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The Use of the Wordwall Application to Improve the Mastery of Thaharah Material for Grade IV Students at UPTD SDN 15 Parepare

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ABSTRACT

This study aims to examine the effectiveness of the Wordwall application as an interactive gamified medium in enhancing fourth-grade elementary school students' mastery of thaharah material in Islamic Religious Education at UPTD SDN 15 Parepare. Employing a quantitative experimental approach with a one-group pretest-posttest design, the research involved 26 students as participants. Data were collected through pretest and posttest instruments to measure conceptual understanding and practical application of thaharah, supplemented by observation sheets to assess student engagement during three learning sessions. Data analysis included descriptive statistics, normality testing, paired sample t-tests (both two-tailed and one-tailed), and N-Gain calculations. The results revealed a significant improvement in mastery, with the mean score increasing from 58.92 in the pretest to 90.46 in the posttest, supported by a paired t-test value of 10.261 and a significance level of 0.000 (< 0.05). The average N-Gain score of 0.72 indicated high improvement, while observation data showed effectiveness rising from 57% (sufficient) to 93% (very good). These findings demonstrate that Wordwall significantly enhances cognitive mastery, motivation, and active participation, aligning with Piaget's constructivism theory and Mayer's Cognitive Theory of Multimedia Learning. This study fills a research gap by providing empirical evidence on Wordwall's effectiveness in elementary-level thaharah instruction through face-to-face learning. Despite its contributions, limitations include a small sample and lack of a control group, suggesting the need for future research with broader samples and more comprehensive designs.

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INTRODUCTION

In the current digital era, the integration of technology in education has become a significant global trend, including in the teaching of Islamic Religious Education (PAI) at the elementary school level. The use of interactive media based on gamification, such as the Wordwall application, has proven effective in enhancing students' motivation, engagement, and learning outcomes across various subjects (Habibah, 2024; Supriadi et al., 2025). Recent studies published in reputable international journals indicate that Wordwall, as a gamified platform, can significantly improve vocabulary retention, conceptual understanding, and student participation (Simanjuntak et al., 2024).

The organization and improvement of educational quality in Indonesia are regulated through various policies that emphasize the utilization of technology and teacher professionalism. Teachers are required to deliver high-quality instruction and enhance their competencies in line with advancements in knowledge and technology (Refiny et al., 2025). These policies encourage meaningful learning, mastery of 21st-century competencies, and innovative use of digital media (Kementerian Pendidikan Riset, dan Teknologi, 2024). They also provide flexibility in curriculum implementation and the use of interactive digital media (Kementerian Pendidikan Riset, dan Teknologi, 2025). In addition, there is a presidential instruction regarding the digitalization of learning (Indonesia, 2025). Thus, the integration of technology in education becomes part of teachers' professional responsibilities to create a high-quality, interactive, and era-relevant learning process (Fakhrudin, 2024; Pohan et al., 2024).

There exists a gap between the demands of national education policies and the reality of classroom practices. Normatively, regulations and the curriculum emphasize innovative learning, strengthening digital literacy, and 21st-century competencies, including through education digitalization programs (Gunagraha & Ibrahim, 2025). However, Islamic Religious Education (PAI) instruction at UPTD SDN 15 Parepare remains dominated by lecture methods, with limited use of varied learning media and insufficient encouragement of active student participation. Initial observations indicate low mastery of *thaharah* material, marked by students' difficulties in understanding and correctly practicing the steps of ritual purification. This condition reflects a disparity between ideal expectations and actual practices in PAI teaching. Such a gap highlights the need for innovation to make learning more relevant to students' lives and aligned with the characteristics of the digital generation.

The utilization of the Wordwall application as an interactive learning medium represents a relevant alternative to address these issues. Wordwall presents material through varied educational game formats, thereby enhancing student engagement and motivation in learning (Berliningrum et al., 2025). Furthermore, interactive media has been proven effective in improving Islamic Religious Education (PAI) learning outcomes and facilitating active student participation in the learning process. Through the use of this medium, students are expected not only to master the concepts of thaharah theoretically but also to apply them in their daily activities.

