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THE EFFECTIVENESS OF AN INTERACTIVE DIGITAL MODULE BASED ON GAMIFICATION IN ENHANCING JUNIOR HIGH SCHOOL STUDENTS' VOCABULARY LEARNING MOTIVATION

Muhamad Khoerul Hadits[1*], Al Juska Sasni Akbar[2], Muhamad Ichsan Nurjam'an[3], Lucky Dewanti,[4]
[1]Pendidikan Bahasa Inggris, UMBARA, Indonesia
[2]Administrasi Pendidikan, UMBARA, Indonesia
[3]Pendidikan Bahasa dan Sastra Indonesia, UMBARA, Indonesia,
[4]Pendidikan Guru AUD, UMBARA, Indonesia
*coiruel12@mail.com, *aljuska05uika@gmail.com
*ichsan2820@gmail.com, *luckydewanti187@gmail.com

Abstrak

Penelitian ini bertujuan untuk mengembangkan dan mengukur efektivitas modul digital interaktif berbasis game dalam meningkatkan minat dan kemampuan belajar kosakata siswa kelas VII SMPN 2 Leuwisadeng. Penelitian menggunakan desain Research and Development (R&D) dengan model ADDIE yang meliputi tahap analisis, desain, pengembangan, implementasi, dan evaluasi. Pengukuran aspek persepsi melibatkan tiga indikator, yaitu motivasi, keterlibatan, dan ketekunan yang dianalisis melalui kuesioner berbasis skala Likert. Hasil analisis menunjukkan bahwa ketiga indikator berada pada kategori cukup tinggi hingga tinggi, yang mengindikasikan bahwa modul berbasis gamifikasi mampu meningkatkan minat belajar siswa terhadap kosakata bahasa Inggris. Pada aspek kognitif, hasil pre-test dan post-test menunjukkan peningkatan signifikan dari nilai rata-rata 51.54 menjadi 71.83. Uji *paired samples t-test* menghasilkan nilai $p < 0.001$ yang menandakan bahwa penggunaan modul digital interaktif memberikan dampak signifikan terhadap peningkatan penguasaan kosakata siswa. Secara keseluruhan, penelitian ini menyimpulkan bahwa modul digital interaktif berbasis game efektif dalam meningkatkan minat dan hasil belajar kosakata siswa dan dapat dijadikan alternatif inovatif dalam pembelajaran bahasa Inggris di tingkat SMP.

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Kata kunci : modul digital interaktif, gamifikasi, kosakata, motivasi belajar, hasil belajar.

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Abstract

This study aims to develop and evaluate the effectiveness of an interactive digital module based on gamification to enhance seventh-grade students' vocabulary learning interest and achievement at SMPN 2 Leuwisadeng*. The research employed a Research and Development (R&D) approach using the ADDIE model, consisting of analysis, design, development, implementation, and evaluation stages. Students' perception was measured through three indicators—motivation, engagement, and grit—using a Likert-scale questionnaire. The results indicate that all three indicators fall within the moderately high to high categories, demonstrating that the gamified module successfully increased students' interest in learning English vocabulary. In terms of cognitive performance, the pre-test and post-test results show a significant improvement, with the mean score increasing from 51.54 to 71.83. A paired samples t-test revealed a significance value of $p < 0.001$, confirming that the interactive digital module had a substantial impact on students' vocabulary mastery. Overall, the findings suggest that the gamification-based interactive digital module is effective in improving both students' learning interest and vocabulary achievement and can serve as an innovative alternative for English language instruction at the junior high school level.*

Keywords*: interactive digital module, gamification, vocabulary, learning motivation, learning outcomes.*

I. Introduction

Vocabulary learning plays a crucial role in the success of English language acquisition at the secondary school level. Vocabulary serves as the foundation that supports listening, reading, speaking, and writing skills. Despite its essential role, recent studies show that Indonesian students' vocabulary mastery remains low, largely due to unengaging teaching methods and the underutilization of technology (Simonnet, 2025). These findings underscore the need for innovative learning strategies capable of enhancing students' motivation and interest to make vocabulary acquisition more meaningful and sustainable.

