

Google sites integrated wordwall: Effectiveness on students' motivation and cognitive learning outcomes

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Abstract: This study aimed to create an innovative web-based learning platform using Google Sites, enhanced with Wordwall, for the Basics of Office Management and Business Services course. The research followed a 4-D development model and engaged students from class X Office Management 1 at SMK PGRI 1 Jombang. The study used expert validation sheets, student feedback questionnaires, motivation surveys, and pretest-posttest assessments to measure effectiveness. Results were promising: media experts rated the platform at 87% feasibility, while material experts rated it at 94%, both considered highly feasible. Students responded enthusiastically, with an average score of 4.21, indicating a very positive reception. Statistical analysis confirmed that the platform significantly boosted learning motivation and improved cognitive outcomes, with moderate gains and strong significance values. These findings highlight how Google Sites and Wordwall-based learning media can transform the teaching of Basics of Office Management and Business Services into a more dynamic and effective experience.

Keywords: Cognitive learning outcomes, learning media, learning motivation

Abstrak: Penelitian ini bertujuan untuk mengembangkan platform pembelajaran berbasis *web* yang inovatif menggunakan *Google Sites* yang diperkaya dengan *Wordwall* untuk mata pelajaran Dasar-Dasar Manajemen Perkantoran dan Layanan Bisnis. Penelitian ini menerapkan model pengembangan 4-D dan melibatkan siswa kelas X Manajemen Perkantoran 1 di SMK PGRI 1 Jombang. Untuk mengukur efektivitasnya, penelitian ini menggunakan lembar validasi ahli, kuesioner tanggapan siswa, survei motivasi, serta penilaian pre-test dan post-test. Hasilnya menunjukkan capaian yang menjanjikan yaitu ahli media memberikan penilaian kelayakan sebesar 87%, sedangkan ahli materi memberikan penilaian 94%; kedua angka tersebut dikategorikan sangat layak. Siswa memberikan respons yang antusias dengan skor rata-rata 4,21, yang mencerminkan penerimaan yang sangat positif. Analisis statistik mengonfirmasi bahwa platform tersebut secara signifikan meningkatkan motivasi belajar dan hasil belajar kognitif, dengan peningkatan pada tingkat sedang dan nilai signifikansi yang kuat. Temuan ini menyoroti bagaimana media pembelajaran berbasis *Google Sites* dan *Wordwall* dapat mengubah pembelajaran Dasar-Dasar Manajemen Perkantoran dan Layanan Bisnis menjadi pengalaman yang lebih dinamis dan efektif.

Kata kunci: Hasil belajar kognitif, media pembelajaran, motivasi belajar

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INTRODUCTION

Education is not merely about sharing knowledge; it also involves helping individuals develop the thinking skills and attitudes necessary to navigate the changing times. Students can reach their full potential when the learning process is systematic and continuous, enabling them to meet life's demands and seize available opportunities (Tambunan & Siagian, 2022). However, student learning motivation remains a common issue, characterized by low enthusiasm, minimal active engagement, and a lack of persistence in learning activities. This situation is largely driven by instruction that remains teacher-

centered and relies on limited use of media, preventing student participation and motivation from developing optimally (Ghory & Ghafory, 2021).

Low learning motivation does not exist in isolation; it also affects student engagement and learning outcomes. Students with low motivation tend to show limited engagement during the learning process, such as rarely asking questions, showing reluctance to complete assignments diligently, and being easily distracted, which results in suboptimal understanding of the material. This aligns with findings that student engagement contributes to improved learning outcomes; consequently, low engagement stemming from weak motivation can hinder optimal learning results (Faiz et al., 2025). Furthermore, student motivation and engagement have been shown to improve with appropriate instructional media, suggesting that without such media, motivation and learning outcomes tend to remain low (Rahmatih et al., 2024). Thus, learning motivation and cognitive learning outcomes are closely interconnected; a decline in one inevitably affects the other, requiring a simultaneous approach to address both.