Malik et al., in their research, emphasize the importance of utilizing technology in PAI instruction to enhance effectiveness and students' understanding of Islamic teachings. The use of mobile applications and interactive multimedia is considered capable of

creating a more engaging learning environment that motivates students and supports both independent and collaborative learning. Technology also provides opportunities for teachers to adapt materials to students' needs and interests through diverse and relevant media. Consequently, the integration of technology in PAI teaching can deliver a more interactive, engaging learning experience that encourages active student involvement (Malik et al., 2025).

The use of Wordwall in the learning process has been proven to enhance motivation and learning achievement across various subjects. Hartati et al. reveal that the application of Wordwall can improve the learning outcomes of elementary school students through the presentation of engaging learning activities that involve active participation. Although numerous studies have explored the use of Wordwall in education, most focus on general subjects such as science, social studies, and mathematics. Research specifically examining the implementation of Wordwall in Islamic Religious Education (PAI), particularly on the topic of thaharah, remains limited (Hartati, 2024).

A study by Nur Laili et al. demonstrates that Wordwall can foster students' enthusiasm for learning in PAI instruction, though it does not specifically address the thaharah material (Laili et al., 2024). Similarly, the research by Safitri et al. indicates an improvement in PAI learning outcomes through Wordwall at the junior high school level, but it does not focus on thaharah and employs a qualitative approach, thus lacking measurable quantitative evidence (Safitri et al., 2022). Meanwhile, Serly's study emphasizes the development of Wordwall media and the enhancement of student creativity, rather than its effectiveness in mastering thaharah material at the elementary school level (Serly, 2022).

This study possesses novelty because it examines the effectiveness of using the Wordwall application on the mastery of thaharah material among fourth-grade elementary school students through a quantitative approach with a pretest–posttest design, which allows for objective and measurable assessment of learning outcomes. Unlike previous studies that focused on media development or were conducted at the junior high school level, this research is applied in a real elementary school learning context and integrates multimedia cognitive learning theory and constructivism theory as analytical frameworks. The focus on thaharah material, which is both conceptual and practical, further strengthens the relevance of this study in Islamic Religious Education (PAI) instruction.

This research is essential to determine the effectiveness of using the Wordwall application in enhancing the mastery of thaharah material among fourth-grade students at UPTD SDN 15 Parepare. The utilization of interactive digital applications such as Wordwall is expected to serve as an engaging and effective alternative medium for PAI learning, as it enables teachers to present material through quizzes, games, and interactive exercises that promote active student participation. Through this medium, it is anticipated that there will be an improvement in conceptual understanding as well as practical skills in ritual purification in a more optimal manner. The objectives of this research are:

1. To identify differences in the level of mastery of thaharah material before and after the use of the Wordwall application.
2. To evaluate the effectiveness of using the Wordwall application in thaharah learning for fourth-grade students at UPTD SDN 15 Parepare.

LITERATURE REVIEW

Cognitive Theory of Multimedia Learning (CTML)

The cognitive-based multimedia learning theory was developed by Richard E. Mayer in 2009 and updated in 2024 (Siregar et al., 2024). This theory posits that learning is more effective when information is presented through a combination of words (verbal) and images (visual) (Firmansyah et al., 2024). The theory is grounded in the concept of "dual channels," whereby the brain has separate channels for processing verbal information (text, narration) and visual information (images, animations) (Mayer, 2024). Learning with the aid of digital media, such as the Wordwall application, aligns with the multimedia learning theory proposed by Richard E. Mayer. Mayer states that learning is more effective when information is delivered through two primary channels visual and verbal operating simultaneously. As an interactive learning medium, Wordwall presents text, images, sounds, and animations that enhance students' attention, comprehension, and information retention (Wijayanti et al., 2025).