In many secondary schools, vocabulary instruction is still dominated by conventional methods such as word lists, memorization, and repetitive written exercises. Studies in the last five years confirm that such approaches often lead to boredom, low learner engagement, and limited opportunities for meaningful interaction with the language (Evandri, 2024). This situation negatively impacts vocabulary retention, concept comprehension, and students' ability to apply vocabulary in real communication. Thus, the main issue is not only the limited amount of vocabulary students acquire, but also the lack of engaging and relevant instructional strategies aligned with the characteristics of today's learners.

As digital technology develops, opportunities arise to design more interactive learning media. Educational technology—especially those integrating digital platforms and gamification principles—has been shown to increase motivation, attention, and learner engagement (Zakaria & Zakaria, 2023). Learning that incorporates elements such as rewards, challenges, badges, and leaderboards creates a more competitive and enjoyable experience. López-Fernández et al. (2024) find that game-based

learning not only enhances learning experiences but also improves academic performance due to active and collaborative interaction.

Digital game-based learning also plays an important role in language learning, particularly vocabulary acquisition. Recent studies reveal that digital game environments provide multimodal learning experiences that combine visuals, audio, interactivity, and contextualized tasks, which reinforce long-term memory (Amzalag et al., 2024). Interactive features in educational games offer instant feedback, help learners correct errors immediately, and increase engagement throughout the learning process. Through these integrated features, game-based learning becomes an effective approach to addressing the low interest in vocabulary learning among secondary school students.

In addition to interactivity, adaptive technology is a recent focus in educational research. Adaptive systems allow learning activities or task difficulty to be adjusted according to students' performance. In vocabulary learning contexts, Gómez et al. (2022) demonstrate that game-based assessment tools can automatically monitor learners' proficiency levels and provide more personalized learning experiences. This indicates substantial potential in combining digital games with adaptive learning systems to increase vocabulary learning effectiveness.

However, critical reviews highlight that many game-based media implemented in schools have not been developed using systematic instructional design frameworks. Most educational games merely convert conventional exercises into digital formats without considering pedagogical principles or structured learning flows (Slattery et al., 2025). This results in temporary increases in learner interest but insignificant long-term effects on learning outcomes. Therefore, the development of interactive digital modules based on games must employ comprehensive instructional design approaches such as the ADDIE model to ensure pedagogical quality, relevance, and effectiveness.

In the Indonesian context, studies on vocabulary learning media using game-based approaches have begun to emerge, but most target elementary students and use relatively simple applications. Research by Evandri (2024) and Nurhidayat and Asro (2024) focuses primarily on basic exercise-supported applications rather than comprehensive digital modules. Few studies have produced fully interactive digital modules that integrate multiple activities—such as leaderboard-based quiz challenges, word-matching puzzles, and interactive storytelling—to enhance vocabulary learning interest among secondary school students. This gap highlights the need for more sophisticated game-based learning modules specifically designed for this educational context.

Based on this literature review, there is a clear gap: the absence of interactive digital modules based on game mechanics that are systematically designed using the ADDIE model and empirically tested for their effectiveness in improving vocabulary learning interest among secondary school students. This gap signifies the novelty of

the present study, particularly in terms of instructional design, media development, and the measurement of motivation, interest, and learning experience. The study offers significant contributions by integrating gamification, adaptive technology, and interactive digital media into a unified learning module tailored for vocabulary learning.

Considering this research gap, the present study focuses on evaluating the effectiveness of an interactive digital module based on game mechanics in increasing secondary school students' interest in vocabulary learning. This focus is crucial because learning interest is a key factor driving active engagement and improved learning outcomes. Learning interventions that significantly enhance interest are likely to support better concept acquisition and greater long-term academic success.

The expected outcome of this study is to contribute to the development of innovative learning media relevant to modern learners' needs. Additionally, this research provides empirical insights into how interactive digital game-based modules can be used to enhance interest in vocabulary learning. From a scientific standpoint, the study strengthens the literature on digital game-based learning, particularly within the Indonesian English-learning context, and offers strategic recommendations for teachers and instructional media developers.

