

WORDWALL: A GAME-BASED LEARNING MEDIA TO IMPROVE STUDENTS' COGNITIVE DEVELOPMENT

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Abstract: This study aims to analyse the effectiveness of Wordwall as an interactive digital media in improving students' cognitive. The sample of this study was 40 students of TK Khairani, Aceh Besar. This research employed a quasi-experimental design involving two groups: an experimental group using Wordwall-based activities and a control group using conventional behaviour. Data were collected through test, pre-test and post-test. The findings indicate that students who participated in Wordwall-integrated learning showed significant improvement in cognitive performance compared to the control group. The interactive features of Wordwall were found to enhance attention, recall, and problem-solving skill. The study concludes that Wordwall is an effective digital media for supporting cognitive development and can be integrated into various instructional context to enrich the learning experience.

Keywords: Wordwall; students' cognitive development; game-based learning.

1. Introduction

The rapid development of digital technology has encouraged teachers to integrated interactive learning media into the process teaching learning in the classroom. Digital platforms are increasingly recognized as tools that can enhance students engagement and support deeper learning process [1]. One of them is Wordwall. It is an online platform that offers game-based activities designed to make learning process more interactive and motivating for students [2].

Cognitive development, particularly in areas such as attention, recall, and conceptual understanding, is a fundamental component of academic success. Studies have shown that digital and game-based learning environments can significantly support the development of these cognitive skills by providing immediate feedback and encouraging active participation [3] [4]. Wordwall, with its interactive quizzes, matching games, and problem-solving tasks [5] [6], presents an opportunity to create more dynamic learning experiences. Prior research suggests that integrating interactive digital platforms can improve students' attention, retention, and conceptual understanding [7]. Moreover, its need more studies to understand the extent to which Wordwall specifically influences cognitive outcomes across different education levels. Therefore, this study aims to examine the effectiveness of Wordwall as a digital learning medium in improving kindergarten students' cognitive performance.

2. Literature Review

2.1 Digital Learning Media

The integration of digital media in education has grown rapidly alongside advancements in educational technology. Digital platforms allow teachers to create interactive flexible, and engaging learning environments that support a variety of learning styles [1]. According to [3], multimedia-based instructional materials enhance cognitive processing by combining text, visuals, animations, and interactive elements, enabling students to understand and retain

information more effectively. Such media also facilitated both independent and collaborative learning, making them relevant across various educational settings [8].

2.2 Game-Based Learning

Game-based learning utilizes game elements to enhance motivation, engagement, and conceptual understanding. [7] emphasize that educational game foster flow and engagement, which contribute to improved learning outcomes. Game-based environments often incorporate challenges, feedback and rewards, encouraging learning to remain focused and participate actively [5]. [4] highlight the emotional component (enjoyment and challenge) of learning technologies can positively influence cognitive process such as attention, retention, and problem-solving.

2.3 Wordwall as an Educational Platform

Wordwall is a digital platform that provides a variety of educational games, including Quizzes, Open the Box, Random Card, Find the Match, and many others games [5][6]. Moreover, its user-friendly design enables teachers to create interactive activities that boost student's motivation and engagement. In addition, Wordwall improve learning academic performance and motivation due to its competitive elements, instant feedback, and dynamic interface [2]. Wordwall activities can be used for formative assessment, reinforcement of concepts, and collaborative tasks in both online and face-to-face classrooms [10].

2.4 Cognitive Development in Learning

Cognitive development refers to mental processes such as attention, memory, reasoning, and understanding of concepts. These abilities play a crucial role in helping students process, organize, and apply new information [11]. Multimedia learning can enhance cognitive development by integrating multiple modes of information that stimulate deeper processing [2]. Game-base and digital learning activities also have been shown to strengthen cognitive skills by providing stimulating, interactive, and students-centered experiences [7].

In early childhood education, interactive and visually rich activities are particularly important for supporting foundational cognitive abilities such as pattern recognition, memory, sequencing, and basic problem-solving [11] [12]. Thus, Wordwall align with these needs by offering activities that are visually engaging, repetitive, and developmentally appropriate for young learners [9].