Low motivation and learning outcomes stem from several contributing factors, including the suboptimal use of media and technology in instruction. As students acquire and process information, rapid advances in digital technology are transforming the learning process, so education no longer relies entirely on conventional classroom methods (Hu et al., 2026). Instruction that still relies on conventional methods while underutilizing technology-based media is a key reason the learning process often fails to engage students. Access to diverse learning resources has become broader and more flexible, ultimately driving a shift toward digital-based learning. This shift requires educators to take on a new role as facilitators who guide students in using technology effectively in the learning process (Surbakti & Chantrin, 2025).

The effective use of technology in learning offers a range of benefits for both student motivation and learning outcomes. Technology enables learning activities to happen without the constraints of time and space, as instructional materials can be accessed anytime via the internet and digital devices (Noryanto et al., 2026). This flexibility allows students to learn at their own pace and according to their needs, making the learning process more comfortable and less monotonous. Furthermore, digital interactive media have proven effective in education by encouraging active student engagement involved (Gan et al., 2015; Rahmawati et al., 2025; Surbakti & Chantrin, 2025). Integrating technology-based media into learning activities can foster greater student motivation and engagement, thereby improving learning outcomes (Faiz et al., 2025). Consequently, the appropriate use of technology-based media offers a potential solution to the previously outlined issues regarding low student motivation and poor learning outcomes.

This situation aligns with preliminary observations conducted at SMK PGRI 1 Jombang. The observations revealed that conventional media, such as whiteboards and textbooks, continue to dominate instruction in the "Fundamentals of Office Management and Business Services" subject. Although the school has LCD facilities, teachers use them inconsistently and not fully across teaching and learning activities. Furthermore, learning assessments are still conducted using conventional methods rather than interactive digital media. Consequently, some students appear to lack enthusiasm and become bored easily during lessons, indicating low learning motivation. This lack of motivation ultimately

reduces student engagement and affects learning outcomes, particularly in the cognitive domain, preventing students from achieving the expected level of performance.

Given these circumstances, technology-based learning media alternatives are needed to address issues with student motivation and learning outcomes. Google Sites is an interactive, web-based tool that teachers can use in their instructional activities. It serves as a viable learning medium because it supports structured content organization without requiring complex technical skills (Mustofa et al., 2024). Through Google Sites, teachers can integrate various types of content, such as text, images, and videos, into a neatly organized website layout, allowing students to access and study the material with greater flexibility than conventional classroom media (like whiteboards and textbooks). Its ease of use makes Google Sites an ideal tool for teachers to present learning materials in a more structured and engaging way without extensive technical training, offering a solution to the limitations of digital media use often encountered in the field.

Although Google Sites effectively delivers content in a structured way, it has limitations, particularly a lack of built-in features for interactive assessments or game-based exercises. Consequently, student engagement during the learning evaluation phase tends to remain low when relying solely on Google Sites. Therefore, supplementary tools are needed to address these shortcomings, particularly regarding more interactive evaluation methods. Integrating website-based learning media with game-based approaches can make learning more engaging and help prevent student boredom. Wordwall is one such tool that supports this approach, as it offers interactive exercises in the form of quizzes, games, and challenges (Zahroatul & Zainullah, 2025). Student motivation and engagement have been shown to increase following the implementation of this tool (Rahmatih et al., 2024). Thus, combining Google Sites as a content delivery platform with Wordwall as an interactive evaluation tool creates a complementary relationship, offering a more comprehensive solution to the previously identified issues of low student motivation and poor learning outcomes.

METHOD

This study uses an R&D methodology to create Google Sites, an online learning tool supported by Wordwall. The product is developed using a 4-D model with four stages: define, design, develop, and disseminate, developed by Thiagarajan et al. (1974). Evaluating how effective the learning materials are in improving students' motivation and thinking skills through an experimental research design. The activity was conducted from June to July 2026 at SMK PGRI 1 Jombang, involving 36 Class X Office Management 1 students as both the population and sample, which was determined through a saturated sampling technique. All students were designated as the experimental group received treatment using Google Sites web-based assisted by Wordwall. Measurements were taken using a test before treatment and another test after treatment.

