

The Effect of Using ICT-Based Interactive Media on Students' Cognitive Learning Outcomes in English Nouns Material at SMP Negeri 11 Maros Baru

Dwi Nuraqidah¹, Muhammad Yaumi², Andi Asmawati³

^{1,2,3,4,5} Universitas Islam Negeri Alauddin Makassar

Email: nuraqidahdwi@gmail.com

ABSTRACT

This study aims to investigate the effect of using ICT-based interactive media on students' cognitive learning outcomes in English noun material at SMP Negeri 11 Maros Baru. English noun mastery is a crucial component of vocabulary learning; however, students often experience difficulties in understanding and identifying nouns due to conventional and less interactive teaching methods. Therefore, the use of ICT-based interactive media is considered an effective alternative to make the learning process more engaging, motivating, and effective in improving students' participation and comprehension. This research employed a pre-experimental design with a one-group pre-test and post-test model. The sample consisted of 32 eighth-grade students selected through purposive sampling. The research instrument included 35 test items, comprising multiple-choice and short-answer questions, administered through Wordwall before and after the treatment. The results showed that the students' average pre-test score was 23.03 (very poor), which increased to 75.53 (good) in the post-test. The paired sample t-test indicated a significance value of $0.000 < 0.05$, proving a significant difference between the two tests. The implication of this study highlights that integrating ICT-based interactive media can serve as an effective alternative teaching strategy in English learning. Such media support students' comprehension of nouns, enhance motivation and participation, and create a more enjoyable learning experience. Furthermore, these findings are expected to encourage teachers to be more innovative in applying technology and to serve as a reference for further research in broader educational contexts.

Keywords: *ICT-Based Interactive Media, Wordwall, English Nouns, Cognitive Learning Outcomes, Motivation, Participation.*

1) INTRODUCTION

English is an international language that plays a vital role in education, global communication, and technological development. At the junior high school level, mastery of vocabulary particularly nouns serves as a fundamental foundation of language competence. However, based on preliminary observations at SMP Negeri 11 Maros Baru, it was found that many students experience difficulties in understanding, distinguishing, and using nouns in English contexts. These challenges are related to learning methods that remain conventional, teacher-centered, and provide limited opportunities for

Paper presented at The 2nd ICONETT, 2025
Faculty of Teacher Training and Education
Universitas Islam Negeri Alauddin Makassar
South Sulawesi-Indonesia

students to engage actively in the learning process. Such conditions result in low motivation, participation, and cognitive learning outcomes among students.

In everyday instructional practice, teachers generally rely on lecturing and repetitive written exercises. This one-way instructional delivery causes students to receive information passively and does not sufficiently foster conceptual understanding. In fact, vocabulary mastery in English requires learning activities that allow students to engage actively, interactively, and contextually. In other words, a learning model is necessary one that creates an engaging, meaningful learning environment and stimulates cognitive information processing.

Along with the advancement of information and communication technology, ICT-based learning media such as Wordwall offer an innovative and effective alternative to support the learning process. Wordwall presents materials in the form of quizzes, educational games, multimedia visualizations, and interactive exercises, facilitating active student learning. The use of this media aligns with cognitivist perspectives, which view learning as an internal process of mentally processing information. Piaget (1973) asserts that knowledge is constructed through active interaction with the learning environment, while Bruner (1966) explains that understanding is derived through enactive, iconic, and symbolic representations.

Furthermore, Gagné (1985) posits that effective learning occurs when internal and external conditions support attention, information encoding, retention, and retrieval. Wordwall meets these conditions by reinforcing concepts, enabling repetitive practice, and providing immediate feedback. From a social perspective, Vygotsky (1978) emphasizes that learning takes place through interaction within the Zone of Proximal Development (ZPD), where students receive scaffolding from teachers and peers until they can reach a higher level of understanding. From a multimedia standpoint, this principle corresponds with Mayer (2009), who asserts that learning involving both visual and verbal channels simultaneously is more effective, and with Paivio's dual coding theory (1991), which emphasizes that memory processing is stronger when information is visually represented.