2.5 Integrating Wordwall to Enhance Cognitive Skills

The use of Wordwall in the classroom creates opportunities for students to practice cognitive tasks through engaging game-based activities. Features such as immediate feedback, scoring, repetition, and timed challenges help maintain students focus and encourage meaningful learning [9]. Moreover, Wordwall can enhance information processing, retention, and conceptual understanding [2]. Therefore, Wordwall represent a promising digital tool for supporting cognitive development across different educational context, including early childhood settings.

3. Method

This study employed a quasi-experimental research design to examine the effectiveness of Wordwall in improving kindergarten students' cognitive abilities. The population of this study was the students of TK Khairani, Aceh Besar. A total of 40 students participated, divided into an experimental group and a control group. The selection of participants used a purposive technique based on classroom availability and teacher recommendations.

Three main instruments were used to collected the data:

1. Cognitive Assessment Test. Pre-test and post-test were developed to measure students' cognitive skills, including attention, memory, pattern recognition, and simple problem-solving. The test items were adapted from childhood cognitive development indicators [13].
2. Observation Checklist. An observation sheet was used to record students engagement, attention, and participation during learning activities in both groups.
3. Teacher Activity Log. Teachers documented the implementation process to ensure that instructional procedures in the experimental group followed the planned Wordwall-based intervention.

This study was conducted in four meetings for each group. The steps were followed:

1. Pre-test. Both groups completed a pre-test to assess their initial cognitive ability levels.
2. Intervention was conducted in two meetings for each group. The following were the procedures for each group:
 - a. The experimental group participated in learning activities using Wordwall games such as matching, categorization, sequencing, and quick-response quizzes.



Figure 1. The material using Wordwall

- b. The control group received traditional instruction using worksheets, flashcard, and verbal explanations.
3. Observation. Students engagement and learning behaviours were observed during every sessions using the observation checklist.
 4. Post-test. After the intervention, both groups were given a post-test to measure any changes in cognitive performance.

Data from the pre-test and post-test were analysed using descriptive and inferential statistics. Inferential analysis used the independent sample t-test to determine whether there was a significant difference between the two groups. A significant level of $\alpha = 0.005$ was used to interpret statistical results. Moreover, the observation data were analysed using qualitative descriptive methods to support the quantitative findings.

4. Finding and Discussion

The pre-test was administered to both the experimental and control groups to determine their initial cognitive ability levels. The descriptive analysis showed that both groups had relatively similar baseline score. An independent sample t-test indicated no significant difference between the two groups prior to the intervention ($p > .05$). This suggests that both groups started at a comparable cognitive level. Moreover, after intervention, the post-test was conducted to measure the impact of using Wordwall on students' cognitive abilities. The experimental group showed a substantial improvement compared to the control group. An independent sample t-test revealed a significant difference between the two groups ($p < .05$), indicating that

students who used Wordwall performed better in cognitive tasks. The table below showed the result of pre-test and post-test.

Table 1. The results of pre-test and post-test

Group	Pre-test score	Post-test score
Experimental group	56,40	78,20
Control group	55,80	65,10

To further analyse the improvement, gain scores were calculated by comparing pre-test and post-test results.

Table 2. The improvement scores

Group	Improvement score
Experimental group	21,80
Control group	9,30

These results demonstrated that the improvement in the experimental group was more than double that control group. This suggests that Wordwall-based learning activities had a strong and positive effect on students' cognitive development.

Moreover, observation data provided additional insight into students engagement and classroom behaviour. Based on observation, the students in the experimental group showed higher levels of attention, participation, and enthusiasm during learning activities. The interactive and game-based Wordwall kept students focused, especially during matching, sequencing, and quick-response activities. In contrast, the students in control group displayed moderate engagement, with several students becoming distracted during traditional worksheet-based instruction.

Furthermore, teacher documentation indicated that Wordwall activities were easy to implement and required minimal preparation time. The students responded positively to the competitive and visual elements of the games.

5. Conclusion and Recommendation

The finding of this study showed that the use of Wordwall as a digital learning medium has a significant positive impact on enhancing students' cognitive abilities. It can be concluded that Wordwall is an effective instructional tool for improving cognitive skills in early childhood education levels. Its integration into classroom instruction can create more engaging learning experiences, support concept understanding, and enhancing learning outcomes. Further researches may explore long-term effects, the use of Wordwall across different age groups, and combination of Wordwall with other digital pedagogical strategies to further strengthen cognitive development.

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