The definition stage focuses on needs analysis, student characteristics, and learning problems. The planning stage includes designing Google Sites media, Wordwalls, materials, instruments, and questions. The development stage covers media creation, expert review, product updates, testing, collecting questionnaire feedback, and checking the tools used. Next, the dissemination stage involves media implementation, measuring learning motivation and cognitive learning outcomes, and disseminating the product.

This research adopted a one-group pretest-posttest design (Sugiyono, 2019). Cognitive learning outcomes were measured with a test that included pretest and posttest questions assessing four skills: C1 stands for Remembering, C2 is Understanding, C3 means Applying, and C4 refers to Analyzing.

Table 1. Pretest-posttest question grid

Learning Indicators	Cognitive Level	Number of Items
Identifying office equipment and supplies	C1	7
explain the function of office equipment and supplies	C2	10
Implementing the use and management of office equipment and supplies	C3	7
analyze the use and management of office equipment and supplies	C4	6

The learning motivation tool is a questionnaire with a 1-5 rating scale used to measure students' motivation before and after learning with Google Sites web media supported by Wordwall. The questionnaire was developed based on four learning motivation indicators according to Keller (1987), namely Attention (4 items), Relevance (4 items), Confidence (4 items), and Satisfaction (3 items), resulting in a total of 15 statement items.

Before being used in this study, the research instruments were tested for validity and reliability. To check if the tool is valid, we used the Pearson correlation, where the tool was considered valid when the computed *r* value exceeded the *r*-table value. In this study, 35 students took part in the instrument trial, so the degrees of freedom were 33, and the *r*-table value was 0.334. The reliability test checks how consistently the tool measures the research variables; the instrument was considered reliable when the Cronbach's Alpha coefficient exceeded 0.60. The results of both tests are shown in Table 2.

Table 2. Results of the validity and reliability analysis

Instrument	Initial Item	Invalid	Untestable	Items Used	r-Value Range	Cronbach's Alpha
Learning Motivation Questionnaire	16	1	-	15	0.387-0.762	0.854
Pretest-Posttest Questions	30	4	3	23	0.350-0.891	0.909

Table 2 shows that out of 16 learning motivation questionnaire items tested, 15 were valid. For the 30 cognitive learning outcome items, 23 were valid, 4 were invalid, and 3 could not be tested. The reliability test for the motivation questionnaire indicated a Cronbach's Alpha of 0.854, while pretest-posttest item reliability was 0.909. Since both values are above 0.60, the instruments are considered reliable and suitable for research.

The difficulty level and differential power tests were conducted to evaluate the quality of the test items before they were used as research instruments. The difficulty level test

aims to identify question categories based on difficulty. In contrast, the differential power test aims to identify the question's ability to differentiate students according to ability.

The data used are number-based. These numbers came from checks by media and material experts, student surveys, motivation surveys, and test results before and after using Google Sites, a web-based learning tool supported by Wordwall. The data analysis method is quantitative and aims to determine whether the media is suitable, how students respond, and how effective Google Sites with Wordwall is for motivation and learning outcomes.

Media feasibility was assessed by media and material experts, each represented by one teacher, using validation aspects adapted from Arsyad (2019). The media expert validation covered the aspect of Technical Quality, while the subject matter expert validation covered the aspects of Content Quality, Purpose, and Instructional Quality.

A questionnaire was administered to 36 students, who responded using a 1–5 rating scale. The questionnaire was developed based on indicators adapted from Pahlevi et al. (2025), consisting of two criteria: Response, covering the aspects of format and relevance, and Reaction, covering the aspects of attention, satisfaction, and confidence.

We studied how using Google Sites as an online learning tool, together with Wordwall, influenced students' motivation and thinking skills. Initially, normality and homogeneity tests were conducted to assess whether the data distributions across groups were similar. Then, we compared results before and after the learning activity using a paired t-test. To assess students' improvement in thinking skills, we used N-Gain analysis.