II. Research Method

This study employed a Research and Development (R&D) design aimed at developing and evaluating an interactive digital module based on game mechanics to improve secondary school students' interest in learning English vocabulary. The R&D approach was selected because it provides a systematic, iterative, and user-centered framework suitable for designing instructional products and testing their pedagogical effectiveness. The development process followed the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. This model is widely used in technology-enhanced learning research due to its structured steps and emphasis on continuous improvement.

The study was conducted at SMPN 2 Leuwisadeng, located in Bogor Regency, West Java, Indonesia. The school was selected purposively based on its readiness to implement digital learning innovations, the availability of basic technological facilities, and the support of the English teacher who was willing to be involved in the implementation process. The research participants consisted of 63 seventh-grade students, comprising 35 students from class VII-1 and 28 students from class VII-2. In addition to the student participants, one English teacher participated as a collaborator in the implementation, and two expert validators (a media expert and a content expert) assessed the quality of the developed module.

The first stage, Analysis, focused on identifying learners' needs, challenges in vocabulary instruction, and gaps in the current learning environment at SMPN 2 Leuwisadeng. Data were collected through classroom observations, interviews with the English teacher, and needs-analysis questionnaires administered to all 63 students in classes VII-1 and VII-2. The findings indicated that students had low

motivation and interest in learning vocabulary due to the repetitive and conventional teaching techniques commonly used. Students also showed a strong preference for visually appealing, interactive, and game-based learning media. These insights informed the direction of the module design to ensure alignment with learner characteristics and curriculum objectives.

The Design stage involved determining learning objectives, structuring vocabulary content, planning game-based activities, and developing a storyboard for the module. The module incorporated various types of game-based learning activities such as leaderboard-based quiz challenges, word-matching puzzles, and interactive storytelling segments. Gamification elements—such as points, scores, badges, and instant feedback—were included to increase engagement and create a more enjoyable learning experience. The development platform selected was Construct 3, producing an HTML5-based module to ensure accessibility across laptops and mobile devices.

During the Development stage, the storyboard was transformed into a functional digital module. This stage involved creating digital assets such as icons, animations, illustrations, audio effects, and interface layouts, which were then integrated into the learning flow. The prototype module underwent expert validation. The media expert evaluated visual quality, navigation, interactivity, and aesthetic appeal, while the content expert assessed linguistic accuracy, vocabulary relevance, and alignment with curriculum standards. Revisions were made based on expert feedback to refine instructions, improve user interface clarity, and strengthen the overall learning experience.

The Implementation stage was carried out in two phases: a small-group trial and a full-scale implementation. The small-group trial involved a subset of students from class VII-1, whose participation helped identify technical issues, navigation challenges, and instructional clarity. After adjustments were made, the module was implemented with the full sample of 63 students—35 from VII-1 and 28 from VII-2. Students used the module independently under the supervision of the teacher and researcher. Observations were conducted to record engagement levels, user responses, and any operational difficulties encountered during the learning process. A user-experience questionnaire was also administered to assess practicality and usability.

The Evaluation stage included both formative and summative assessments. Formative evaluation occurred throughout the development phases to ensure continuous product improvement. Summative evaluation was conducted after module implementation to measure its effectiveness in enhancing students' interest in vocabulary learning. Two main instruments were used: a vocabulary learning interest questionnaire using a five-point Likert scale and vocabulary tests (pre-test and post-test). The questionnaire measured dimensions of intrinsic motivation, engagement, enjoyment, and persistence, while the vocabulary tests assessed students' comprehension before and after using the module.

Quantitative data were analyzed using descriptive and inferential statistics. Descriptive statistics included mean scores, percentage distributions, and score tendencies. To determine the module's effectiveness, a paired-samples t-test was conducted when normality assumptions were met. For non-normal data, the Wilcoxon signed-rank test was used. Qualitative data from classroom observations and field notes were analyzed using thematic analysis to complement quantitative findings and provide deeper insights into students' learning experiences.

Ethical considerations were carefully addressed. Permission was obtained from the school, and parents were informed of their children's participation in the study. All student data were anonymized and used solely for research purposes. The implementation of the digital module did not disrupt the regular learning schedule, and all students were provided equal access to the learning intervention.

