



# IMPROVING STUDENTS' CONCEPTUAL UNDERSTANDING AND CRITICAL THINKING SKILLS THROUGH WORDWALL EDUCATIONAL GAMES IN ELEMENTARY SCHOOL

Vera Idayani<sup>1</sup>, Syifa Saputra<sup>2</sup>, Afkar<sup>3</sup>

<sup>1,2,3</sup>Master of Elementary Education, Universitas Almuslim, Bireuen, Aceh, Indonesia

## Article Info

### Article history:

Received 10/01/2026

Accepted 22/04/2026

Published 30/04/2026

### Keywords:

Conceptual Understanding;

Critical Thinking Skills;

Elementary School;

Wordwall Educational Games.

## ABSTRACT

The swift evolution of digital technology in the domain of primary education has reshaped instructional methods of innovative, interactive, and effective learning media. In this regard, Wordwall-based educational games are viewed as a promising tool to significantly improve students' conceptual understanding as well as their critical thinking skills. This research was conducted to investigate the effectiveness of Wordwall educational games in enhancing elementary school students' comprehension of concepts and their critical thinking abilities. The study employed a quantitative approach with a quasi-experimental method, specifically utilizing a non-equivalent control group design. The participants consisted of elementary school students who were divided into two groups: an experimental group and a control group. The experimental group was taught using Wordwall-based educational games, while the control group received instruction through traditional teaching methods. Data were collected using test instruments in the form of pre-tests and post-tests, which were designed to measure students' conceptual understanding and critical thinking skills. The instruments were developed based on predetermined learning indicators and were validated by experts before being administered. Following rigorous statistical screening via normality and homogeneity tests, an independent samples t-test confirmed that the experimental group attained markedly superior post-test results in critical thinking and conceptual understanding compared to the control group. These findings demonstrate that the implementation of Wordwall educational games has a positive and by demonstrating a statistically significant influence on students' cognitive growth, Wordwall proves to be a robust digital medium that effectively facilitates higher-order thinking within primary school settings.

*This is an open-access article under the [CC BY-SA](#) license.*



## Corresponding Author:

**Vera Idayani**

Master of Elementary Education, Universitas Almuslim, Bireuen, Aceh, Indonesia

Email: [verraidayani2020@gmail.com](mailto:verraidayani2020@gmail.com)

## 1. INTRODUCTION

One of the most essential skills is critical thinking, which enables students to analyze, evaluate, and make informed decisions. Furthermore, conceptual understanding is also an essential foundation for students to connect learned concepts to real life. According to , modern education must utilize digital technology as a means to create a fun and interactive learning experience, so

that students not only passively receive knowledge but also actively participate in the learning process. At the elementary school level, natural and social sciences is a crucial platform for instilling critical thinking skills and conceptual understanding. Material on plant organs, for example, not only introduces plant parts but also requires students to understand their functions and their relevance to everyday life (Rahayu et al., 2025). However, the reality on the ground shows that learning in elementary schools still relies predominantly on conventional, monotonous methods. This results in low achievement of learning objectives. Research conducted by (Jannah & Atmojo, 2022) shows that students often experience difficulty developing conceptual understanding and critical thinking when learning is solely teacher-centered without the support of interactive media.

The development of digital technology provides significant opportunities for educators to deliver more engaging and meaningful learning. Technology-based learning media has been proven to increase student motivation by presenting material in visual, audio, and interactive forms. According to (Putu Wahyu Ligyawati et al., 2025), Wordwall, as an educational game-based learning medium, can help students develop critical thinking skills through activities that require analysis, evaluation, and problem-solving. Similarly, research by (Narita Maharani et al., 2024) demonstrated that the use of Wordwall in interactive learning increases student active participation and strengthens conceptual understanding. In recent years, digital educational games have been increasingly integrated into elementary school learning to foster active engagement and higher-order thinking skills. However, many classrooms still rely on conventional teacher-centered instruction, which often limits students' opportunities to develop deep conceptual understanding and critical thinking skills (Hwang et al., 2015). Although platforms such as Wordwall offer interactive and game-based learning experiences, empirical evidence examining their simultaneous impact on both conceptual understanding and critical thinking at the elementary level remains limited. Most existing studies focus primarily on learning motivation or achievement, leaving a gap in understanding how Wordwall-based educational games support cognitive processes essential for meaningful learning.