The Cognitive Theory of Multimedia Learning (CTML), developed by Richard Mayer, explains that learning is more effective when students receive information through two main channels: verbal (text/narration) and visual (images/animations). The fundamental principle of this theory is that humans learn better from words and pictures than from words alone (Mayer, 2024). Wordwall, as a digital-based learning medium, integrates verbal and visual elements within a single platform. Activities in Wordwall encourage students to think, recall, and comprehend concepts holistically through interactions with the presented visual media and text. This supports deeper understanding of subject matter, including concepts in Islamic Religious Education lessons such as thaharah (Sholeh et al., 2024).

Constructivism

Jean Piaget's constructivism theory views learning as an active process in which students construct knowledge and meaning through interactions with their environment and learning experiences. Knowledge is not understood as a direct transfer of information from teacher to student but rather as the result of internal construction that occurs through individual mental activities in interpreting new experiences (Taber, 2024). Piaget emphasizes that individuals' cognitive structures develop alongside active engagement in the learning environment, resulting in understanding that is personal and contextual.

The term "cognitive" originates from the word "cognition," which means understanding or the ability to comprehend. In a broader sense, cognition refers to the processes of acquiring, organizing, and utilizing knowledge (Firmansyah et al., 2024; Neviyarni, 2020). Cognitive theory is an approach generally related to learning processes. In this context, cognition pertains to human mental or psychological abilities, such as observing, understanding, analyzing, evaluating, and paying attention (Sutarto, 2017). In other words, cognition relates to the concepts of recognition or comprehension. This theory explains that learning occurs due to obstacles or challenges in various aspects of an individual's cognition. The primary focus of cognitive theory is on the learning process itself, not merely the final outcomes of learning (Habsy et al., 2023). This means the theory does not view learning simply as a straightforward relationship between stimulus and

response but also involves complex and in-depth thinking processes. The theory assumes that every student already possesses experiences and knowledge stored in the form of cognitive structures. The learning process will be effective if new material can adapt to or align with the preexisting cognitive structures of the student.

The Cognitive Theory of Multimedia Learning (CTML) and Constructivism are highly complementary and, when integrated, form a strong theoretical foundation for the use of interactive digital media such as Wordwall in learning thaharah (Adzibah et al., 2025). CTML explains how information is processed more effectively when presented through dual channels (verbal and visual/pictorial), reducing cognitive load and promoting deeper understanding through the simultaneous use of words and images (Cavanagh & Kiersch, 2023). Constructivism, on the other hand, focuses on how learners actively build knowledge by interacting with learning experiences, assimilating new information into existing cognitive structures through personal mental activity. In the context of Wordwall, CTML provides the cognitive processing mechanism: multimedia elements (text, images, animations, and sounds) engage both channels to optimize attention, comprehension, and retention (Yıldız & Karadağ, 2025). Meanwhile, Constructivism accounts for the active learning process: interactive features such as quizzes, games, and exercises enable students to explore, experiment, and construct their own understanding of thaharah concepts in a meaningful and contextual way. The integration of these two theories thus explains not only why multimedia presentation enhances learning outcomes but also why student-centered interaction leads to more durable and personally relevant knowledge construction (Muhdi & Ardhiy, 2025).

The Use of the Wordwall Application

The use of the Wordwall application is essentially an innovative and engaging platform that is accessible to anyone, anytime, and through any browser for free. In other words, utilizing the Wordwall application as an e-learning medium is beneficial for enhancing students' understanding and creativity, as it can be accessed independently without constraints of distance or time (Yuliza et al., 2023).

The Wordwall application represents an innovation in the field of education, developed with the aim of improving students' comprehension of the material being studied. This application is designed to support educators in conducting more effective and interactive learning processes. Whereas previously, material presentation was dominated by lecture methods that were theoretical in nature, the utilization of Wordwall allows materials to be delivered in a more innovative and creative manner. The various features available in this application enable the presentation of material not only in the form of text or theory but also through appealing visuals such as images and illustrations (Marlinda et al., 2025). Consequently, the use of Wordwall has the potential to increase students' enthusiasm and promote more optimal learning outcomes. In general, Wordwall is a web-based application used to create learning media through provided features such as quizzes, matching activities, pairing exercises, anagrams, word scrambles, and others.