Overall, the application of the ADDIE model ensured that the digital interactive module was developed systematically, validated rigorously, and evaluated meaningfully. The combination of quantitative and qualitative methods provided a comprehensive understanding of the module's effectiveness in improving vocabulary learning interest among seventh-grade students at SMPN 2 Leuwisadeng. The approach used in this study demonstrates a strong pedagogical foundation for integrating game-based and interactive digital media into English vocabulary instruction.

III. Finding and Discussion

A. Finding

This chapter presents the research findings obtained through the analysis of questionnaire data and test results conducted to evaluate the effectiveness of the game-based interactive digital module in improving students' interest and vocabulary learning ability at SMPN 2 Leuwisadeng. The presentation of results focuses on two main types of data: (1) measurements of students' affective aspects, which include motivation, engagement, and perseverance collected through a questionnaire instrument, and (2) measurements of cognitive aspects in the form of vocabulary mastery tests administered before and after the use of the module. These two data sets are used to provide a comprehensive picture of changes in students' learning experiences and learning achievements after receiving the intervention through the interactive digital module.

The first section presents the descriptive analysis of the questionnaire, illustrating the level of students' learning interest based on three main indicators: motivation, engagement, and perseverance. This analysis provides an understanding of how the game-based interactive digital module influences students' psychological and affective aspects during the learning process. The assessment was carried out using a Likert scale of 1–5, and the results were analyzed to identify response trends, score distribution, and the characteristics of each indicator.

The second section describes the vocabulary mastery test results, including pre-test and post-test scores, as an objective measurement of students' improvement in English vocabulary after using the module. This analysis was conducted to determine the extent to which the interactive digital module could significantly enhance students' learning outcomes. Statistical tests were employed to compare pre-test and post-test scores, allowing the identification of academically meaningful improvements.

The discussion in this chapter not only focuses on numerical and statistical data but also links the empirical findings with relevant theories and previous studies. This approach ensures deeper interpretation and provides scientific justification for the effectiveness of the game-based interactive digital module as a medium for vocabulary learning. In addition, the discussion highlights aspects that require further development so that the module can deliver more optimal learning impacts in the future.

Table 1. Descriptive Statistics of Motivation

	Statement	N	Mean	Std. Deviation
1.	I feel happy when learning English.	63	3.17	1.129
2.	I have a high curiosity to learn new vocabulary.	63	3.30	1.131
3.	I feel that learning English vocabulary is useful for my future life.	63	3.40	1.420
4.	I am motivated to master vocabulary so that I can understand texts or conversations in English.	63	3.52	1.176
5.	I try to learn new vocabulary even without being instructed by the teacher.	63	2.98	1.198
Valid N (listwise)		63		

Based on the results of the descriptive statistical analysis of the intrinsic motivation variable, the average scores ranged from 2.98 to 3.52, indicating that students' motivation falls into the moderately high category. These findings show that the use of the game-based interactive digital module contributes positively to increasing students' motivation in learning English vocabulary.

The item with the highest score is the statement *"I am motivated to master vocabulary so that I can understand texts or conversations in English"* (Mean = 3.52). This indicates that students understand the long-term benefits of vocabulary mastery and recognize that such competence is essential for overall English proficiency. The game-based module appears to provide learning experiences and contexts that help students feel more connected to these learning goals.

Meanwhile, the lowest score appears in the item *"I try to learn new vocabulary even without being instructed by the teacher"* (Mean = 2.98). This finding suggests that although the module can enhance students' enjoyment and interest, their self-initiated learning remains moderate. In other words, students tend to be motivated when stimulated by engaging activities, but they have not yet fully developed independent vocabulary-learning habits.

Overall, these results indicate that students' learning motivation increases, particularly in terms of perceived benefits, learning goals, and the drive to understand

English texts. Nevertheless, the module needs to explicitly incorporate features that encourage self-directed learning, such as daily challenges, continuous points systems, or progress-tracking features that promote repeated engagement.