Calculating the validation of learning media using the formula:

$$\text{percentage} = \frac{\text{total score}}{\text{highest score}} \times 100\% \quad (1)$$

Calculate the average questionnaire response using the formula:

$$\text{mean} = \frac{\text{total score}}{\text{number of student} \times \text{number of test item}} \quad (2)$$

To see how much learning has improved, use this formula:

$$\text{N-Gain} = \frac{\text{posttest score} - \text{pretest score}}{\text{ideal score} - \text{pretest score}} \times 100\% \quad (3)$$

Table 3. Expert validation interpretation criteria (Riduwan, 2015)

Evaluation	Interpretation
81% - 100%	Very Valid
61% - 80%	Valid
41% - 60%	Fairly Valid
21% - 40%	Less Valid
0% - 20%	Invalid

Table 4. Criteria for Interpreting student responses (Pahlevi et al., 2025)

Evaluation	Interpretation
4.21 – 5.00	Very good
3.41 – 4.20	Good
2.61 - 3.40	Enough
1.81 - 2.60	Poor
1.00 - 1.80	Very Poor

Table 5. N-gain score effectiveness categories (Kolopita et al., 2022)

N-Gain Value	Criteria
$N > 0.70$	High Category
$0.30 < N < 0.70$	Medium
$N < 0.30$	Low

RESULTS AND DISCUSSION

Define stage

This subject is based on the Independent Curriculum, with the topic of Office Equipment and Supplies selected as the development focus; given the procedural nature of the material, optimal student understanding requires visual aids and repetitive practice. This approach aligns with the Cognitive Theory of Multimedia Learning, which posits that learners process information through two distinct channels verbal and visual meaning that instructional content combining text and visuals helps learners construct a more complete mental model of a process than relying solely on verbal explanations (Mayer, 2021). Based on these considerations, the researcher incorporated multimedia elements such as text, images, and quizzes into the design of the learning media. Google Sites, serving as a web-based learning platform integrated with Wordwall, was deemed an appropriate choice for development, as the use of interactive digital media has been shown to boost student motivation and engagement, thereby contributing to improved learning outcomes (Faiz et al., 2025; Rahmatih et al., 2024).

Planning stage

The planning results produced a Google Sites Web media blueprint containing a structure of six main menus, namely (1) Home, (2) Menu, (3) Instructions, (4) Material, (5) Game consisting of four types of games integrated by Wordwall, namely Match Up, Group Sort, Open the Box, and Quiz, and (6) Developer Profile. Wordwall is integrated into the Game menu as an evaluation and understanding exercise. Various game types are used so that students do not feel monotonous during the process. The instruments developed at this stage include media expert assessment sheets 15 items, material experts 20 items, response questionnaires 15-question survey with a 5-point scale, a 15-question motivation survey with the same scale, and 20 questions before and after the test to measure students' thinking and learning results.

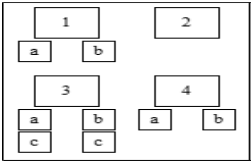
Main Menu		
		
Text and Image	Description	Action
Text and Image	The main menu provides access to the learning content, instructions, interactive Wordwall games, and developer profiles. It allow student to select each feature according to their learning needs.	1. Main Menu Text 2. Instruction a. Instructional Media b. Instructional Wordwall Games 3. Material 4. Games a. Match Up b. Group Sort c. Open the Box d. Quiz 5. Developer Profil a. Supervisor Profil b. Media Development Profil

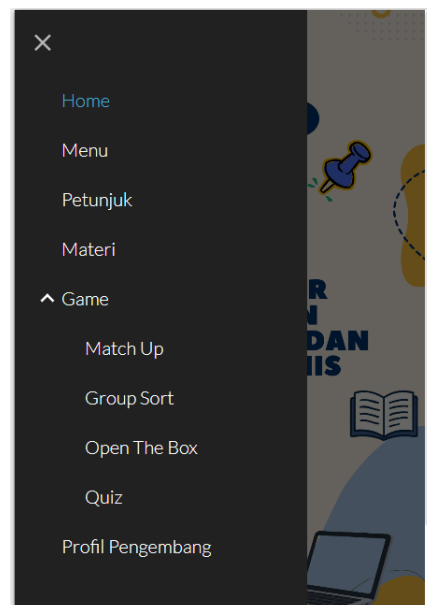
Fig. 1. Media storyboard

Development stage

At this stage, the Google Sites learning media was developed based on the previously created storyboard design. The developed media includes a home section displaying the material's title and topic, as well as a menu section that provides access to instructions, materials, and interactive games through Wordwall. Fig. 2 shows the appearance of the developed learning media.