Previous research has demonstrated that game-based learning can significantly enhance students' engagement and conceptual comprehension when compared to traditional instructional methods (Sailer & Homner, 2020). Several studies reported that digital games encourage problem-solving, analysis, and reflection, which are key components of critical thinking (Zainuddin et al., 2020). Specifically, studies on Wordwall indicated its effectiveness in improving learning outcomes and student participation in elementary classrooms (Dewi et al., 2024). However, these studies often examined learning outcomes in isolation and did not comprehensively analyze how Wordwall facilitates the integration of conceptual understanding and critical thinking skills simultaneously. Conceptual understanding refers to students' ability to comprehend, connect, and apply concepts meaningfully rather than memorizing facts, while critical thinking entails examining information, assessing evidence, and drawing logical conclusions (Facione, 2023). Wordwall educational games provide interactive features such as quizzes, matching tasks, and problem-based challenges that encourage students to actively process information and reflect on their answers. Through repeated interaction and immediate feedback, students are expected to construct stronger conceptual frameworks and engage in higher-order thinking processes. Thus, the use of Wordwall is conceptually positioned as a learning medium that supports both cognitive engagement and critical reasoning in elementary education.

According to (Jääskä et al., 2022), educational games enable students to learn through exploration, experimentation, and direct feedback. Thus, educational games can increase student motivation and facilitate a deeper understanding of the subject matter. Educational games contain learning materials and practice questions with diverse and attractive designs that utilize technological advances. Wordwall is effective in improving students' conceptual understanding due to its interactive and flexible design. Wordwall supports technology-based learning. According to (Yuni Wijaya et al., 2025), Wordwall educational games can train students' critical thinking skills through analysis- and evaluation-based questions. According to (Muhammad Hasan; et al., 2021), Wordwall is a technology-based learning tool that is highly relevant to 21st-century learning because it supports the development of students' critical thinking, collaboration, communication, and creativity skills. By using Wordwall, learning becomes more interactive and suits the learning styles of modern students.

Furthermore, educational game-based learning media has significant potential for fostering student interest in learning. (Khofifah Choirun et al., 2025) emphasized that educational games can encourage students to be more active, engaged, and enthusiastic in the learning process. Through interaction through digital media, students can more easily understand abstract concepts while honing higher-order thinking skills. Recent research by (Sely Ariska, 2025) also demonstrated that Wordwall not only improves student learning outcomes but also facilitates collaborative and individual learning. This makes Wordwall an innovative learning medium that aligns with the demands of 21st-century education. This study is relevant in responding to the growing demand for innovative digital learning media aligned with 21st-century skills in elementary education. By examining the effectiveness of Wordwall educational games in improving conceptual understanding and critical thinking skills, this research contributes empirical evidence to support technology-enhanced learning practices.

The findings are expected to provide practical implications for teachers in designing interactive and student-centered instruction, as well as theoretical contributions to the field of educational technology and cognitive development. Moreover, this study supports current educational policies that emphasize digital literacy, critical thinking, and meaningful learning in primary education. Based on the description above, it is necessary to analyze the application of the model to develop local culture-based comic strip learning media to promote the social skills of fourth-grade elementary students. This study aims to analyze the effectiveness of Wordwall-based educational games in advancing students' conceptual understanding and critical thinking skills. Therefore, the research question is How effective is the Wordwall educational game in improving students' conceptual understanding and critical thinking skills.

## **2. METHOD**

Research design use this study seeks or investigate the efficacy of Wordwall-integrated gamification in augmenting students' conceptual grasp and critical thinking skills. This study employed a quasi-experimental approach with a non-equivalent control group design to contrast the developmental trajectories of the two groups. The experimental cohort was exposed to instruction mediated by Wordwall educational games, whereas the control group received standard instruction through conventional pedagogical techniques." was taught using a traditional learning approach. The learning processes in the two classes follow different structures. In the conventional

class, students engage in discussions, followed by the lecturer explaining the material. The lecturer plays a more dominant role in this setup, delivering content through traditional lectures. In contrast, stages of wordwall educational game based learning: preparation stage, orientation and motivation stage, exploration through wordwall game, discussion and concept reinforcement, reflection and evaluation, conclusion and follow-up.