Table 2. Descriptive Statistics of Engagement

Statement	N	Mean	Std. Deviation
1. I stay focused when the teacher explains English vocabulary material in class.	63	3.35	1.272
2. I participate actively during vocabulary exercises or discussions.	63	3.22	1.142
3. I feel enthusiastic when there are activities related to vocabulary.	63	3.14	1.075
4. I try to complete all vocabulary assignments given by the teacher.	63	3.46	1.202
5. I feel that vocabulary learning time in class passes quickly because I am actively involved.	63	3.06	1.076
Valid N (listwise)	63		

The engagement variable shows an average score ranging from 3.06 to 3.46, indicating that students' level of engagement in vocabulary learning falls within the moderately high category. Engagement is an important indicator of the effectiveness of game-based learning, as digital learning requires active participation and sustained attention.

The item with the highest score is *"I try to complete all vocabulary assignments given by the teacher"* (Mean = 3.46). This finding suggests that students feel encouraged to complete all assigned activities, either because the game provides an enjoyable learning experience or because gamification features such as points, levels, or leaderboards stimulate healthy competition.

On the other hand, the lowest score appears in the item *"I feel that vocabulary learning time in class passes quickly because I am actively involved"* (Mean = 3.06). This value indicates that although students feel engaged, their level of flow experience has not yet reached its optimum. Flow is a state in which students enjoy the learning activity so much that time seems to pass more quickly. This may indicate that the module still requires deeper interactive elements, such as more varied games, narrative-based learning, or personalized learning experiences.

Overall, students' engagement is fairly good but can be further enhanced by incorporating features that promote sustained active participation, such as group collaboration, inter-class competitions, or multi-level game activities with special rewards.

Table 3. Descriptive Statistics of Grit

Statement	N	Mean	Std. Deviation
1. I do not give up easily when encountering vocabulary that is difficult to understand.	63	3.22	1.184
2. I continue trying to find the meaning of vocabulary even if I do not immediately understand it.	63	3.33	1.218

Statement	N	Mean	Std. Deviation
3. I consistently practice vocabulary to improve my English skills.	63	3.33	1.218
4. I try to remember new vocabulary even though it takes a long time.	63	3.46	1.075
5. I am committed to improving my vocabulary skills even when faced with difficulties.	63	3.21	1.194

The perseverance or grit variable shows the highest average scores compared to the other two variables, ranging from 3.21 to 3.46, which falls into the high category. This indicates that students possess a good level of perseverance in learning vocabulary using the game-based digital module.

The item with the highest score is *"I try to remember new vocabulary even though it takes a long time"* (Mean = 3.46). This finding demonstrates that the game-based digital module is able to encourage students' persistence in completing learning activities, particularly because the game provides progressive challenges that stimulate their desire to keep trying until they succeed.

Meanwhile, the item with the lowest score is *"I am committed to improving my vocabulary skills even when faced with difficulties"* (Mean = 3.21). Although this still falls within the moderately high category, the score suggests that students need additional support or reinforcement to maintain long-term commitment to vocabulary learning. Features such as progress tracking or rewards for long-term achievements could further strengthen this commitment.

These findings indicate that the digital module helps enhance students' grit through challenges that encourage persistence. This is important because perseverance is a key predictor of long-term success in language learning.

Overall, the analysis of the three variables—motivation, engagement, and perseverance—shows that the use of a game-based interactive digital module has a positive influence on students' interest in learning English vocabulary. The motivation variable reveals that students feel more interested and driven to learn when materials are presented through interactive game-based activities, although the aspect of self-directed learning still requires improvement. In the engagement variable, the scores indicate that students are fairly active in participating in learning tasks, yet they have not fully reached the optimal level of engagement or flow, especially in learning situations that require sustained focus and participation. Meanwhile, the perseverance variable obtains the highest scores, indicating that students tend to be persistent and not easily discouraged when facing challenges in understanding new vocabulary—a condition likely influenced by the competitive and progressive elements of gamification.

All those three variables demonstrate that the game-based interactive digital module can create a more motivating, engaging, and challenging learning environment, thereby supporting stronger learning interest compared to conventional instruction. However, the findings also highlight the need for further development to improve students' autonomy and deeper engagement so that learning can proceed more optimally and sustainably.