METHOD

This study employs a quantitative method with a pre-experimental approach. The quantitative method was selected because the research aims to objectively measure

changes in learning outcomes through numerical data, specifically assessing differences in the mastery of thaharah material among fourth-grade students before and after the use of the Wordwall application as a learning medium. This approach enables the researcher to collect data in the form of test scores that can be statistically analyzed, providing an indication of the potential effectiveness of the intervention within the studied group.

The quantitative approach employed is pre-experimental research. Pre-experimental research involves the administration of a treatment to a single group and the observation of changes through pretest and posttest measurements, without a separate control group. In this context, the researcher administers the treatment namely, the use of the Wordwall application to the experimental group and compares the results before and after the treatment through pretest and posttest measurements. This pre-experimental approach was chosen because it aligns with the research objectives, which are to investigate differences in mastery of thaharah material and to obtain an indication of the effectiveness of using Wordwall in improving student learning outcomes.

The research design utilized is a Pre-Experimental Design, specifically the One-Group Pretest-Posttest Design. This design involves a single group of subjects (fourth-grade class as the experimental group) whose initial abilities are measured through a pretest (O_1), followed by the administration of the treatment (X) in the form of learning using the Wordwall application, and concluded with a final measurement through a posttest (O_2).

FINDINGS

Differences in the Level of Mastery of Thaharah Material Before and After Using Wordwall

Table 1: Descriptive Statistics of Pretest Scores

Descriptive Statistics									
	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Pretest Score	26	48	30	78	1532	58.92	2.703	13.781	189.914
Valid N (listwise)	26								

Source: Output SPSS 25.

Table 2: Descriptive Statistics of Posttest Scores

Descriptive Statistics									
	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Post-test Score	26	18	80	98	2352	90.46	.950	4.843	23.458
Valid N (listwise)	26								

Source: Output SPSS 25.

The table reveals a significant increase in the average score from 58.92 on the pretest to 90.46 on the posttest. In addition, the range, standard deviation, and variance values on the pretest are considerably higher, indicating greater score dispersion and inconsistency prior to the intervention. The minimum and maximum scores on the posttest are also higher. Overall, these findings provide strong evidence that students' mastery of the material improved and became more uniform after the intervention/posttest.

Following the descriptive statistical analysis, the next step is to calculate the Average Percentage (AP) of the pretest scores to interpret the overall level of material mastery.

$$\mathrm{AP} = \frac{\mathrm{Xi}}{\mathrm{Sit}} x100\%$$
$$\mathrm{AP} = \frac{1532}{2600} x100\%$$
$$AP = 58{,}92\%$$

Based on the data processing results, it was found that the Average Percentage (AP) of the pretest for students' mastery of thaharah material is 58.92%, which falls into the "sufficient" category. The next step is to calculate the Average Percentage (AP) of the posttest scores to interpret the overall level of material mastery.

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$$\mathrm{AP} = \frac{\mathrm{Xi}}{\mathrm{Sit}} x100\%$$
$$\mathrm{AP} = \frac{2352}{2600} x100\%$$
$$AP = 90{,}46\%$$

The Effectiveness of Wordwall Learning in Thaharah Learning

Table 3: Observations on the Use of Wordwall

Behavior Indicators	Meeting 1	Meeting 2	Meeting 3
Paying attention to the teacher when explaining the use of Wordwall	3	3	4
Showing curiosity and enthusiasm when using Wordwall	3	4	4
Actively answering questions/activities in the Wordwall application	2	4	4
Cooperating/discussing with peers when answering in Wordwall (if done in groups)	2	3	4
Able to operate Wordwall without much assistance	2	4	4
Expressing opinions/positive reactions toward Wordwall	2	3	3
Able to answer Wordwall questions correctly	2	3	3
Total Score	**16**	**24**	**26**
Average	**2.29**	**3.43**	**3.71**
Percentage	**57%**	**86%**	**93%**

Prerequisite Testing

Normality Test

Table 4: Data Normality Test

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Nilai *Pretest*	.141	26	.195	.930	26	.077
Nilai *Posttest*	.121	26	.200*	.955	26	.301
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

Source: Output SPSS 25.