This study employed a quasi-experimental design involving a purposive sample of 50 fourth-grade students. The participants were equally partitioned into two groups: an experimental cohort (n=25) which utilized Wordwall-based games, and a control cohort (n=25) taught via conventional methods. The research location was chosen because it has various digital facilities and digital-based learning media. A cluster sampling technique was used to select the participants and received approval from participants. Some reasons why cluster sampling is chosen cluster sampling allows researchers to reduce costs and time required. Researchers only need to take samples from a portion of the cluster, not the entire population. Given the large sample size, groups were predetermined for sampling.

The instruments used were tests of students' conceptual understanding and critical thinking skills. Presented in Table 1 below.

Table 1. Grid of Conceptual Understanding Test Instrument

No	Indicator of Conceptual Understanding	Description	Cognitive Level (Revised Bloom's Taxonomy)	Item Format
1	Explaining concepts	Students are able to explain concepts using their own words	C2 (Understanding)	Multiple choice
2	Classifying concepts	Students are able to classify objects or phenomena based on given concepts	C2 (Understanding)	Multiple choice

Table 2. Grid of Critical Thinking Skills Test Instrument

No	Indicator of Critical Thinking Skills	Description
1	Analyzing problems	Students possess the ability to deconstruct problems and formulate logical solutions.
2	Identifying assumptions	Students are able to identify assumptions or key information in a problem
3	Evaluating arguments	Students are able to evaluate the correctness of statements or solutions
4	Drawing conclusions	Students are able to draw logical conclusions based on evidence
5	Providing reasons	Students are able to justify answers using logical reasoning
6	Solving problems	Students are able to propose appropriate solutions to given problems

These research The validity analysis is carried out to determine whether the instrument items are appropriate and valid. To evaluate validity, the researchers use the expert agreement index calculated through Aiken's V. Meanwhile, the reliability of the instrument is assessed using Cronbach's alpha coefficient. The results indicate that the reliability of the instruments measuring

students' conceptual understanding and critical thinking skills reached a coefficient of 0.86, indicating high reliability, placing it in the high reliability category (Taber, 2018). The results of this evaluation are shown in Table 3.

Table 3. The results of the Aiken Index Coefficient of Instrument Validity

Instruments	V	Validity
Conceptual Understanding	0.82	Valid
Critical Thinking Skills	0.84	Valid

The independent sample t-test was employed at a significance level of 0.05. If the probability is less than the specified significance level, it indicates that the application of wordwall educational game has an effect on improving students' conceptual understanding and critical thinking abilities. Data normality was assessed using the One-Sample Kolmogorov–Smirnov test, while homogeneity was examined through Levene's test. Furthermore, an independent samples t-test was conducted to determine whether significant differences existed between the mean scores of the experimental and control groups.

### 3. RESULTS AND DISCUSSION

The implementation of the Wordwall educational game was evaluated based on its influence on improving students' conceptual understanding and critical thinking abilities, as shown in Table 4. The results reveal that the experimental group achieved higher mean scores than the control group in both aspects.

Table 4. The comparison of Average Value of collaboration skills and Problem Solving Skills in Control and Experimental Class

	Group	Mean	Std. Deviation	N
conceptual understanding	control	63.70	3.475	25
	experimental	82.82	2.523	25
	Total	77.72	11.385	50
critical thinking	control	62.55	6.742	25
	experimental	83.72	3.264	25
	Total	74.52	10.484	50

Based on the test of normality, the the data follow a normal distribution since the significance value is higher than 0.05 (see Table 6). Whereas, Table 5 shows that all group variance pairs have significance numbers greater than 0.05. Thus, the variance of each pair is homogeneous.

Table 5. Tests of Normality

Group	Kolmogorov-Smirnov <sup>a</sup>			
	Statistic	df	Sig.	
conceptual understanding	control	.121	25	.143
	experimental	.230	25	.206
critical thinking	control	.472	25	.145
	experimental	.103	25	.132

Table 6. Levene's Test of Equality of Error Variances<sup>a</sup>

	<b>F</b>	<b>df1</b>	<b>df2</b>	<b>Sig.</b>
conceptual understanding	1.102	1	50	.211
critical thinking	1.178	1	50	.125

Based on the results of the dependent variable covariance matrix tests, Each dependent variable demonstrated equal variance across groups, as indicated by a significance value of 0.211 ( $p > 0.05$ ). Additionally, the correlation among the dependent variables was consistent across all groups (see Table 7), suggesting homogeneity of covariance. Therefore, the variance for each variable pair can be considered homogeneous. These assumption test results confirm that the data satisfy the requirements for performing a MANOVA test.