Before further discussing the effectiveness of the game-based interactive digital module in improving students' vocabulary mastery, this section presents the results of the cognitive aspect measurement obtained through the pre-test and post-test. This measurement aims to evaluate the extent to which the gamification-based learning intervention produces significant changes in students' ability to understand and remember English vocabulary. By comparing pre-test and post-test scores and conducting relevant statistical analyses, an objective picture is obtained regarding the module's impact on the development of students' cognitive abilities, complementing the findings on the affective aspects presented earlier.

Table 4. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre_Test	63	44	60	51.54	4.150
Post_Test	63	65	81	71.83	4.094
Valid N (listwise)	63				

The descriptive table shows that the number of respondents who participated in the test was 63 students. The pre-test scores ranged from 44 to 60 with an average of 51.54, while the post-test scores ranged from 65 to 81 with an average of 71.83. This indicates an increase of 20.29 points in the mean score after the use of the game-based interactive digital module.

The difference between the minimum and maximum scores also illustrates an overall improvement in students' abilities. In the pre-test, the highest score reached only 60, whereas in the post-test it increased to 81. The wider score range in the post-test reflects that most students were able to perform better after participating in gamified learning.

The standard deviations of the pre-test (4.150) and post-test (4.094) are relatively similar, indicating that the distribution of scores before and after the intervention remained consistent. With a significantly increased mean score and a relatively small difference in distribution, these data suggest that the interactive digital module not only improved scores but also provided a stable and evenly distributed impact across all students.

Overall, the descriptive table provides an overview that the game-based interactive digital module is effective in improving students' vocabulary mastery, as the improvement occurred not only in some students but across the entire group.

Table 5. Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Pre_Test	.105	63	.081	.971	63	.136
Post_Test	.088	63	.200*	.969	63	.119

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Both p-values are greater than 0.05, indicating that the data are normally distributed. Thus, the assumption of normality is fulfilled, and parametric tests such as the Paired Sample t-test can be used to examine the effectiveness of the module.

These results confirm that the pre-test and post-test scores follow a reasonable distribution and do not show extreme deviations, ensuring that the inferential statistical analyses used can produce academically valid results.

This interpretation of normality is important because it provides a strong basis for selecting the appropriate follow-up test. Meeting the normality assumption indicates that the increase in scores is not the result of extreme outliers, but rather reflects a systematic and consistent pattern of distribution.

Table 6. Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	**Pre_Test - Post_Test**	-20.286	.851	.107	-20.500	-20.071	-189.296	62	.000

The results of the paired samples t-test indicate that there is a highly significant improvement in vocabulary ability after students participated in learning using the game-based interactive digital module. The mean difference between the pre-test and post-test scores is 20.286 points, with post-test scores consistently higher than pre-test scores. The obtained t-value of -189.296 is extremely large in the context of statistical testing, indicating that the difference observed is not due to chance but reflects a real change in students' abilities. The significance value of 0.000 ($p < 0.001$) further confirms that the improvement is statistically highly significant.

In addition, the 95% confidence interval ranging from -20.500 to -20.071 strengthens the conclusion that the learning effect produced by the interactive digital module is consistent and stable across all participants. Thus, the paired t-test provides strong evidence that the game-based interactive digital module has a substantial positive influence on students' cognitive achievement, particularly in English vocabulary mastery.

B. Discussion

The results of the motivation aspect measurement show that students have a moderately high level of motivation in learning vocabulary after using the game-based interactive digital module. The average motivation scores ranged from 2.98 to 3.52, indicating that students feel more interested and driven to learn when learning activities are presented in an interactive and gamified format. This finding aligns with the study by Zakaria and Zakaria (2023), which explains that gamification elements

such as points, challenges, and instant feedback can enhance students' learning interest by activating internal reward systems. Thus, the digital module not only enriches students' learning experiences but also increases their intrinsic motivation to understand new vocabulary.