The effectiveness of ICT-based media in learning has also been supported by previous studies. Gulo et al. (2018), found that technology-based interactive media improve students' comprehension in learning English and encourage more active engagement. Dewi et al. (2020), demonstrated that the use of Wordwall significantly increases student participation and strengthens vocabulary retention through game-based activities. Similarly, Syamsidar et al. (2019), concluded that interactive digital

media enhance students' cognitive abilities and create a more enjoyable and meaningful learning experience. These findings indicate that the application of ICT-based interactive media is a promising approach for improving the quality of English language learning.

Therefore, the integration of ICT-based learning media into English instruction is believed to create a more engaging, interactive, and effective learning environment for enhancing students' understanding, particularly regarding noun mastery. The purpose of this study is to measure students' learning outcomes before and after the implementation of ICT-based interactive media, and to analyze the degree of improvement in students' skills in understanding and applying nouns in English learning. Through this research, it is expected that a clear depiction of the effectiveness of ICT-based interactive media on student learning outcomes can be obtained and that the findings may serve as valuable insights for educators in designing technology-based instructional strategies to optimize the quality of teaching and student learning outcomes.

2) METHODS

This study employed a quantitative approach, as it emphasizes numerical measurement and statistical analysis to objectively assess changes in student learning outcomes. Creswell (2014) explains that quantitative research uses a deductive approach to test hypotheses and identify relationships between variables in an empirical context. This is consistent with Sugiyono (2015), who states that quantitative methods are based on the philosophy of positivism, using objective research instruments and statistical analysis to test predetermined hypotheses.

The research applied a pre-experimental design with a one-group pretest-posttest structure, involving only one experimental group without a control group. Ary et al. (2010) state that pre-experimental research is useful when researchers aim to measure the effect of a treatment in a basic setup without full experimental control. In this design, students received a pre-test (O1), followed by treatment using ICT-based interactive media (X), and finally a post-test (O2). This design corresponds to Gay et al. (1981), who affirmed that comparing O1 and O2 provides measurable evidence of learning improvement.

The research was conducted at SMP Negeri 11 Maros Baru in South Sulawesi. The population consisted of 185 eighth-grade students. The research sample was class VIII D with a total of 32 students. The sample was selected using purposive sampling, based on specific criteria relevant to the research objective. Arikunto (2006) defines a sample as a portion of the population that represents its

Paper presented at The 2nd ICONETT, 2025
Faculty of Teacher Training and Education
Universitas Islam Negeri Alauddin Makassar
South Sulawesi-Indonesia

characteristics, enabling researchers to generalize findings. Furthermore, Arikunto (2014) provides procedural guidance for sampling in practice, emphasizing researcher consideration supported by teacher recommendations, observed learning motivation, and academic characteristics of the class.

The test instrument consisted of 35 items (15 multiple-choice and 20 short-answer items) used as both pre-test and post-test. Gay (1981) emphasizes that research instruments serve as a primary medium through which researchers gather data. Scoring followed the procedure described by Arikunto (2006), who states that scoring must be conducted objectively and systematically. Each correct answer was assigned a score of 1, and each incorrect answer a score of 0.

Data collection occurred across six meetings. In the first meeting, pre-test administration and Wordwall introduction were conducted. The second to fifth meetings involved treatment, including interactive learning activities such as matching games, noun categorization, grouping, sentence creation, text analysis, and interactive noun quizzes. In the final meeting, the post-test was administered to measure improvement. The implementation of procedural steps in conducting the research followed the operational guidelines described by Arikunto (2014), emphasizing systematic planning, execution, and evaluation.

Data analysis included descriptive statistical analysis and a paired-sample t-test using SPSS. Normality testing was first carried out, as Setyawan (2021) asserts that the normality test is essential for determining the appropriate statistical method. Agung (2022) explains that parametric statistics are used when data are normally distributed, while non-parametric statistics are used for non-normal distributions. The paired-sample t-test was used to determine the significance of differences between pre-test and post-test scores. Sugiyono (2015) explains that this test is appropriate for comparing two related means, and Santoso (2014) further clarifies that it is used when the same group is measured under two different conditions before and after treatment.