Table 7. Box's Test of Equality of Covariance Matrices<sup>a</sup>

<b>Category</b>	<b>Value</b>
Box's M	2.253
F	3.102
df1	4
df2	250310.000
Sig.	.211

The MANOVA analysis employed Hotelling's Trace statistic (see Table 8), which is appropriate when comparing two independent groups. A higher value of Hotelling's Trace indicates a stronger effect of the Wordwall educational game. As shown in the table, the Hotelling's Trace value is 11.241, exceeding the value of Pillai's Trace (Hotelling's Trace  $>$  Pillai's Trace). Furthermore, Table 8 demonstrates that the significance values for Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root across all model variables are below 0.05. This result suggests that there is an influence of the wordwall educational game simultaneously. Thus, testing between subjects can be continued (see Table 8).

Table 8. Multivariate Tests

	<b>Effects</b>	<b>Value</b>	<b>F</b>	<b>Sig.</b>	<b>Partial Eta Squared</b>
Intercept	Pillai's Trace	.558	17483.157 <sup>b</sup>	.000	.724
	Wilks' Lambda	.012	17483.157 <sup>b</sup>	.000	.724
	Hotelling's Trace	515.341	17483.157 <sup>b</sup>	.000	.724
	Roy's Largest Root	529.453	17483.157 <sup>b</sup>	.000	.724
group	Pillai's Trace	.832	342.145 <sup>b</sup>	.000	.848
	Wilks' Lambda	.071	342.145 <sup>b</sup>	.000	.848
	Hotelling's Trace	11.241	342.145 <sup>b</sup>	.000	.848
	Roy's Largest Root	11.241	342.145 <sup>b</sup>	.000	.848

Table. 9 Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	F	Sig.
Corrected Model	conceptual understanding	1071.600 <sup>a</sup>	1	310.683	.000
	critical thinking	2740.017 <sup>b</sup>	1	416.437	.000
Intercept	conceptual understanding	320166.627	1	28405.077	.000
	critical thinking	217818.447	1	14733.275	.000
Group	conceptual understanding	2501.500	1	730.683	.000
	critical thinking	4300.027	1	526.437	.000

The subsequent analysis focuses on the differences in the effect of each factor on the dependent variables (see Table 9). The findings indicate statistically significant differences, as evidenced by p-values below 0.05. Specifically, A significant difference was observed in students' conceptual understanding between those who were taught using the Wordwall educational game and those who received conventional instruction ( $p = .000$ ). Likewise, students' critical thinking skills also differed significantly between the two groups ( $p = .000$ ). These findings substantiate that the implementation of Wordwall educational games is markedly more efficacious in elevating students' conceptual understanding and critical thinking abilities. This suggests that interactive digital media can transcend traditional instruction by providing a more immersive and cognitively stimulating environment for elementary education. than the traditional learning approach applied in the control group. Based on the average Gain Score calculation of 0.74, which is considered high, it can be concluded that the Wordwall Educational Game is highly effective in improving students' conceptual understanding of the Plant Organs topic. This indicates that students gained significant knowledge after participating in learning with this medium. Therefore, this medium is suitable for widespread use in elementary school science lessons, particularly for the Plant Organs topic, as an alternative, innovative learning medium that is engaging and meaningful for students.

These findings support research by (Berliana & Widiyono, 2025), which states that interactive game-based learning can improve students' focus and retention on the material. Furthermore, these results align with Putra & Anggraeni, (2023), who stated that Wordwall-based digital media not only improves learning outcomes but also strengthens students' critical and collaborative thinking skills. The Wordwall game facilitates students' contextual understanding of plant organ concepts by connecting the material to everyday examples, such as carrots (roots), rice (fibrous roots), and roses (flowers). According to (Azzahra Nurlatifah & Purniati, 2025), context-based learning helps students understand scientific concepts more meaningfully because they are linked to real-life experiences. The Wordwall game supports the contextual approach emphasized in the Independent Curriculum. The questions in the game not only test memorization but also challenge students to analyze differences in organ structures, evaluate their functions, and draw conclusions. This aligns with the Independent Curriculum's goal of fostering critical reasoning. (Winarti et al., 2026) stated that analysis-based questions in digital media effectively train students' critical thinking skills. The final product, Wordwall, provides a learning experience that fosters higher-order thinking skills (HOTS), in line with the demands of 21st-century learning and the Independent Curriculum.