(a) Home section (initial display)



(b) Menu section in learning media

Fig. 2. View of learning media

Media and content experts checked the product to determine whether the learning materials were appropriate by testing them with students. Table 6 presents the results of their review.

Table 6. Validation results by experts

Aspects	Presentation	Category
Media Expert	87%	Very Valid
Subject Matter Expert	94%	Very Valid

Based on Table 6, the media received scores of 87% and 94% from the two experts, making it highly suitable. The media expert suggested adding audio or narration relevant to the material to strengthen students' understanding during independent learning.

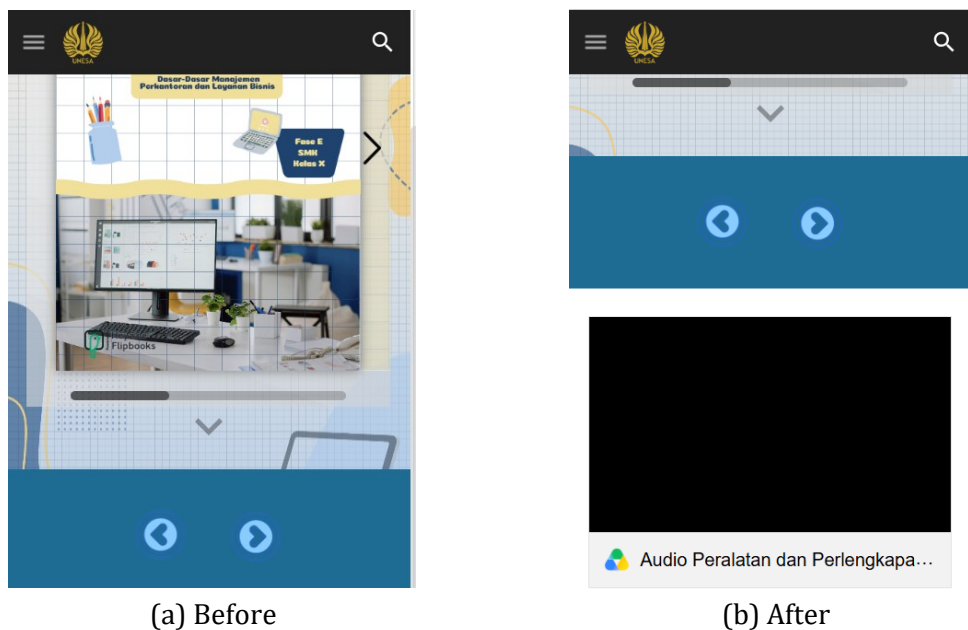


Fig. 3. Revision of learning media

We conducted difficulty and discrimination assessments to evaluate the quality of the test items before using them in the research instruments. Table 7 shows the results.

Table 7. Difficulty level and differential power results

Test	Category	Amount
Difficulty Level	Easy	22
	Currently	1
Differential Power	Enough	5
	Good	13
	Very good	5

Based on Table 7, the difficulty-level test results for the 23 items showed that 22 items were categorized as easy and 1 item as moderate. Meanwhile, the discriminatory power

showed that 5 items were categorized as sufficient, 13 items as good, and 5 items as very good. The 20 best items were selected, considering the level of difficulty and discriminatory power, to be used as the test instrument. A response questionnaire was administered to 36 students to determine their responses to the revised learning media. Table 8 presents the results.

Table 8. Results of student response questionnaire

Aspect	Respondents	Mean Value	Category
Format	36	4.24	Very good
Relevance	36	4.41	Very good
Attention	36	4.09	Good
Satisfaction	36	4.16	Good
Confidence	36	4.10	Good
Overall Average	36	4.21	Very good

Based on Table 8, 36 students acquired a mean value of 4,21, indicating a very good level of reliability. This indicates that Google Sites web process using the developed Wordwall received a very positive response from students.