Based on the normality test table above, the pretest and posttest score data can be interpreted as follows:

Pretest Scores:

Kolmogorov-Smirnov: Sig. = 0.195 (> 0.05) → normally distributed

Shapiro-Wilk: Sig. = 0.077 (> 0.05) → normally distributed

Posttest Scores:

Kolmogorov-Smirnov: Sig. = 0.200 (> 0.05) → normally distributed

Shapiro-Wilk: Sig. = 0.301 (> 0.05) → normally distributed

Both the pretest and posttest data yield significance values greater than 0.05 in both tests (Kolmogorov-Smirnov and Shapiro-Wilk). Therefore, it can be concluded that both datasets are normally distributed, allowing the analysis to proceed with parametric statistical tests, specifically the paired t-test, to compare the pretest and posttest results.

Hypothesis Testing

Paired Sample T-Test (Two-Tailed)

Table 5: Paired Sampel T-Test (2-Tailed) Pretest-Posttest

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-test Score - Post-test Score	-31.538	15.672	3.074	-37.869	-25.208	-10.261	25	.000

Source: Output SPSS 25.

Conclusions can be drawn in two ways: by comparing the calculated t-value with the critical t-value from the table, and by examining the significance value.

1. Testing Criteria
   a. Using the t-table and calculated t-value
      1) If |t calculated| > t table, then H_0 is rejected and H_a is accepted.
      2) If |t calculated| ≤ t table, then H_0 is accepted and H_a is rejected. If the calculated t-value is far from zero (in either the positive or negative direction), the difference is considered significant. Note: The symbol || denotes the absolute value, which ignores the negative sign. The absolute value focuses solely on the distance from zero, regardless of direction (negative or positive).
   b. Using the significance value
      1) If sig ≥ 0.05, then H_0 is accepted and H_a is rejected.
      2) If sig < 0.05, then H_0 is rejected and H_a is accepted.
2. Drawing the Conclusion Based on a significance level of 0.05 with degrees of freedom (df) = n – 1, or df = 26 – 1 = 25, the critical t-value from the table is 2.060. From the SPSS output, the calculated t-value is -10.261. Since |t calculated| > t table (|-10.261| = 10.261 > 2.060), H_0 is rejected and H_a is accepted. In addition to the comparison between the calculated t-value and the t-table, hypothesis testing can also be assessed through the significance value. The SPSS output shows a 2-tailed significance of 0.000. Since sig < 0.05, H_0 is rejected and H_a is accepted.

Based on the testing criteria using both the calculated t-value and the significance level, it can be concluded that there is a significant difference in the mastery of thaharah material before and after the use of the Wordwall application among fourth-grade students at UPTD SDN 15 Parepare

Paired Sample T-Test (One Tailed)

Table 6: Paired Sample T-Test (2-Tailed) Posttest – Pretest

Paired Samples Test									
		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-test Score - Post-test Score	31.538	15.672	3.074	25.208	37.869	10.261	25	.000

Source: Output SPSS 25.

1. Testing Criteria
   a. Using the calculated t-value
      - If t calculated > 0, then H_0 is rejected → There is a significant increase.
      - If t calculated ≤ 0, then H_0 is accepted → There is no significant increase.
   b. Using the significance value
      - If Sig. (1-tailed) < 0.05, then H_0 is rejected → There is a significant increase.
      - If Sig. (1-tailed) ≥ 0.05, then H_0 is accepted → There is no significant increase.
2. One-Tailed Test Procedure

$$Sig.(1-tailed) = \frac{Sig.(2-tailed)}{2} = \frac{0{,}000}{2} = 0{,}000$$

Based on the SPSS output for Posttest – Pretest, the calculated t-value is 10.261. Since the t-value is positive and greater than the critical t-value from the table, H_0 is rejected and H_a is accepted. In addition, the one-tailed significance test yields a sig. (1-tailed) value of 0.000. As this value is less than 0.05, H_0 is again rejected and H_a is accepted. Based on both testing criteria, it can be concluded that there is a significant increase in the mastery of thaharah material after the use of the Wordwall application among fourth-grade students at UPTD SDN 15 Parepare..