All procedures complied with research ethics, including informed consent, confidentiality, and academic integrity.

3) RESULTS AND DISCUSSION

3.1. RESULT

To determine the research findings, pre-test and post-test results from 32 students of Class VIII D at SMP Negeri 11 Maros Baru were analyzed. The tests measured students' cognitive outcomes before and after using ICT-based interactive media (Wordwall), and the data were processed using a paired sample t-test and descriptive statistics to identify whether a significant improvement occurred.

3.1.1. TEST RESULT

3.1.1.1. Students' Cognitive Learning Outcomes Before Using Wordwall

The pre-test results showed that students' cognitive learning outcomes in English nouns were still in the very poor category, with an average score of 23.03. They experienced difficulties in remembering vocabulary, distinguishing between abstract and concrete nouns, and applying them in sentences. This indicates that their understanding of English nouns before using interactive media was still insufficient and needed improvement.

Table 1: *Students' Pre-test Results*

Score	Frequency	Percentage (%)	Category
80-100	0	0	Very good
66-79	0	0	Good
56-65	0	0	Fair
40-55	1	3.12	Poor
0-39	31	96.87	Very poor
Total	32	100	

Table 3.1 shows that almost all students obtained very low scores in the pre-test. Out of 32 students, 31 students (96.87%) were in the very poor category, while only 1 student (3.12%) was in the poor category. None of the students reached the fair, good, or very good categories. This indicates that the students' initial understanding of English nouns was still very weak. This condition highlights the need for more innovative learning media, such as ICT-based interactive media (Wordwall), to enhance students' motivation and learning outcomes.

3.1.1.2. Students' Cognitive Learning Outcomes After Using Wordwall

The post-test showed a significant improvement in students' cognitive learning outcomes after using Wordwall, with the average score rising to 75.53 (good category). Students became more active and demonstrated better abilities in memorizing nouns, categorizing them as abstract or concrete, and

using them accurately in sentences, indicating that ICT-based interactive media effectively enhanced the learning process.

Table 2: *students' post-test Results*

Score	Frequency	Percentage (%)	Category
80-100	17	53.12	Very good
66-79	4	12.50	Good
56-65	7	21.87	Fair
40-55	4	12.50	Poor
0-39	0	0	Very poor
Total	32	100	

Table 2 presents the post-test results of Class VIII D, showing significant improvement after learning with ICT-based interactive media (Wordwall). Of 32 students, 53.12% were very good, 12.50% good, 21.87% fair, and 12.50% poor, with none in the very poor category. The results indicate that most students improved their understanding of English nouns, and almost all achieved better learning outcomes compared to the pre-test. Overall, Wordwall effectively enhanced cognitive performance, motivation, and active participation.

3.1.1.3. Comparison of Pre-Test and Post-Test Result

Table 3: *Scoring classification*

Score	Pretest		Posttest		Category
	Frequence	Percentage (%)	Frequence	Petcentage (%)	
80-100	0	0	17	53.12	Very good
66-79	0	0	4	12.50	Good
56-65	0	0	7	21.87	Fair
40-55	1	3.12	4	12.50	Poor
0-39	31	96.87	0	0	Very poor
Total	32	100	32	100	

Table 3 shows a substantial improvement in students' scores after being taught using ICT-based interactive media (Wordwall). In the pre-test, 96.88% of students were in the Very Poor category, with scores ranging from 8.57 to 42.85 and an average score of 23.03. After the treatment, the post-test results demonstrated a remarkable increase, with 53.13% of students reaching the Very Good category, scores ranging from 51.43 to 100, and an average score of 75.54 (Good category). These results clearly indicate that the use of ICT-based interactive media had a significant positive effect on enhancing students' understanding and performance in English nouns.