Google Sites Web media eligibility assisted by Wordwall

The Google Sites web-based assisted by Wordwall, was categorized as very feasible. This feasibility meets the required criteria from both media and material aspects. Developed media is considered appropriate and can be used to support learning activities. The media deliver material more interactively, providing an interesting student educational engagement. This finding aligns with research showing that Google Sites web-based learning media with R&D obtains high validity because various multimedia elements become an interconnected whole (Hermawati & Yulianto, 2025; Maharani et al., 2025; Sitompul et al., 2026).

The material received a high validation score because its content matches the Learning Outcomes set by the Independent Curriculum. The Office Equipment and Supplies material requires procedural understanding, supported by illustrations and repeated practice. From the media aspect, the validator assessed that the visual design of Google Sites met the principles of learning design. Navigation within the media is clearly structured, and the layout is consistent, making it easy to use. The media expert's suggestion to add audio or narration fits with the Cognitive Theory of Multimedia Learning (CTML). This explains combination text, images, and audio help learners process information, thereby sharpening understanding.

The student response questionnaire in the developed media received a very good response. With the high response results, media was effective, easy to use, and students enjoyed it (Putri et al., 2025). Integrating Wordwall as a game-based evaluation medium contributed to the highly positive response, because it increased engagement and reduce student boredom (Hartati et al., 2024; Panis et al., 2025). Thus, the Web learning media assisted by Wordwall, designed in this study, was found to be viable and practical for use in learning activities.

Dissemination stage

Results of learning motivation data analysis

The student learning motivation data were first tested for normality and homogeneity before hypothesis testing. This met the requirements for using parametric statistics. Table 9 shows the results.

Table 9. Normality and homogeneity test

Statistical Test	Statistical Value	Sig. (p-value)	Information
Normality Before Treatment	W = 0.957	0.179	Normal
Normality After Treatment	W = 0.968	0.374	Normal
Homogeneity (Levene's Test)	F = 3.434	0.068	Homogeneous

Table 9 presents the results of the Shapiro-Wilk normality assessment, yielding a p-value of 0.179 before the intervention and 0.374 afterward. Because both values exceed 0.05, the dataset can be considered normally distributed. The homogeneity test resulted in 0.068, likewise exceeding the threshold, indicating that the variance between the two conditions is homogeneous. With these assumptions satisfied, the hypothesis was subsequently examined using a paired-samples t-test. Table 10 presents the descriptive statistics corresponding to these results.

Table 10. t-Test and descriptive statistic results

Data	N	Mean	Standard Deviation	t	df	Sig. (2-tailed)	Mean Difference
Before Treatment	36	57.03	4,171	-3,339	35	0.002	-4,056
After Treatment	36	61.08	5,448				

Based on Table 10, the average learning motivation before treatment was 57.03, after treatment was 61.08, and the average difference was -4.056. The t-test computation revealed a t-value of -3.339 with df 35, alongside a p-value (2-tailed) of 0.002, falling under the established 0.05 criterion. As this figure is smaller than the established criterion, H1 is accepted. The results show that students' motivation to learn changed noticeably after the intervention compared to before.

Media influences motivation in learning

Google Sites and Wordwall-assisted web-based learning media greatly influence how motivated students are to learn. The difference in conditions before and after treatment indicates that using learning media can increase student motivation; thus, H1 is accepted. Media aids in the precise delivery of material, creating captivating learning experiences and fostering student participation based on the research findings.

A surge in learning motivation often stems from ARCS theory, which brings to life the energizing forces of Attention, Relevance, Confidence, and Satisfaction developed by Keller (1987). Learning media can attract attention through interactive materials and varied evaluations, while the Wordwall game. Encourage students to participate more actively. The

relevance aspect: structured material helps students understand the connection between the material and the learning activities undertaken. Wordwall activities give students opportunities to try and answer directly and gain experience, thereby increasing self-confidence. Providing feedback through games can create a fun experience that supports satisfaction. Thus, Google Sites web-assisted Wordwall can support attention, relevance, confidence, and satisfaction through interactive, participatory, and cheer up learning experiences.