The findings of this study indicate that the use of Wordwall educational games significantly improved students' conceptual understanding in elementary school learning. This improvement can be attributed to the interactive and repetitive nature of game-based activities, which allow

leveraging interactive features, the Wordwall platform compels students to actively grapple with learning content rather than merely acting as passive vessels for information. This shift in engagement is crucial for internalizing complex concepts and developing the critical thinking skills necessary in primary education. Interactive digital games facilitate meaningful learning by enabling students to visualize concepts, receive immediate feedback, and correct misconceptions in real time (Mayer, 2002). As a result, students were better able to explain, classify, and apply concepts accurately. Furthermore, Wordwall educational games were found to positively influence students' critical thinking skills. The game formats, such as quizzes and problem-based challenges, required students to analyze questions, evaluate answer options, and make reasoned decisions. These processes align with higher-order thinking skills, particularly analysis and evaluation. According to (Lionenko & Huzar, 2023), critical thinking develops when learners are consistently exposed to tasks that require reasoning, judgment, and reflection. The results of this study support the view that digital game-based learning environments can effectively foster such cognitive engagement.

Another important finding is that Wordwall promotes active participation and sustained attention during the learning process. Students demonstrated higher enthusiasm and motivation when learning activities were presented in a game-based format. Increased motivation plays a crucial role in enhancing cognitive performance, as motivated learners are more willing to invest effort in solving problems and understanding concepts deeply (Jatmika et al., 2025). This condition creates a supportive learning atmosphere that encourages students to think critically and engage meaningfully with instructional content (Irdalisa et al., 2024). In addition, the immediate feedback provided by Wordwall educational games contributed to students' improved learning outcomes. Feedback helps learners recognize errors, reflect on their thinking processes, and adjust their strategies accordingly. Effective feedback is a key element in developing both conceptual understanding and critical thinking skills (Williams, 2024). Through instant feedback, students were able to identify incorrect reasoning and refine their understanding without delay, which strengthened their learning process. Overall, the results of this study reinforce the relevance of integrating digital educational games into elementary school instruction. Wordwall serves not only as a motivational tool but also as an effective learning medium that supports conceptual clarity and higher-order thinking. These findings are consistent with constructivist learning theory, which emphasizes active knowledge construction through interaction and reflection (Pegarro & Maghuyop, 2025). Therefore, Wordwall educational games can be considered a viable instructional strategy to support 21st-century learning goals in elementary education.

#### **4. CONCLUSION**

The findings indicate that the implementation of Wordwall educational games effectively enhances elementary students' conceptual comprehension and critical thinking abilities. The interactive and game-based learning environment provided by Wordwall encourages active student engagement, supports meaningful learning, and helps students construct concepts more clearly through immediate feedback and repeated practice. In addition, Wordwall educational games promote higher-order thinking by engaging students in analyzing problems, evaluating answer choices, and drawing logical conclusions. These cognitive processes are essential for the development of critical thinking skills in elementary education. The findings indicate that students who participated in Wordwall-based learning demonstrated better reasoning abilities and deeper conceptual comprehension compared to those who experienced conventional instruction. Furthermore, the use of Wordwall contributes to a positive learning atmosphere by increasing students' motivation and participation. Motivated learners tend to be more persistent in solving problems and more reflective in their thinking processes, which in turn enhances both conceptual

understanding and critical thinking skills. This condition supports the effectiveness of digital game-based learning as a student-centered instructional strategy.