3.1.2. The SPSS Calculation Results

3.1.2.1. Descriptive Statistics

Table 4: *Descriptive Statistics*

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Pretest	32	8.571	42.857	23.03522	8.272486	68.434
Posttest	32	51.428	100.000	75.53525	15.082730	227.489
Valid N (listwise)	32					

Table 4 presents a comprehensive summary of the pre-test and post-test results of 32 students, highlighting substantial improvement following the implementation of ICT-based interactive media (Wordwall). In the pre-test, students' scores ranged from 8.57 to 42.86, with a mean of 23.03, a standard deviation of 8.27, and a variance of 68.43, reflecting a generally low and heterogeneous level of understanding of English nouns.

Subsequent post-test results demonstrated a marked increase, with scores ranging from 51.43 to 100, a mean of 75.53, a standard deviation of 15.08, and a variance of 227.49. Although some variability persisted, the overall improvement indicates that the use of Wordwall significantly enhanced students' cognitive mastery, retention, and ability to apply English nouns in context. These findings provide compelling evidence that ICT-based interactive media not only facilitates cognitive learning outcomes but also promotes greater learner engagement and active participation in the language learning process.

3.1.2.2. Normality Test

Table 5: *Tests of Normality*

	Kolmogorov-Smirnov ^a	Shapiro-Wilk
--	---------------------------------	--------------

	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.137	32	.133	.965	32	.367
Posttest	.281	32	.063	.867	32	.181

Based on the normality test results, the pre-test and post-test data with a sample size of 32 students show significance (Sig.) values of 0.133 for the pre-test and 0.063 for the post-test under the Kolmogorov-Smirnov test, while the Shapiro-Wilk test shows 0.367 for the pre-test and 0.181 for the post-test. Since all significant values are greater than 0.05, it is possible to conclude that both the pre-test and post-test data are regularly distributed.

3.1.2.3. Paired Sample T test

Table 6: *Paired Samples Test*

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest - Posttest	-52.500	11.071	1.957	-56.491	-48.508	-26.824	31	.000

Based on the results of the paired sample t-test in the table above, a mean difference of -52.500 was obtained, indicating a difference of 52.500 points between the average pre-test and post-test scores, with the post-test score being higher than the pre-test. The calculated t-value was -26.824 with degrees of freedom (df) = 31, derived from the total sample size of 32 students, reduced by 1 (df = N-1 = 32-1 = 31). The significance level (Sig. 2-tailed) was 0.000 < 0.05, showing a significant difference between pre-test and post-test data. As a result, it can be inferred that the usage of ICT-based interactive media significantly improves students' cognitive learning results in English Nouns content.

3.2. DISCUSSION

The results of this study revealed that students' cognitive learning outcomes in English Nouns before the treatment were still very low, with an average pre-test score of 23.03. Most students were categorized as very poor, indicating that their initial understanding was not yet optimal and required more supportive learning media. After being treated with ICT-based interactive media using Wordwall, the post-test findings indicated a considerable improvement. The average score rose to 75.53, with the majority of students rated as very good. Nearly all students improved, and some even achieved the maximum score. This demonstrates that Wordwall provides a more engaging, enjoyable, and effective learning experience for improving students' cognitive learning outcomes.

The implications of these findings indicate that English learning particularly the cognitive understanding of nouns will be more effective when supported by game-based digital media such as Wordwall. This is supported by Medina et al. (2024), who found that Wordwall (or interactive educational websites) can create an enjoyable classroom atmosphere, increase student participation, and make vocabulary learning more interesting and easier to follow. In addition, Zhu (2022) explains that using simple multimedia instructional designs that do not overload students helps make the learning process more efficient a principle that matches Wordwall's practical and easy-to-use interface.

The statistical analysis supported these findings. The normality test indicated that both pre-test and post-test data were normally distributed, leading to the application of a paired sample t-test. The mean difference was -52.250 with a significance value of $0.000 < 0.05$, indicating a significant difference between pre-test and post-test. As a result, the usage of ICT-based interactive media has been shown to significantly improve students' cognitive learning outcomes.