N-Gain Test

Table 7: N-Gain Data

No.	*Pretest Score*	*Posttest Score*	*N-Gain*	Interpretation
1	64	80	0,44	Medium
2	75	91	0,64	Medium
3	65	93	0,80	High
4	62	82	0,53	Medium
5	55	94	0,78	High

6	75	91	0,64	Medium
7	58	89	0,86	High
8	61	86	0,60	Medium
9	54	93	0,74	High
10	59	91	0,78	High
11	73	89	0,80	High
12	46	88	0,74	High
13	78	98	0,91	High
14	58	96	0,76	High
15	66	89	0,68	Medium
16	73	91	0,41	Medium
17	53	84	0,60	Medium
18	30	96	0,76	High
19	41	88	0,75	High
20	59	93	0,82	High
21	54	89	0,78	High
22	59	98	0,78	High
23	30	96	0,80	High
24	78	82	0,83	High
25	35	94	0,86	High
26	71	91	0,79	High
	Total		**18,88**	
	Average		**0.72**	

The average N-Gain score of the students reached 0.72. According to the N-Gain level criteria (Table 7), this value falls into the "high" category, indicating a substantial improvement in students' mastery of thaharah material from pretest to posttest. However, when interpreted using the effectiveness criteria for the intervention (Table 8), the N-Gain value of 0.72 (equivalent to 72%) is classified as "moderately effective." This distinction arises because Table 7 evaluates the magnitude of learning gain achieved by students, while Table 8 assesses the overall effectiveness of the Wordwall application as a learning medium. These findings confirm that the technology-based interactive medium provides a significant positive contribution to improving students' mastery of the material, with a high level of learning gain, although the effectiveness of the medium itself is at a moderate level and has potential for further optimization.

DISCUSSION

Differences in the Level of Mastery of Thaharah Material Before and After Using Wordwall

The results of the paired sample t-test indicate a significant difference in the mastery of thaharah material before and after the use of Wordwall, with a calculated |t| value of 10.261 and a significance level of $p = 0.000 < 0.05$. The high posttest mean score (90.46) accompanied by a relatively small standard deviation (4.843) suggests that the improvement in material mastery occurred evenly across most students. These findings

demonstrate that Wordwall-assisted learning can significantly enhance conceptual understanding of thaharah in a relatively homogeneous manner among students.

The results of this study align with various previous research that also reported significant differences in learning outcomes following the use of Wordwall. Serly et al. reported that the implementation of interactive Wordwall games on thaharah material at the junior high school level significantly improved learning outcomes (Serly, 2022). Similarly, Safitri et al., through classroom action research, found an increase in Islamic Religious Education (PAI) learning outcomes after using Wordwall at SMP Negeri 2 Langsa (Safitri et al., 2022). The consistency of these findings reinforces that Wordwall is effective in enhancing learning outcomes across various educational contexts.

However, most previous studies have primarily focused on junior and senior high school levels and examined Islamic Religious Education (PAI) material in general. Research that specifically tests differences in the mastery of thaharah material before and after using Wordwall at the elementary school level with a quantitative experimental design remains very limited. Additionally, studies that explicitly link improvements in learning outcomes to the cognitive developmental characteristics of elementary school students are still scarce. Therefore, this study addresses these gaps by providing new empirical evidence on the effectiveness of Wordwall in enhancing the mastery of thaharah material among elementary school students who are in the early stages of cognitive development (Darling-Hammond et al., 2020).

Theoretically, these findings can be understood through Jean Piaget's constructivism theory, which places elementary school students in the concrete operational stage (ages 7–11), a phase in which they begin to think logically about concrete objects and events (Waite-Stupiansky, 2022). The improvement in mastery of thaharah material through Wordwall demonstrates the processes of assimilation and accommodation, whereby students actively adjust their cognitive structures through interactive learning experiences (Rosyid & Alwi, 2024). Although the constructivist approach has been widely applied in interactive learning, its specific implementation through Wordwall in PAI instruction on thaharah material at the elementary school level has rarely been quantitatively investigated. Thus, this study further strengthens the relevance of Piaget's theory in digital-based PAI learning.

