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Optimization of teachers' digital competence in the development of wordwall as interactive learning platform

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ABSTRACT
Background: The rapid advancement of digital technology necessitates that teachers enhance their digital competence to create more engaging learning experiences. Interactive learning media, such as Wordwall, provide opportunities to integrate technology into teaching.
Aim: This study aims to optimize teachers' digital competence through the development of a valid and practical interactive Wordwall-based learning media.
Method: This study employed research and development (R&D) using the ADDIE model. The research subjects involved eighth-grade teachers and students, with four mathematics teachers and six students selected through purposive sampling. Data collection included expert validation, practicality tests with teachers and students, and teacher interviews. Additionally, qualitative data from teacher interviews provided deeper insights into the platform's impact on their digital competence.
Results: The validation results indicate that Wordwall has a high level of validity, with an average score of 90% (highly valid), covering content suitability, construction, language, and technology aspects. The practicality test demonstrated that Wordwall is practical for both teachers and students, with average scores of 77.45% and 82.75%, respectively (practical). Additionally, a survey assessing the optimization of Wordwall usage by teachers yielded an average score of 77.6% (good). Teacher interviews revealed that Wordwall enhances their confidence in utilizing digital technology.
Conclusion: Wordwall serves as a valid and practical interactive learning platform that supports the optimization of teachers' digital competence. It enables teachers to integrate technology into their teaching, enhancing their confidence and instructional strategies. Future research is recommended to explore the long-term impact on teachers' digital competence and investigate its application across diverse educational contexts.

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INTRODUCTION

Teachers' digital competence has become a crucial requirement in the modern digital era for addressing the challenges of 21st-century learning. The ability of teachers to integrate technology into the learning process not only enhances efficiency (Ertmer et al., 2012) but also fosters an interactive, engaging, and relevant learning environment that aligns with students' current needs (Ghavifekr & Rosdy, 2015). The use of technology, particularly interactive digital platforms, has been proven to increase student engagement, expand access to learning resources, and promote learning effectiveness (Haleem et al., 2022; Kumi-Yeboah et al., 2020). In this context, national education policies such as the *Kurikulum Merdeka* in Indonesia encourage the integration of technology into teaching as an effort to create a more adaptive and responsive education system in response to the evolving demands of the times (Pramesworo et al., 2023; Sukmayadi & Yahya, 2020; Yetti, 2024). Additionally, international standards, such as the UNESCO ICT Competency Framework for Teachers, emphasize the importance of developing teachers' digital competence to support sustainable and inclusive educational transformation (Falloon, 2020; Fernández-Batanero et al., 2022).

Although the integration of technology in education is increasingly emphasized, many teachers still face challenges in improving their digital competence. One of the primary issues is the limited ability of some teachers to effectively utilize educational technology for both lesson planning and instructional implementation (Ghavifekr et al., 2016; Hew & Brush, 2017). This challenge is often attributed to teachers' lack of understanding of how to leverage interactive technology to support learning. According

to a survey conducted by the Center for Educational and Cultural Policy Research (2023), only about 30% of teachers in Indonesia feel confident in effectively using educational technology. This situation indicates that further efforts are needed to support teachers in enhancing their digital competence, enabling them to integrate educational technology effectively into the learning process.

Teachers' ability to create interactive and engaging learning experiences can depend on the media they use. One such tool is Wordwall, which provides a practical solution for teachers to facilitate dynamic and interactive learning activities through its easily accessible and user-friendly features (Annisa et al., 2025; Frada et al., 2024; Syaifi & Murwitaningsih, 2022). Wordwall enables teachers to develop various types of content, including quizzes, educational games, and gamification-based activities, designed to enhance student engagement in learning (Emilia et al., 2024; Frada et al., 2024). Its relevance is further reinforced in supporting collaborative learning that encourages active student participation, aligning with the demands of 21st-century educational technology. With these advantages, Wordwall not only simplifies technology integration in classrooms but also contributes to creating more engaging and effective learning experiences.