These findings align with the Multimedia Learning Theory proposed by Mayer (2009), which states that learning is more effective when involving both visual and auditory channels simultaneously, as this enhances information processing and knowledge retention. Previous research also supports this study. Gulo et al. (2024) reported that ICT-based interactive media significantly improved students' vocabulary mastery by increasing their focus and making learning more engaging. His findings confirm that digital platforms can reinforce cognitive understanding through attractive and interactive learning tasks similar to the improvement shown in this study through Wordwall. Similarly,

Syamsidar (2023) showed that digital learning tools make language material easier to grasp and encourage students to participate more actively, which boosts their learning results.

In addition, Darmawati and Nayla (2023) showed that Wordwall significantly improved vocabulary mastery. Dewi et al. (2024) emphasized that Wordwall received very good expert validation scores, confirming its feasibility in language instruction. Moreover, Hafifah and Hanifa (2024) reported that students perceived Wordwall as highly motivating, particularly in terms of attention and confidence. Similarly, Belvin et al. (2023) demonstrated that Wordwall significantly outperformed traditional methods in enhancing vocabulary learning. Furthermore, Prastiwi and Lestari concluded that digital game-based learning significantly enhances students' motivation, engagement, and vocabulary retention.

The enhancement of students' cognitive achievement can be attributed to Wordwall's engaging, enjoyable, and interactive features. By presenting learning as a variety of game-based tasks (e.g., matching, sorting, and quizzes), Wordwall breaks the monotony of conventional instruction and fosters active student participation. Such dynamic activities increase focus and motivation, which in turn facilitate better comprehension and retention particularly in cognitive skills like identifying, understanding, and applying nouns in context.

The integration of Wordwall in classroom practice fosters a higher degree of learner participation throughout the instructional process. Rather than acting as passive receivers of knowledge, students are actively engaged through interactive and game-oriented exercises that require their direct involvement with the content. This interactive engagement reinforces both cognitive and affective dimensions of learning, as it encourages students to employ critical thinking, make informed choices, and continuously assess their conceptual understanding. As a result, Wordwall transforms traditional classroom dynamics into a more stimulating, purposeful, and learner-centered environment.

In addition to promoting active involvement, Wordwall effectively enhances students' curiosity, attentiveness, and intrinsic motivation. The combination of multimodal features visual, auditory, and interactive creates a communicative and enjoyable atmosphere conducive to language learning, particularly in the instruction of English nouns. Consequently, the utilization of Wordwall contributes not only to the improvement of students' cognitive comprehension but also to the cultivation of a positive and enduring learning experience that maintains students' enthusiasm and engagement.

In conclusion, the overall findings affirm that Wordwall is not merely statistically significant in improving students' cognitive performance but is also pedagogically advantageous in stimulating motivation, active learning behavior, and meaningful participation. With its engaging, interactive, and student-centered design, Wordwall serves as an innovative ICT-based pedagogical tool that effectively supports both the cognitive and affective aspects of English language learning. Therefore, educators are strongly encouraged to incorporate Wordwall into classroom instruction particularly in teaching English nouns to facilitate deeper understanding, active involvement, and enhanced academic achievement among learners.

4) CONCLUSIONS

This study concludes that the use of ICT-based interactive media, specifically Wordwall, has a significant positive impact on students' cognitive learning outcomes in learning English nouns. The findings showed a substantial improvement from the pre-test average score of 23.03, categorized as very poor, to the post-test average score of 75.53, categorized as very good. The statistical analysis using the paired sample t-test further confirmed this improvement, with a significance value of $0.000 < 0.05$, indicating a meaningful difference between students' achievement before and after the treatment. These results affirm that Wordwall successfully creates an engaging, enjoyable, and motivating learning environment that fosters better understanding and retention of English nouns.

The study also implies that integrating ICT-based interactive media into English instruction can enhance not only students' cognitive performance but also their interest, participation, and motivation in the learning process. The findings strengthen the viewpoint supported by previous research that game-based digital platforms help simplify learning materials, encourage active involvement, and provide multimodal stimulation that contributes to better learning outcomes. Therefore, English teachers are encouraged to utilize Wordwall or similar digital learning tools to support more effective and student-centered teaching practices.