Within the constructivist framework, Wordwall serves as an interactive learning medium that facilitates students' cognitive engagement through quizzes, games, and immediate feedback (Damayanti et al., 2025). This interaction encourages students to evaluate their initial understanding, perform self-corrections, and gradually build concepts of thaharah through processes of exploration and reflection. Learning experiences centered on these activities strengthen the knowledge construction process, as students do not merely receive information but actively process and verify it themselves within a meaningful learning context (Rohmah, 2025).

Such active construction aligns with Jean Piaget's constructivist theory, where students build knowledge through direct interaction and experience, thereby enhancing motivation and learning outcomes in subjects like language arts (Montecillo, 2024). This alignment extends to religious education domains, where Wordwall's gamified activities support cognitive development in the concrete operational stage, enabling logical operations and enhanced mastery of concepts such as Arabic vocabulary in Islamic studies

(Khoriyah & Muhid, 2025). Furthermore, this approach resonates with Vygotsky's sociocultural theory, wherein collaborative interactions via Wordwall's game-based elements promote internalization of religious concepts through social engagement and guided feedback (Esteban, 2024).

In addition to Piaget's framework, the improvement and homogeneity of scores (low standard deviation) in this study were also influenced by practical factors, such as the varied and adaptive design of Wordwall activities, the provision of immediate feedback, and the increased motivation and engagement of students through game-based learning. Wordwall not only enhances learning outcomes but also promotes motivation and active participation among students, resulting in more consistent achievement levels. Thus, the significant improvement in material mastery observed in this study is the result of an optimal knowledge construction process that aligns with the cognitive developmental characteristics of elementary school students.

The Effectiveness of Using Wordwalls in Thaharah Learning

The research findings show a significant improvement in students' mastery of thaharah material after the implementation of the Wordwall application. This is evidenced by the increase in the percentage of material mastery achievement from 57% (sufficient category) to 93% (very good category), an N-Gain score of 0.72 falling into the high category, and the results of the paired t-test indicating a significant difference between pretest and posttest scores ($t = 10.261$, $p = 0.000 < 0.05$). These results suggest a positive association between the use of Wordwall and the observed enhancement in students' understanding of thaharah material, although the pre-experimental design limits the ability to establish definitive causality.

The results of this study are consistent with previous findings that demonstrate Wordwall's effectiveness in improving learning outcomes, motivation, and student engagement (Rahman et al., 2025). As a game-based medium, Wordwall can significantly enhance learning outcomes while creating a more conducive and engaging learning atmosphere. Wordwall promotes active student participation and accelerates conceptual understanding through the provision of immediate feedback from the application (Ma'arif et al., 2025). These findings suggest that Wordwall influences not only the cognitive domain but also the affective and motivational aspects of the learning process.

These findings are also supported by various studies in the context of Islamic Religious Education (PAI) across different educational levels. Safitri et al. demonstrated that the implementation of Wordwall can improve PAI learning outcomes among students at SMP Negeri 2 Langsa (Safitri et al., 2022). While Ma'arif et al. affirmed that game-based Wordwall can increase students' interest in learning PAI at the elementary school level (Ma'arif et al., 2025). The consistency of these findings indicates that Wordwall possesses strong and stable effectiveness, both in improving learning outcomes and in boosting motivation and student participation across various educational levels.

This versatility extends to other subjects, such as Civic Education and Arabic language learning in elementary and higher education settings, where Wordwall has been shown to enhance mastery and engagement through interactive gamification (Putri et al., 2024). Similarly, in science curricula, gamified activities via platforms like Wordwall have been shown to significantly elevate students' achievement and positive attitudes toward the

subject (Karagöz et al., 2024). Furthermore, empirical evidence underscores Wordwall's capacity to foster student engagement and motivation in diverse learning environments, including assessments and writing skill development (Aprilia et al., 2024). Beyond these applications, Wordwall's integration into language education, particularly for vocabulary acquisition through gamified activities like quizzes and puzzles, has been shown to enhance critical thinking and problem-solving skills (Kholis et al., 2022). Such enhancements in cognitive abilities are paralleled by Wordwall's proven role in elevating writing proficiency through interactive games that encourage collaborative tasks and spelling reinforcement (Amri & Sukmaningrum, 2023). These cognitive and linguistic advancements are further evidenced by Wordwall's positive impact on student perceptions in vocational vocabulary enrichment and its strategic alignment with learning objectives to optimize skill development (Anisah, 2022).