## REFERENCES

- Azzahra Nurlatifah, P., & Purniati, T. (2025). Systematic Literature Review: Penerapan Game Edukasi untuk Meningkatkan Motivasi Belajar Matematika. *Jurnal Pendidikan Matematika*, 4(1), 115–127.
- Berliana, S., & Widiyono, A. (2025). Efektivitas Penggunaan Media Wordwall terhadap Hasil Belajar IPAS Materi Gaya SD Negeri 1 Tahunan. In *Janacitta : Journal of Primary and Children's Education* (Vol. 8). <http://jurnal.unw.ac.id/index.php/janacitta>
- Dewi, R., Ruhayat, Y., & Nulhakim, L. (2024). The Use of WordWall-Based Learning Media in Elementary Schools. *Journal of Educational and Technology*, 8.
- Facione, P. A. (2023). Critical Thinking: What It Is and Why It Counts. *Insight Assesment*.
- Hwang, G.-J., Chiu, L.-Y., & Chen, C.-H. (2015). A contextual game-based learning approach to improving students' inquiry-based learning performance in social studies courses. *Computers & Education*, 81, 13–25. <https://doi.org/10.1016/j.compedu.2014.09.006>
- Jääskä, E., Lehtinen, J., Kujala, J., & Kauppila, O. (2022). Game-based learning and students' motivation in project management education. *Project Leadership and Society*, 3. <https://doi.org/10.1016/j.plas.2022.100055>
- Jannah, D. R. N., & Atmojo, I. R. W. (2022). Media Digital dalam Memberdayakan Kemampuan Berpikir Kritis Abad 21 pada Pembelajaran IPA di Sekolah Dasar. *Jurnal Basicedu*, 6(1), 1064–1074. <https://doi.org/10.31004/basicedu.v6i1.2124>
- Khofifah Choirun, Nisya Siregar, & Eka Sustri Harida. (2025). Efektivitas Game Edukasi Wordwall Pada Motivasi Belajar Siswa Sekolah Dasar Kajian Literatur. *Pendas : Jurnal Ilmiah Pendidikan Dasar*.
- Muhammad Hasan;, Rahmi Munfangati;, Mustika;, & I kadek dwi gandika. (2021). *Pembelajaran Digital* (Widina Bhakti Persada Bandung, Ed.).
- Narita Maharani, O., Gasa Nopa, P., Anggraini, R., Lendri, R., Utami, N. P., Pendidikan, S. 6, Guru, P., Guru, P., Dasar, S., Sriwijaya, U., Bukit Lama, J., & Palembang, K. (2024). Efektivitas Penggunaan Media Pembelajaran Aplikasi Wordwall Pada Siswa Kelas V Di SDN 45 Palembang. *Jurnal Pendidikan Dasar*, 12(2), 2024. <https://doi.org/10.46368/jpd.v12i2.2673>
- Putu Wahyu Ligyawati, N., Dewi Pusparini, L., & Ketut Manik Asta Jaya, I. (2025). Pengaruh Media Wordwall Games terhadap Berpikir Kritis Siswa Kelas IV di SD Saraswati 1. *Jurnal Pengabdian Masyarakat Dan Riset Pendidikan*, 4(1), 802–807. <https://doi.org/10.31004/jerkin.v4i1.1375>
- Rahayu, R., Eriya, V., Simanjuntak, R., Angraini, N., Hasibuan, S. I., Islam, U., Syekh, N., Hasan, A., & Padangsidempuan, A. A. (2025). Pemanfaatan Teknologi Digital Dalam Meningkatkan Efektivitas Media Pembelajaran Di Sekolah. *Edutech : Jurnal Inovasi Pendidikan Berbantuan Teknologi*, 5(4). <https://jurnalp4i.com/index.php/edutech>
- Sailer, M., & Homner, L. (2020). The Gamification of Learning: a Meta-analysis. *Educational Psychology Review*, 32(1), 77–112. <https://doi.org/10.1007/s10648-019-09498-w>
- Sely Ariska. (2025). Efektivitas Penerapan Media Pembelajaran Wordwall dalam Meningkatkan Kemampuan Menulis Surat Resmi pada Pembelajaran Bahasa Indonesia Siswa Kelas VII SMP Negeri 13 Kota Bengkulu. *JPI : Jurnal Pustaka Indonesia*, 4(3), 203–214. <https://doi.org/10.62159/jpi.v4i3.1653>
- Winarti, S., Utomo, S. W., & Lukitasari, M. (2026). The Influence of Game-Based Learning Using Assemblr Edu on Digital Skills and Critical Thinking of Elementary School Students in

Mathematics: Toward Quality Education and Digital Literacy. *Jurnal Penelitian Pendidikan IPA*, 12(2), 17–29. <https://doi.org/10.29303/jppipa.v12i2.13768>

Yuni Wijaya, E., Tahir, M., Nurqomariah, J., Raya Telang, J., & Timur, J. (2025). Systematic Literature Review : Efektivitas Game Edukasi Dalam Meningkatkan Motivasi, Dan Minat Belajar Peserta Didik. *Journal of Informatic Engineering (Joutica)*. <https://jurnalteknik.unisla.ac.id/index.php/informatika>

Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *Educational Research Review*, 30, 100326. <https://doi.org/10.1016/j.edurev.2020.100326>