In the development of educational platforms, the primary focus is on creating media that support interactive learning and align with the needs of the 21st century. One of the greatest challenges is ensuring that educational technology genuinely helps teachers effectively integrate technology into their teaching. In the context of Wordwall, this platform offers a range of features designed to facilitate engaging learning experiences, including educational games, interactive quizzes, and collaborative activities that enhance student engagement (Agusti & Aslam, 2022; Hidayaty et al., 2022; Syaifi & Murwitaningsih, 2022). With its simple design and flexible usability, Wordwall serves as a technological solution that not only supports teaching but also helps teachers improve their digital skills (Dewi et al., 2024; Rodriguez-Escobar et al., 2023). Its interactive features enable teachers to adopt technology with greater confidence, ultimately creating more engaging learning experiences for students.

Previous studies have extensively explored the use of Wordwall in various learning contexts. Sari et al. (2025) highlighted the potential of Wordwall in increasing students' learning interest in support of Sustainable Development Goals (SDGs). A study by Bouzaiane & Youzbashi (2024) demonstrated the effectiveness of gamification-based learning using Wordwall in enhancing student engagement. Similarly, research by Rahma et al. (2023) examined how gamified Wordwall supports students' mathematical learning activities. In addition, Nenohai et al. (2022) developed a gamification-based Wordwall platform for reaction rate materials, focusing on content enrichment. While Wordwall has been proven effective in improving student learning outcomes, studies such as Hasram et al. (2021) and Chandra & Kun (2024) have primarily focused on student engagement without specifically addressing the challenges teachers face in effectively utilizing the platform. Furthermore, Tomczyk et al. (2024) found that despite Wordwall being considered easy to use, a digital competence gap persists among teachers, particularly in applying interactive technology in learning. This study aims to address this gap by focusing on teachers' digital competence and ensuring that Wordwall is not only user-friendly but also relevant and sustainable in the context of 21st-century learning. Thus, this research contributes to supporting teachers in enhancing their digital skills while simultaneously developing Wordwall as an interactive learning medium.

Based on the background outlined, this study aims to develop Wordwall as a valid and practical interactive learning platform to support the teaching process and optimize teachers' digital competence. This research is expected to provide a concrete solution to the challenges of digital learning in the modern era by offering an interactive medium that is not only easy to use but also effective in creating engaging and relevant learning experiences for students.

METHOD

Research Design

This study employs a research and development (R&D) approach to develop an interactive Wordwall-based learning media designed to enhance teachers' digital competence. The development process

involves experts to validate the media, focusing on content, structure, language, and technological aspects. After incorporating feedback from experts, the product is tested with a small group of teachers and students to assess its practicality and relevance in the learning process. The evaluation results from validation and trials are used to refine the Wordwall media to meet the required validity and practicality criteria for interactive learning. Once the developed product meets the valid and practical criteria, questionnaires and interviews are conducted to measure the optimization of teachers' digital competence after using the media. The research design flow is presented in Figure 1.

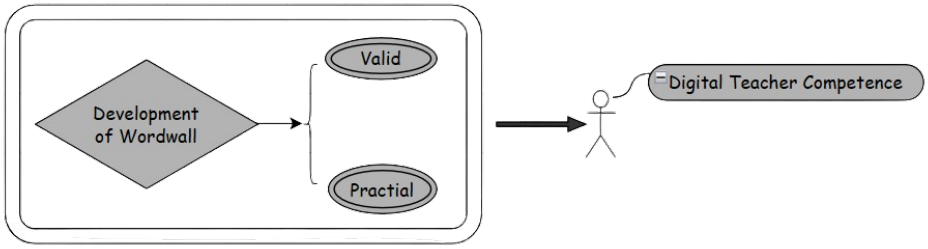

Figure 1. Research Design

Participants

The participants in this study were mathematics teachers and eighth-grade students from a school in East Lampung Regency, selected using a purposive sampling technique. The selection criteria included teachers who had access to Wordwall technology and were willing to provide feedback on its use in teaching and learning. To determine validity, the platform was comprehensively evaluated by four experts in education and instructional technology. The number of participants was adjusted to meet the study's requirements, involving six students and four teachers in the implementation phase to assess the practicality and gather feedback on Wordwall's use by teachers. This participant selection aimed to ensure that the study was conducted with individuals who were directly relevant to the research focus.