This alignment is exemplified by Wordwall's capacity for real-time collaboration and feedback, which significantly contributes to active learning and heightened student engagement across compatible devices such as tablets and smartphones (Rahmah et al., 2024). This cross-device compatibility further enables inclusive access in varied educational settings, such as rural secondary schools, where interactive features promote inclusivity and skill advancement (Zhang & Leong, 2024).

Nevertheless, most previous studies have primarily focused on junior high school (SMP), senior high school (SMA), and madrasah aliyah (MAN) levels, with the majority employing classroom action research (PTK) approaches and conducted in online learning contexts during the pandemic. Research that specifically examines the effectiveness of Wordwall at the elementary school level on thaharah material through a quantitative experimental approach based on N-Gain in face-to-face learning remains very limited. Therefore, this study plays a role in filling the research gap by expanding empirical evidence regarding the effectiveness of Wordwall among elementary school students in PAI instruction that is concrete and procedural in nature, particularly on thaharah material.

Theoretically, the effectiveness of using Wordwall in this study can be explained through the Cognitive Theory of Multimedia Learning (CTML) proposed by Mayer. According to CTML, learning achieves higher effectiveness when information is processed through two primary channels visual and verbal and actively managed in working memory (Amirah, 2025). Wordwall integrates text, images, animations, and immediate feedback, designed in accordance with principles such as coherence, signaling, modality, redundancy, and segmenting, thereby reducing irrelevant cognitive load and optimizing essential processing for students (Prima Belvin Gulo et al., 2024). The automatic feedback feature also assists students in promptly correcting misconceptions and supports individual remediation (Kennedy et al., 2020). Thus, the high N-Gain value in this study can be understood as a result of optimized cognitive processing through Wordwall's interactive multimedia design, which aligns with CTML principles.

Furthermore, Wordwall embodies the active processing principle in CTML, wherein students do not merely receive material passively but actively engage in answering questions, connecting concepts, and reflecting on their understanding through immediate feedback (Gusman et al., 2022)). Therefore, the effectiveness of Wordwall in this study is reflected not only in the quantitative increase in scores but also in the enhanced quality of students' cognitive processes while learning thaharah material.

CONCLUSION

The research findings confirm that the use of Wordwall significantly enhances elementary school students' mastery of thaharah material. This study also addresses gaps in previous research, which predominantly focused on junior high school (SMP), senior high school (SMA), and madrasah aliyah (MAN) levels or on Islamic Religious Education (PAI) material in general. By providing empirical evidence in the context of elementary schools and on thaharah material which is procedural and concrete in nature—these findings broaden the understanding of Wordwall's contribution as a relevant, interactive, and effective digital learning medium in PAI instruction.

Nevertheless, this study has several limitations. The sample was limited to only one class, making it difficult to generalize the findings to other schools. The design without a control group also makes it hard to confirm that the improvements in learning outcomes were solely due to Wordwall, as other factors—such as student motivation or the teacher's teaching style may have played a role. In addition, the assessment focused mainly on knowledge (cognitive aspects) and was conducted over a short period, so the impact on students' attitudes, practical skills, or long-term mastery remains unclear.

These findings suggest that Wordwall can be a practical and engaging supplementary tool for Islamic Religious Education teachers in elementary schools. Teachers can use Wordwall to present thaharah material through interactive quizzes, games, and animations, helping students become more active, motivated, and better able to understand concepts of ritual purification. The use of Wordwall as an additional medium has been shown to improve short-term material mastery, so it is recommended for regular classroom use to make PAI lessons more enjoyable and effective.

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