In the engagement aspect, the scores obtained ranged from 3.06 to 3.46, indicating that students were fairly active in participating in the game-based learning process. The presence of interactive elements that require quick responses and problem-solving activities helps students stay focused and engaged. However, the slightly lower score on the flow indicator suggests that some students have not yet fully immersed themselves in the learning experience. Research by López-Fernández et al. (2024) indicates that although game-based learning is effective, the quality of narrative flow and the level of challenge greatly influence the depth of learners' engagement. Therefore, improving narrative design and increasing game variation could strengthen engagement in future versions of the module.

The perseverance aspect is the variable with the highest scores, ranging from 3.21 to 3.46. This shows that students have strong persistence and endurance in completing vocabulary activities provided through the module. Features such as level progression, progress tracking, and gradual challenges seem to provide a positive stimulus that encourages students to complete tasks even when they encounter difficulties. These findings are consistent with Amzalag et al. (2024), who emphasize that educational games can increase grit through learning experiences that are challenging yet structured. Thus, the interactive digital module not only enhances learning interest but also cultivates students' perseverance in vocabulary acquisition.

Together, these three perceptual variables—motivation, engagement, and perseverance—comprehensively demonstrate that the interactive digital module is able to create a more engaging, meaningful, and challenging learning ecosystem. Increased motivation, strong engagement, and high perseverance indicate that game-based approaches have great potential to enhance students' interest in learning vocabulary. Gómez et al. (2022) also affirm that adaptive and interactive digital media can provide more personalized learning experiences, thereby strengthening affective outcomes and learning interest. However, aspects such as self-directed learning and deeper flow still require further improvement in future module development.

In the cognitive aspect, the descriptive results show a highly significant improvement, with the average score increasing from 51.54 in the pre-test to 71.83 in the post-test. This improvement indicates that the module is effective in helping students understand and remember English vocabulary. The Shapiro–Wilk normality test shows that both pre-test and post-test data are normally distributed ($p > 0.05$), allowing the use of more robust parametric analyses. These findings support Simonnet (2025), who states that integrating digital learning into language education can significantly enhance memory retention and vocabulary comprehension, especially through visual and interactive media.

The results of the paired samples t-test further reinforce the module's effectiveness, with a mean difference of 20.286 points and a significance value of $p =$

0.000 ($p < 0.001$). This demonstrates a statistically significant improvement in vocabulary ability following the use of the game-based interactive digital module. The high t-value indicates that the improvement occurred consistently among nearly all students, rather than being random variation. Slattery et al. (2025) also report that game-based learning has a significant impact on academic achievement through increased motivation and structured practice. Thus, these results provide strong evidence that the interactive digital module has a meaningful positive impact on both perceptual and cognitive aspects of learning.

IV. Conclusion

Based on the research findings and discussion presented in previous Chapter, it can be concluded that the game-based interactive digital module developed in this study has proven effective in increasing the interest and vocabulary learning ability of seventh-grade students at SMPN 2 Leuwisadeng. In terms of students' perceptions, the three indicators—motivation, engagement, and perseverance—showed positive improvements. Students experienced more engaging, meaningful, and interactive learning, which encouraged them to be more active and persistent in learning English vocabulary. Student motivation increased because the module provided challenges, rewards, and instant feedback that supported the learning process. Their engagement was also relatively high, as the gamified activities made the learning experience more enjoyable. Perseverance showed the highest score, indicating that the module successfully encouraged students to keep trying even when facing difficulties.

In the cognitive aspect, improvements in learning outcomes were evident from the difference between pre-test and post-test scores. The average pre-test score of 51.54 increased to 71.83 on the post-test. The paired samples t-test showed that this improvement was highly significant, with a p-value < 0.001. This indicates that learning using the game-based interactive digital module not only increased students' learning interest but also had a direct and substantial impact on their vocabulary mastery. Therefore, the module can be categorized as an effective and innovative learning medium that aligns with 21st-century educational needs.

Overall, this study demonstrates that the game-based interactive digital module contributes significantly to improving students' learning outcomes in both affective and cognitive aspects. Learning through gamification is capable of creating a more responsive, adaptive, and engaging learning environment for middle school students. These findings reinforce the importance of integrating technology and innovative learning design in language education in the digital era.

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