Instruments

The instruments used in this study include several data collection tools designed to assess the validity and practicality of the developed Wordwall platform. A validation rubric was used by experts to evaluate the content suitability, design, and usability of the guide (Ani, 2015). This assessment was conducted based on indicators covering content, pedagogical, and technical validity. Furthermore, a practicality questionnaire was completed by both students and teachers after the product trial to assess the ease of use and benefits of the guide. This questionnaire included indicators such as efficiency, accessibility, and relevance. Prior to implementation, both the validation and practicality questionnaires underwent validity and reliability testing to ensure their appropriateness for this study. In addition, an interview protocol was used to explore teachers' experiences and perspectives regarding the use of the developed Wordwall platform in teaching and learning. These instruments were designed to support a comprehensive data collection process in this study.

Data Analysis

The development of Wordwall as an interactive learning media was evaluated comprehensively. The key aspects assessed in this guide include content, structure, language, and technological compatibility. Each aspect was rated using a Likert scale ranging from 1 to 5, representing the level of appropriateness and quality of the developed guide. This evaluation process aims to ensure that the resulting Wordwall platform possesses validity and effectively supports the optimization of teachers' digital competence. The assessment criteria for each aspect are presented in Table 1.

Table 1. Validation Sheet Assessment Category

Score	Category
5	Very Good
4	Good
3	Good Enough
2	Less Good
1	Not Good

The validity scores obtained will be used to determine the level of validity of the Wordwall platform, which has been assessed based on validity criteria (Sugiono, 2017) as presented in Table 2.

Table 2. Validity Categories

Validity Level	Category
82% - 100%	Very valid
63% - 81%	Valid
44% - 62%	Less Valid
25% - 43%	Invalid

The analysis of the practicality questionnaire data obtained from students and teachers during the small-group trial allows students to provide assessments, comments, and suggestions regarding the Wordwall media. The practicality assessment is conducted using a rating scale from 1 to 5, with detailed descriptions presented in Table 3.

Table 3. Praticality Sheet Assessment Category

Score	Category
5	Very Agree
4	Agree
3	Quite Agree
2	Disagree
1	Very disagree

The evaluation scores obtained will be used to determine the level of practicality of Wordwall as an interactive learning media, referring to the practicality criteria developed by Sugiyono (2017). This assessment is conducted to ensure that the developed guide is user-friendly for teachers and relevant to the needs of interactive learning in the digital era. The analysis results of the practicality level are summarized based on the rating scale outlined in Table 4.

Table 4. Practicality Categories

Validity Level	Category
82% - 100%	Very Practical
63% - 81%	Practical
44% - 62%	Less Practical
25% - 43%	Impractical

The evaluation results of the validity and practicality of Wordwall will serve as the foundation for refining the developed interactive media. The validity assessment conducted by experts provides insights into the alignment of content, structure, language, and technology with learning objectives. Meanwhile, the practicality assessment by teachers and students in the small-group trial offers valuable perspectives on ease of use and the relevance of Wordwall in supporting interactive learning. The collected data will be analyzed quantitatively to determine the validity and practicality categories, as presented in Table 2 and Table 4. Subsequently, the media will be implemented by teachers in the learning process to optimize their competence in utilizing educational digital.

RESULTS AND DISCUSSION

Through the use of Wordwall, the results highlight how its development and implementation contribute to teachers' digital competence. This section presents the research findings based on the evaluation of Wordwall's validity and practicality as an interactive learning media. The findings are derived from data collected through validation by four experts in education and instructional technology, as well as practicality trials conducted with a small group of teachers and students. These findings serve as a foundation for assessing the quality of the developed Wordwall platform and its potential application in interactive learning. Table 5 presents the validation results obtained from the experts.

Table 5. Validation Results of the Wordwall Platform by Experts

Assessment Aspects	Validator			
	V1	V2	V3	V4
Content	70%	72%	68%	74%
Construction	68%	70%	66%	72%
Language	72%	74%	70%	73%
Technological Suitability	71%	69%	70%	72%
Average	70,25%	71,25%	68,5%	72,75 %
Category	Valid			

The validation results of Wordwall as an interactive learning media indicate that all evaluated aspects content, structure, language, and technological compatibility fall within the valid category, with an overall average score of 70.69%. This assessment suggests that the developed Wordwall platform meets the necessary standards for use in interactive learning. The validators found that Wordwall aligns with learning needs, has a reasonably clear structure, employs simple language, and includes technological features that effectively support the learning process. However, the findings also highlight areas for improvement, particularly in enhancing the clarity of the user interface design and ensuring technological compatibility across various devices. Based on expert reviews, Table 6 presents comments and suggestions from validators and students regarding the interactive Wordwall platform.

