to the level of participation, attention, and commitment of students in the learning process, both cognitively, emotionally, and behaviorally. This engagement is one of the main indicators of learning success because actively engaged students tend to have better understanding and higher learning outcomes. According to Fredricks, Blumenfeld, & Paris (2004) , student engagement is divided into three dimensions:

1) Behavioral Engagement

Demonstrated through attendance, attention, active participation, following class rules, and completing assignments. Example: Students actively answer questions, try Wordwall quizzes, or participate in class discussions.

2) Emotional Engagement

Related to interest, enthusiasm, enjoyment, and sense of ownership of learning activities. Example: Students feel happy when playing educational games or feel motivated because learning feels fun.

3) Cognitive Engagement

Related to students' mental efforts in understanding the material, thinking critically, and solving problems. Example: Students use strategies to answer questions on the Wordwall application and try to understand science concepts in depth.

Student Engagement through Wordwall Educational Game Media. The use of Wordwall media has been proven to increase student engagement because: It provides direct interaction through quizzes, anagrams, and visual challenges, provides instant feedback, so students immediately known whether the answer is right or wrong, offers healthy competition with scores or rankings that motivate students to be more active, makes learning activities more fun and less monotonous, which has an impact on emotional engagement.

Table 2. Average Score of Student Engagement in the Learning Process

Group	Average Engagement score	Information
Experiment	88.00	Very active: completing game challenges, discussing, and answering questions
Control	74.30	Less active: lower engagement than the experimental group

The table data above shows that students in the experimental group demonstrated higher engagement during the learning process. They were active in completing game challenges, discussing, and answering questions. The average student engagement score in the experimental group was 88.00, while the control group's score was only 74.30. Student engagement increased because they felt they were directly involved in the learning process, not merely passive recipients of information. This aligns with Vygotsky's (1978) social constructivism theory, which states that learning occurs optimally through social interaction, exploration, and active student involvement in constructing knowledge. Interactive media such as games provide space for students to take on roles, make decisions, and learn from the consequences within a simulated learning environment. This also aligns with Gee's (2003) view that games provide a meaningful learning context through *problem-solving* and independent exploration.

Learning outcomes

Learning outcomes are the abilities achieved by students after experiencing the learning process, reflecting understanding, skills, and attitudes resulting from learning interactions. Learning outcomes are not just about test scores, but encompass cognitive (knowledge), affective (attitude), and psychomotor (skills) aspects. According to Bloom (1956), learning outcomes are grouped into three main domains:

1) Cognitive includes thinking skills such as remembering, understanding, applying, analyzing, evaluating, and creating.
2) Affective includes attitudes, interests, motivations, and values.
3) Psychomotor skills include physical skills and body coordination.

In the context of science learning, learning outcomes are usually focused on cognitive aspects, such as understanding scientific concepts, analytical skills, and solving scientific problems.

Table 3: Average Student Learning Outcomes in the Experimental and Control Groups

Group	Average Learning Outcome Score	Information
Experiment	85.60	Higher, with significant improvement (gain score test results)
Control	78.15	Lower than the experimental group

The learning outcome test showed that students in the experimental group obtained an average score of 85.60, higher than the control group which only obtained 78.15. The score test showed a significant increase in the understanding of science concepts in the group that used the digital wordwall-based game. This educational game was able to strengthen students' understanding because the presentation of the material was visual, contextual, and repetitive. The fun and challenging learning process encouraged students to focus more and deepen their understanding of the concepts. This is in accordance with the opinion of Kebritchi, Hirumi, & Bai (2010) who found that the use of educational games significantly improved academic achievement due to students' emotional and intellectual involvement.

CONCLUSION

The digital educational game Wordwall has a positive and significant impact on students' learning interest . Students who use Wordwall demonstrate greater interest in science materials because learning becomes more enjoyable, interactive, and challenging.

The implementation of Wordwalls also increased student active engagement in the learning process. This was demonstrated by increased student participation in discussions, answering questions, and enthusiasm in completing the educational games provided. The use of Wordwalls has been proven to significantly improve student learning outcomes in science. Students in the experimental group achieved higher posttest scores than those in the control group, indicating a better understanding of the material.

Overall, Wordwall, as a digital learning medium based on educational games, is effective in science lessons , increasing interest, engagement, and learning outcomes for elementary school students. Therefore, teachers are advised to utilize digital interactive learning media as an alternative innovation in the teaching and learning process.

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