This study found that digital learning media can improve student engagement and motivation (Damopolii, 2025). Gamification also creates a more engaging learning atmosphere because students receive challenges, feedback, and game-based learning experiences (Alfares, 2025; Kore et al., 2025; Zedri et al., 2025). The activity demonstrates that using games in learning makes students more enthusiastic about their lessons.

Results of cognitive learning outcome data analysis

We analyzed improvements in thinking skills and student learning outcomes using N-Gain scores. The N-Gain score was 0.5352, indicating a moderate improvement in students' thinking and learning abilities after the intervention. Because the sample size was limited, we used the Shapiro-Wilk test to assess normality. To strengthen the reliability of the findings, we also applied Levene's test for homogeneity, and all presented in Table 11.

Table 11. Normality and homogeneity tests outcome

Statistical Test	Statistical Value	Sig. (p-value)	Information
Pretest Normality	W = 0.945	0.073	Normal
Posttest Normality	W = 0.943	0.063	Normal
Homogeneity (Levene's Test)	F = 0.124	0.726	Homogeneous

Table 11 presents the normality test results, with p-values of 0.073 before treatment and 0.063 after treatment. Both values exceed 0.05, indicating normality. The homogeneity test result is 0.726, indicating that the variances between pre-treatment and post-treatment remain consistent. Because these assumptions are met, the paired-samples t-test was used. Table 12 presents the descriptive statistics used in this analysis.

Table 12. Descriptive statistics and t-test results

Data	N	Mean	SD	t	df	Sig. (2-tailed)	Mean Difference
Pretest	36	74.58	7,500	-9,924	35	0,000	-13,750
Posttest	36	88.33	6,655				

Based on Table 12, the average cognitive learning outcomes before treatment was 74.58 and after treatment was 88.33, with an average difference of -13.750. The t-test yielded a notable t-value of -9.924 with a df of 35. With a two-tailed p-value of 0.000, which is less than 0.05, the results convincingly support H2. This demonstrates a marked shift in students' thinking and learning following the intervention.

Media affects cognitive learning outcomes

Students' cognitive learning outcomes improved after they received the treatment. The N-Gain results showed an increase, which is classified as moderate. The test revealed a clear difference in learning results before and after the treatment, which led to the acceptance of H2. This means that using Google Sites web-based learning tools with Wordwall led to a clear improvement in learners' thinking skills.

This improvement is inseparable from Wordwall's characteristics as a more engaging and less monotonous game-based evaluation medium. Game-based learning activities encourage students to be active, thereby increasing attention and engagement during the learning process. Using Wordwall can positively influence student learning outcomes (Rezeki & Amelia, 2025; Siregar et al., 2025). Implementing game-based learning through Wordwall can improve understanding compared to conventional learning (Fadilah et al., 2025; Rahman et al., 2025).

Presenting material through Google Sites also encourages students' cognitive learning processes. The structured material allows students to access, understand, and review it independently, both before and after evaluation through Wordwall. This matches the ideas in the Cognitive Theory of Multimedia Learning. The theory says that students build understanding by combining words and pictures with what they already know. Therefore, presenting material through Google Sites and gamification through Wordwall can create learning experiences that encourage students' understanding and achievement of cognitive learning outcomes.

CONCLUSION

Based on the research results, the Google Sites learning media supported by Wordwall is valid and effective for improving students' learning motivation and thinking skills in Office Management. The product was developed through the 4-D model, involving needs analysis, media and storyboard design, and integration with Wordwall's interactive game features. Media and material experts declared the instrument very valid. In addition, the media's effectiveness in improving students' learning motivation was proven by a significant increase in the mean score. The media's effectiveness in improving students' thinking skills was also demonstrated by a significant increase in cognitive learning outcomes, with the improvement falling into the moderate category. Thus, the Google Sites learning media supported by Wordwall has been proven suitable for supporting the learning process in a more interactive, motivating, and meaningful way.

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