Table 6. Expert Validators' Comments on Wordwall Validation

Validator	Comments/Suggestions	Revision Decision
Validator 1	The instructions in several activities need simplification for clarity.	Simplified instructions to enhance clarity.
	The language in the feedback section requires consistency.	Revised language for consistent feedback.
Validator 2	Ensure that the features selected align with technological capabilities of users.	Adjusted features to match user technological levels.
	Add a short tutorial for first-time users.	Created a brief tutorial integrated into wordwall.
Validator 3	The content needs to align more closely with learning objectives.	Revised content to align with learning objectives.
	Provide examples of how to apply Wordwall in specific lessons.	Added application examples for selected lessons.
	Clarify the instructions for interactive quizzes.	Improved clarity in quiz instructions.
Validator 4	Some activities are too advanced for students' level.	Adjusted activities to match student abilities.
	Provide a guide for teachers to integrate Wordwall into their lesson plans.	Developed a teacher guide for lesson integration.
	Remove redundant commands in the interactive features.	Streamlined the interactive features for efficiency.

Next, a practicality test was conducted to assess the extent to which Wordwall, as an interactive learning media, can be easily utilized by teachers and students in the learning process. The assessment was carried out through questionnaires completed by a small group of participants. The practicality test focused on three key aspects: efficiency, ease of use, and the relevance of Wordwall to learning needs. The results of this test are presented as practicality percentages based on predetermined categories.

Table 7. Praticality Result by Teacher

No	Component	P_p (Percentage)	Category
1	Ease of use	74%	Practical
2	Relevance to learning objectives	76,6%	Practical
3	Clarity of instructions	74%	Practical
4	Technological compatibility	85,2%	Practical
	Average	77,45%	Practical

The results of nine student assessments of the practicality of CT-based electronic student worksheets are attached in Table 8.

Table 8. Praticality Result by Students

No	Component	P_p (Percentage)	Category
1	Ease of use	89.1%	Practical
2	Relevance to learning objectives	84.7%	Practical
3	Clarity of instructions	78%	Practical
4	Technological compatibility	79,2%	Practical
	Average	82,75%	Practical

The practicality test results for Wordwall as an interactive learning media indicate that it falls into the *practical* category, as assessed by both teachers and students. Teachers provided an average score of 77.45%, with the highest ratings given to technological compatibility (85.2%) and relevance to learning objectives (76.6%), suggesting that Wordwall effectively supports technology integration in education and aligns with interactive learning needs. However, ease of use (74%) and clarity of instructions (74%) received lower scores, indicating a need for improvement in facilitating teachers' understanding and utilization of the platform's features. Meanwhile, students assigned a higher average score of 82.75%, with the highest ratings for ease of use (89.1%) and relevance to learning objectives (84.7%), demonstrating that Wordwall successfully engages students and enhances their comprehension of the material. The score disparity between teachers and students suggests that while Wordwall is intuitive and engaging for students, there remains a need for clearer guidance to support teachers in effectively utilizing the platform. These findings highlight the significant potential of Wordwall as a valuable tool in interactive learning.

After wordwall was deemed valid and practical, teachers utilized the media in the learning process for one month as part of optimizing their digital competence. Table 9 presents the data collected through a questionnaire assessing teachers' perceptions of the improvement in their digital skills in teaching.

Table 9. Results of Teacher Perception Questionnaire on the Op Rata-rata Skor timization of Digital Competence

No	Component	Average Score (%)	Category
1	Ability to use educational technology	80%	Very Good
2	Confidence in utilizing technology	75%	Good
3	Integration of technology in teaching	78%	Good
	Average	77,6%	Good

Based on the questionnaire results completed by three teachers from three different schools, the average scores indicate that the use of Wordwall has positively contributed to enhancing teachers' digital competence. A total of 80% of teachers reported increased confidence in using technology, particularly in designing interactive learning activities. Additionally, 75% of teachers stated that Wordwall facilitated the seamless integration of technology into their daily teaching practices.

The interview results with teachers provide a deeper insight into the impact of using Wordwall on their digital competence. The teachers expressed positive feedback, along with several suggestions for further development. Table 10 presents a summary of their responses.