Based on these results, it is recommended that future educators incorporate a variety of interactive and game-based digital resources to enrich classroom instruction, particularly in vocabulary learning. Schools should also provide adequate technological facilities and training for teachers to maximize the use of ICT in the classroom. For future researchers, it is suggested to explore longer treatment durations, larger populations, or additional language components to further strengthen the evidence of the effectiveness of ICT-based interactive learning media.

Paper presented at The 2nd ICONETT, 2025
Faculty of Teacher Training and Education
Universitas Islam Negeri Alauddin Makassar
South Sulawesi-Indonesia

Acknowledgment

The researcher would like to express sincere appreciation to all parties who contributed to the completion of this article. Special thanks are extended to the supervisor for the guidance and constructive feedback provided throughout the research and writing process. The author also expresses gratitude to the lecturers and students of the English Education Department, Faculty of Tarbiyah and Teacher Training, UIN Alauddin Makassar, for their support and for providing the necessary data for this study. In addition, heartfelt thanks are conveyed to the author's family and colleagues for their continuous encouragement and motivation, which greatly supported the completion of this article.

REFERENCES

- Arikunto, Suharsimi. *Prosedur Penelitian : Suatu Pendekatan Praktek*. Revisi 6. Jakarta: Rineka Cipta, 2006.
- Ary, Donald, Lucy Cheser Jacobs, and Asghar Razavieh. *Introduction to Research in Education* Belmont. California: Wadsworth, 2010.
- Belvin, Harefa, Telaumbanua, and Zega. "The Effect of Interactive Multimedia Wordwall on Students' Vocabulary Learning Outcomes." *Seltics* 7, no. 2 (2023). <https://doi.org/10.46918/seltics.v7i2.2514>
- Bryman, Alan. *Social Research Methods*. Oxford University Press, 2016.
- Clark, Ruth Colvin, and Richard E. Mayer. *E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning*. 4th ed. San Francisco: Pfeiffer, 2016.
- Creswell, John W. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 4thh Editi. United States of America: Sage Publications, Inc, 2014. https://books.google.co.id/books?id=4uB76IC_pOQC&printsec=copyright&hl=id#v=onepage&q&f=false.
- Creswell, John W., and J. David Creswell. *Research Design : Qualitative, Quantitative and Mixed Methods Approaches*. Fifth Ed. California: SAGE Publications, 2018. <https://doi.org/10.4324/9780429469237-3>.
- Darmawati and Nayla. "The Effect of Using Wordwall Website as a Strategy on Students' Vocabulary Mastery." *International Journal of Educational Research* 2, no. 2 (2023). <https://doi.org/10.62951/ijer.v2i2.311>
- Dewi, Utami, and Suprianti. "The Development of Wordwall-Based Digital Media for Teaching English Vocabulary." *Innovative Journal* 4, no. 5 (2024). <https://doi.org/10.31004/innovative.v4i5.13023>
- Fraenkel, Peter, and Wonyoung L. Cho. "Reaching Up, Down, In, and Around: Couple and Family

Paper presented at The 2nd ICONETT, 2025
Faculty of Teacher Training and Education
Universitas Islam Negeri Alauddin Makassar
South Sulawesi-Indonesia