Table 10. Summary of Teacher Responses on the Use of Wordwall

Respondent 1	:	"*I was usually reluctant to try digital media, but Wordwall's simple features motivated me to learn more about technology*."
Respondent 2	:	*'Wordwall provides a concrete example of how technology can support learning, especially in making students more engaged.'*
Respondent 3	:	*"I can quickly create quizzes and educational games, which makes students more enthusiastic about learning."*
Respondent4	:	*"Previously, I was hesitant to use digital media, but Wordwall provided a simple and enjoyable experience, increasing my confidence in exploring other technologies."*

The interview results with teachers provide a clear picture of the positive impact of using Wordwall on optimizing their digital competence. Most teachers reported that Wordwall helped boost their confidence in utilizing educational technology. This is evident from the responses of Respondents 1 and 4, who stated that Wordwall's features provided an enjoyable experience while motivating them to explore other technologies. Additionally, Wordwall was perceived as an effective example of how technology can be meaningfully integrated into learning, as highlighted by Respondent 2. Teachers also appreciated the ease of using Wordwall to create interactive learning activities. For instance, Respondent 3 mentioned that the ability to quickly generate quizzes and educational games using Wordwall enhanced students' enthusiasm for learning. Overall, teachers' responses indicate that Wordwall not only supports technical proficiency but also instills confidence and inspiration to integrate technology into the teaching process. However, to maximize its impact, additional support, such as advanced training or more detailed user guides, is recommended to help teachers explore Wordwall's features more comprehensively.

Overall, the validation results indicate that Wordwall has been well-designed and meets both pedagogical and technical standards, supporting its use in interactive learning. The high validity scores reflect the alignment of this media with the needs of both teachers and students in terms of content and technology. These findings are consistent with Suharsiwi et al. (2023), who stated that valid technology-based learning media can enhance the quality of the learning process. Furthermore, as an interactive platform, Wordwall provides flexibility for teachers to adapt learning materials according to their instructional needs.

The practicality assessment of Wordwall, as evaluated by both teachers and students, indicates that the platform is easy to use, aligns with learning objectives, and enhances the learning experience. Teachers found it helpful in designing more interactive learning activities, while students reported increased motivation due to its engaging features. These findings align with Saba (2024), who highlighted that interactive digital platforms enhance student engagement and improve teaching efficiency. However, aspects such as clarity of instructions and technological compatibility still require further refinement to provide a more optimal user experience.

Interviews with teachers further reinforce these findings, with positive feedback regarding the impact of Wordwall on their confidence and digital competence. Teachers appreciated the flexibility of Wordwall, although some faced challenges in understanding its more complex features. To address this, additional guidance or advanced training is needed to help teachers fully optimize the use of this technology. Thus, this study makes a significant contribution to supporting the optimization of teachers' digital competence, particularly through the development and implementation of technology-based learning media such as Wordwall.

This study aligns with previous research highlighting the effectiveness of interactive learning media in enhancing teachers' digital competence and students' learning motivation. For instance, research by Zulfa et al. (2024) found that the use of Wordwall as a learning tool significantly increased students' motivation in science subjects, with an improvement from 58.6% in the pre-cycle to 90% in the second cycle. Similarly, a study by Marlita et al. (2024) demonstrated that using Wordwall encouraged students to think more critically and had significant benefits for learning. These findings support the current study's results, showing that Wordwall not only boosts teachers' confidence in using technology but also facilitates the design of interactive and engaging learning activities for students.

Conclusion

The use of Wordwall as an interactive learning media has significantly contributed to optimizing teachers' digital competence. Based on validation results, Wordwall demonstrated a high level of validity, with an average score of 90%, categorized as *highly valid*, covering aspects of content suitability, structure, language, and technology. The practicality test indicated that Wordwall is practical for both teachers and students, with average scores of 77.45% and 82.75%, respectively, classified as *practical*. Additionally, a survey assessing the optimization of Wordwall usage by teachers yielded an average score

of 77.6%, categorized as *good*. Teachers reported increased confidence in utilizing technology and found Wordwall helpful in designing engaging interactive lessons, while students became more motivated to learn. However, the findings also highlight the need for additional guidelines and advanced training to maximize the platform's features, particularly for teachers facing challenges in understanding technology. Therefore, Wordwall holds significant potential to support effective technology-based learning in the digital era.

Future research is recommended to expand the implementation scale of Wordwall by involving a larger sample size and various educational levels to examine the diversity of results. Long-term studies are also suggested to assess changes in teachers' digital competence after using Wordwall over an extended period. Further research could explore the integration of Wordwall with local curricula or specific learning needs, such as thematic or project-based learning, as well as investigate its effectiveness in comparison with other interactive media in enhancing student engagement and teachers' digital competence.

Author Contribution

The author independently conceptualized the research idea, formulated the research objectives and questions, and developed the theoretical framework. The author also designed the research methodology, prepared and validated the research instruments, and was responsible for the data collection and analysis. Furthermore, the author wrote the entire manuscript, including the interpretation of results, discussion, conclusion, and carried out all revisions and proofreading processes. All aspects of the research and writing were carried out solely by the author without contribution from others.

References

Agusti, N. M., & Aslam, A. (2022). Efektivitas media pembelajaran aplikasi wordwall terhadap hasil belajar ipa siswa sekolah dasar. *Jurnal Basicedu*, *6*(4), 5794–5800.

Annisa, U. F., Krismanto, W., Tuken, R., & Pasinggi, Y. S. (2025). Wordwall Integration in Learning: Is it Effective in Encouraging Student Activity? *International Journal of Research in Education*, *5*(1), 59–69.

Ani, M. H. I. C. S. (2015). Aplikasi Anates versi 4 dalam menganalisis butir soal. *Faktor: Jurnal Ilmiah Kependidikan*, *1*(2)

Bouzaiane, B., & Youzbashi, A. (2024). The Role of Digital-Game Based Language Learning in EFL Vocabulary Learning and Retention: A Case Study at a Higher Educational Institute in Oman. *Journal of Language Teaching and Research*, *15*(5), 1660–1669.

Chandra, M. R., & Kun, Q. (2024). Utilizing Wordwall Mobile Apps to Improve Mandarin Language Skills. *2024 3rd International Conference on Creative Communication and Innovative Technology (ICCIT)*, 1–4. https://ieeexplore.ieee.org/abstract/document/10701231/

Dewi, R., Ruhiyat, Y., & Nulhakim, L. (2024). The Use of WordWall-Based Learning Media in Elementary Schools. *EDUTEC: Journal of Education and Technology*, *8*(2), 272–280.

Emilia, F., Rulyansah, A., Amin, S. M., & Nafiah, N. (2024). Improving Mathematical Understanding Through the Use of Wordwall Media in Elementary Schools. *BASICA Journal of Arts and Science in Primary Education*, *4*(1), 11–22.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, *59*(2), 423–435.

Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. *Educational Technology Research and Development*, *68*(5), 2449–2472. https://doi.org/10.1007/s11423-020-09767-4

Fernández-Batanero, J. M., Montenegro-Rueda, M., Fernández-Cerero, J., & García-Martínez, I. (2022). Digital competences for teacher professional development. Systematic review. *European Journal of Teacher Education*, *45*(4), 513–531. https://doi.org/10.1080/02619768.2020.1827389

Frada, T. W., Gunawan, G., Untarti, R., Kusuma, J. W., Ristianto, M., & Vertikawati, R. (2024). Application of Problem-Based Learning to Improve Student Motivation and Learning Outcomes Assisted by Wordwall. *International Journal of Multidisciplinary Research and Literature*, *3*(2), 195–203.

Ghavifekr, S., Kunjappan, T., Ramasamy, L., & Anthony, A. (2016). Teaching and Learning with ICT Tools: Issues and Challenges from Teachers' Perceptions. *Malaysian Online Journal of Educational Technology*, *4*(2), 38–57.

Ghavifekr, S., & Rosdy, W. A. W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science*, *1*(2), 175–191.

Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, *3*, 275–285.

Hasram, S., Nasir, M. K. M., Mohamad, M., Daud, M. Y., Abd Rahman, M. J., & Mohammad, W. M. R. W. (2021). The effects of wordwall online games (Wow) on english language vocabulary learning among year 5 pupils. *Theory and Practice in Language Studies*, *11*(9), 1059–1066.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development*, *55*(3), 223–252. https://doi.org/10.1007/s11423-006-9022-5

Hidayaty, A., Qurbaniah, M., & Setiadi, A. E. (2022). The influence of word wall on students' interest and learning outcomes. *Jurnal Penelitian Ilmu Pendidikan*, *15*(2), 211–223.