- Coping During the Coronavirus Pandemic.” *Family Process* 59, no. 3 (September 1, 2020): 847–64. <https://doi.org/10.1111/FAMP.12570>.
- Gagne, Robert M., Leslie J. Briggs, and Walter W. Wager. *Principles of Instructional Design*. 4th ed. Florida: Harcourt Brace College, 1992.
- Gay, Leland R. *Educational Research: Competencies for Analysis and Application*. Columbus: Charles E. Merrill Publishing Company, 1981.
- Gay, Lorraine R, Geoffrey E Mills, and Peter W Airasian. *Educational Research: Competencies for Analysis and Applications*. Pearson, 2012.
- Gerlach, Vernon S., and Donald P. Ely. *Teaching and Media: A Systematic Approach*. California: Prentice-Hall, 1971.
- Hafifah and Hanifa. “Senior High School Students’ Perception of Using Wordwall Toward Their Motivation in Learning Vocabulary.” *Journal of English Language Teaching* 13, no. 3 (2024). <https://doi.org/10.24036/jelt.v13i3.129630>
- I Gusti Ayu Ari Agung. *Pengantar Statistik Parametrik dan Nonparametrik*. 2022.
- Jean Piaget – *The Origins of Intelligence in Children* (1952).
- Jerome Bruner – *Toward a Theory of Instruction* (1966).
- Levie, Wesley H., and Richard Lentz. “Effects of Text Illustrations: A Review of Research.” *Educational Communication and Technology Journal* 30, no. 4 (1982): 195–232. <https://doi.org/10.1007/BF02765184>.
- Mayer, Richard E. *Multimedia Learning*. 2nd ed. Cambridge: Cambridge University Press, 2009. <https://doi.org/10.1017/CBO9780511811678>
- Medina, Mobit, and Puspitaloka. “Game-Based Wordwall in Vocabulary Learning: A Teacher’s Implementation and Students’ Views.” *Journal of Educational Sciences* 8, no. 4 (2024): 847–857. <https://doi.org/10.31258/jes.8.4.p.847-857>
- Miles, Matthew B., A. Michael Huberman, and Johnny Saldaña. *Qualitative Data Analysis: A Methods Sourcebook*. California: SAGE Publications, 2020.
- Namdev, Dhamdhare Sangeeta. “ICT And Web Technology Based Innovations In Education Sector.” *Turkish Online Journal of Distance Education* 13, no. 4 (2012): 256–68. <https://dergipark.org.tr/en/pub/tojde/issue/16902/176214>.
- Ni Putu Ayu Aditya Anggita Dewi, Ida Luh Putu Utami, & Gusti Ayu Putu Suprianti. (2024). The Development of Wordwall-Based Digital Media for Teaching English Vocabulary for Sixth Graders. *Innovative: Journal of Social Science Research*, Vol. 4, No. 5, pp. 919–928. Universitas Pendidikan Ganesha. DOI: 10.31004/innovative.v4i5.13023
- Paulus Budi Gulo, Alfius Telaumbanua Harefa, Yarniati A. Telaumbanua, & Ria Zega. (2024). The Effect of Interactive Multimedia Wordwall on Students’ Vocabulary Learning Outcomes at SMA Negeri 1 Huruna. *Seltics Journal: Scope of English Language Teaching, Literature & Linguistics*, Vol. 7, No. 2. Universitas Muslim Maros
- Purwanto, Ngalmi. *Prinsip-Prinsip dan Teknik Evaluasi Pengajaran*. Bandung: Remaja Rosdakarya,

2010.

Richard C. Atkinson & Richard M. Shiffrin – artikel Human Memory: A Proposed System and Its Control Processes dalam *The Psychology of Learning and Motivation* (1968).

Robert M. Gagné – *The Conditions of Learning and Theory of Instruction* (1985).

Setyawan, D. A. *Petunjuk Praktikum Uji Normalitas & Homogenitas Data Dengan SPSS*. 2021.

Sugiyono. *Metode Penelitian Kuantitatif, Kualitatif Dan R&D*. Bandung: Alfabeta, 2016.

Sutrisno. *Pengantar Pembelajaran Inovatif Berbasis Teknologi Informasi Dan Komunikasi*. Jakarta: Gaung Persada, 2011.

Syamsidar, Murad, Abdul Rahman, & Fitriani. (2023). Wordwall on Mastery of Vocabulary in English Learning. *Al-Ishlah: Jurnal Pendidikan*, Vol. 15, No. 2, pp. 1801–1806. STAI Hubbul Wathan Duri. DOI: 10.35445/alishlah.v15i2.3466.

Tinio, Victoria L. *ICT in Education*. Manila: e-ASEAN Task Force, 2002. <https://doi.org/10.4018/978-1-60960-048-8.ch005>.

Vygotsky, Lev Semenovich. *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, Massachusetts: Harvard University Press, 1978.

Zhu. “A Study on EFL Instructional Design from the Perspective of Cognitive Load Theory.” *Learning & Education* 10, no. 8 (2022): 165–166. <https://doi.org/10.18282/l-e.v10i8.3106>