Kumi-Yeboah, A., Kim, Y., Sallar, A. M., & Kiramba, L. K. (2020). Exploring the use of digital technologies from the perspective of diverse learners in online learning environments. *Online Learning*, *24*(4), 42–63.

Marlita, I. N., Patonah, S., Ariestanti, E., & Miyono, N. (2024). Analisis Penggunaan Media Pembelajaran Wordwall Game dalam Pembelajaran Matematika di Sekolah Dasar. *Jurnal Studi Guru Dan Pembelajaran*, *7*(2), 725–735.

Nenohai, J. A., Rokhim, D. A., Agustina, N. I., & Munzil, M. (2022). Development of gamification-based Wordwall game platform on reaction rate materials. *Orbital: The Electronic Journal of Chemistry*, 116–122.

Pramesworo, I. S., Fathurrochman, I., Sembing, D., Bangkara, B. A., & Sudrajat, D. (2023). Relevance between Blended Learning and Students' Independent Learning Curriculum: An Overview of Digital Age Education, Student and Teacher Engagement, Technological Resources. *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, *9*(3), 858–869.

Rahma, T. K., Nurcahyo, A., Ishartono, N., Setyaningsih, R., Setyono, I. D., Putra, D. A., & Fitrianna, A. Y. (2023). Using wordwall as a gamification-based mathematics learning material to support students' learning activities. *AIP Conference Proceedings*, *2727*(1). https://pubs.aip.org/aip/acp/article-abstract/2727/1/020043/2895073

Rodriguez-Escobar, C., Cuevas-Lepe, J., & Maluenda-Parraguez, L. (2023). Assessing the Effectiveness of Wordwall. Net as a Vocabulary Learning Tool: Pre-Service EFL Teachers' Perspectives. *Journal of Education and Practice*, *14*(31), 41–51.

Saba, S. S. (2024). Optimalisasi Penggunaan Teknologi Dalam Proses Pembelajaran Untuk Meningkatkan Efektivitas Siswa. *JME Jurnal Management Education*, *2*(02), 57–63.

Sari, D. A. K., & Setiawan, E. P. (2023). Literasi baca siswa Indonesia menurut jenis kelamin, growth mindset, dan jenjang pendidikan: Survei PISA. *Jurnal Pendidikan Dan Kebudayaan*, *8*(1), 1–16.

Sari, Y., Marini, A., Rahmawati, Y., Fitriasari, E., Wardhani, P. A., Safitr, D., Dewiyani, L., & Muda, I. (2025). Emerging Technologies of Interactive Learning Media with Wordwall for Students' Interest as an Impact on SDGS. *Journal of Lifestyle and SDGs Review*, *5*(2), e03268–e03268.

Suharsiwi, S., Usmiyatun, U., & Siddique, M. (2023). Current social studies learning: Technology-based learning media for character education. *AMCA Journal of Science and Technology*, *3*(2), 61–67.

Sukmayadi, V., & Yahya, A. (2020). Indonesian education landscape and the 21st century challenges. *Journal of Social Studies Education Research*, *11*(4), 219–234.

Syaifi, A. C., & Murwitaningsih, S. (2022). Analysis of the Influence of Problem Based Learning Models Assisted by Wordwall Media on Science Learning Outcomes of Primary School Students. *Jurnal Paedagogy*, *9*(4), 754–762.

Tomczyk, Ł., Limone, P., & Guarini, P. (2024). Evaluation of modern educational software and basic digital competences among teachers in Italy. *Innovations in Education and Teaching International*, *61*(2), 355–369. https://doi.org/10.1080/14703297.2023.2173632

Yetti, E. (2024). Pedagogical innovation and curricular adaptation in enhancing digital literacy: A local wisdom approach for sustainable development in Indonesia context. *Journal of Open Innovation: Technology, Market, and Complexity*, *10*(1), 100233.

Zulfa, S. A., Nuswowati, M., & Sutomo, S. (2024). Penggunaan Media Pembelajaran Wordwall untuk Meningkatkan Motivasi Belajar Peserta Didik apda Pembelajaran IPA Tingkat SMP. *Prosiding Seminar Nasional Pendidikan Dan Penelitian Tindakan Kelas*, 1467–1473. https://proceeding.unnes.ac.id/snpptk/article/view/3284