Educational Game Wordwall for Enhancing Daily Face Makeup Competencies of Class X Students at Vocational High School in Beauty Cosmetology Program

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Article Info	Abstract
	This study aims to develop educational media in the form of a web-based game using Wordwall, focused on teaching daily face makeup skills at Vocational High School 4 Yogyakarta. The primary issues addressed in this research include the use of a less interactive lecture-based method, low student learning outcomes falling below the Minimum Completion Criteria, and the underutilization of technology in the learning process. The research follows the ADDIE development model, which consists of five stages: analysis, design, development, implementation, and evaluation. The media was designed to encourage unconscious learning and improve students learning outcomes. Validation was conducted by subject matter and media experts, while its practicality was tested by both teachers and students. The validation results revealed that the media is highly feasible, with an average score of 4.84, while the practicality test achieved a score of 97.3%, categorized as very practical. The effectiveness test, using N-Gain analysis and independent sample t-tests, demonstrated a significant improvement in student learning outcomes. Therefore, the Wordwall educational game media is considered valid, practical, and effective for use in the Beauty Cosmetology program. This media can serve as an innovative solution to enhance the quality of both the teaching process and student learning outcomes at vocational high schools.

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INTRODUCTION

Vocational education, also known as Vocational Education, is a form of education specifically designed to equip students with the necessary skills to enter the workforce and occupy specific career positions in their respective fields. In Indonesia, Vocational High Schools serve as one of the formal education pathways at the secondary level, continuing from Junior High School, Islamic Junior High School, or their equivalents, with the primary focus on developing job skills. According to Ali and Sukardi (2021), vocational education aims not only to develop technical skills but also encompasses the development of competencies, understanding, work attitudes, positive habits, and respect for the various types of jobs needed by businesses and industries. The learning process should ideally take place under the supervision of the community and government, or in collaboration with specific institutions, and is directed towards producing productive outputs.

Meanwhile, according to Wibawa (2017), vocational education is designed to prepare students to enter the workforce. Due to its close alignment with industry and the real labor market, vocational education is required to continuously adapt to the needs and developments of the sector. Vocational High Schools are formal educational institutions aimed at equipping students with specific skills that can be directly applied to certain jobs upon graduation. However, in the learning process, vocational education does not focus solely on practical skills.

The development of learning media is crucial for teachers in enhancing the quality and efficiency of the learning process, benefiting both educators and students (Kosasih et al., 2023). In reality, the development of student interest in learning does not always occur optimally, as it is influenced by various internal and external factors. This issue has become more complex in today's digital era, where many teenagers are more interested in audio-visual content, such as videos and digital games, rather than reading activities (Widiyarto et al., 2023). This situation requires students to become more independent in learning. As a result, student understanding of the learning material has declined (Ramadani et al., 2021). The low interest and motivation in learning can negatively affect student overall learning outcomes (Haelermans and van der Eem, 2018). Therefore, innovative efforts are needed from educators, particularly in designing and developing learning media that can respond to the needs and characteristics of today's students, and support a more effective and enjoyable learning process.

Media plays an important role in creating a learning environment that supports optimal achievement, as media serves as a learning tool that connects initial experiences with concrete objects, such as student prior knowledge. Media then depicts concepts semi-abstractly through images and subsequently presents ideas abstractly using words (Maghfiroh et al., 2018). Social media platforms, such as Instagram, and other collaborative technologies have proven to enhance student engagement and digital competencies. Digital tools in learning today play a significant role because they can facilitate communication, collaboration, and content creation relevant to the needs of modern learning environments (Martínez-Domingo et al., 2025). The use of learning media is not only a means of delivering information but also serves as a learning stimulus that can increase the motivation of students.

One interactive media platform with potential for use in learning is Wordwall, a web-based platform that allows teachers to create engaging and easy-to-use educational games. Wordwall creates positive interaction between students and the learning material, thus enhancing student engagement in the learning process (Maghfiroh et al., 2018). This platform supports various game formats such as quizzes, crossword puzzles, random cards, drag-and-drop, and many other options. In addition to being a learning medium, Wordwall also functions as an effective assessment tool for measuring student understanding of the material taught (Arrosyad et al., 2023). The application offers various types of games, including crossword puzzles, quizzes, random cards, drag-and-drop, and other choices (Saptaaji et al., 2023). Another advantage of Wordwall is its easy access, which is free, with several basic features and available templates.

Games that have been created can be shared across various online platforms such as WhatsApp, Google Classroom, and other media, making the distribution of materials more convenient. This aligns with the opinion of Wafiqni and Putri (2021), who stated that Wordwall is highly helpful in delivering lesson materials to students and makes it easier for teachers to evaluate student learning outcomes in a practical and efficient manner.

Research conducted by Asyuyuti et al. (2021) and Habib Alfian et al. (2021) on the development of industrial culture learning media using a problem-based learning (PBL) approach to improve student soft skills demonstrated that such media is highly feasible and practical to use. This study used a Research and Development (R&D) approach with a focus on the development of evaluation instruments based on information technology, where the format used was interactive quizzes. The use of the Wordwall platform in this research facilitated the design process, as Wordwall provides ready-to-use interfaces and templates. Researchers only need to adjust elements such as themes, work duration, question randomization, and ranking systems according to their needs.

Referring to previous studies, it can be concluded that Wordwall is a web-based application with high potential as an interactive learning medium that is engaging and easily accessible for students. In the context of this study, the researcher will also develop an educational game based on Wordwall. However, the content focus in this study differs from previous research. The game developed in this study will feature daily face makeup material for Class X students in the Beauty Cosmetology and SPA program at Vocational High School 4 Yogyakarta, with the goal of improving student learning outcomes.

METHODOLOGY

In general, research methods can be divided into three main categories: quantitative methods, qualitative methods, and research and development methods (Research and Development or R&D). In this study, the researcher uses the R&D approach as the main method to develop products that meet the needs of learning. According to Borg & Gall (2003) in Purnama (2016), the R&D research method is an approach aimed at creating and testing the effectiveness of an educational product. The products produced can vary in form, ranging from textbooks, modules, handouts, student worksheets, models or prototypes, to audio-based learning materials or interactive learning materials (Viosladini & Mustika, 2021). This study aims to develop an educational game using the Wordwall website to improve students' understanding of daily face makeup material at the Vocational High School in the Beauty Cosmetology and SPA program.

Research and Development, often referred to as development research, is an approach used to design, develop, and validate various products that can be used in the context of education and learning. Asim (2001) in Purnama (2016) states that development research in learning is a process to develop and test the effectiveness of learning products. Similarly, Borg and Gall in R. K. Sari (2021) define development research as a systematic process used to validate existing products or develop new ones. Soenarto (2005) in Tegeh & Kirna (2013) adds that development research includes the design, development, and validation of products used in educational and learning activities. The products developed can include learning materials, learning media, teaching aids, or learning strategies, which are specifically aimed at addressing issues in the teaching and learning process in the classroom or laboratory, rather than testing theories. Therefore, the development research approach is considered effective as a strategy to improve teaching practices and provide solutions to various educational challenges through the development of relevant products (Tegeh & Kirna, 2013).

RESULT AND DISCUSSION

Research Result

This study is a Research and Development (R&D) research with the developed product in the form of an educational game using Wordwall for improving the learning outcomes of students in Vocational High Schools on the topic of daily face

makeup. This development research was conducted from April 25 to May 17, 2024, at Vocational High School 4 Yogyakarta as the experimental group and Vocational High School 2 Godean Yogyakarta as the control group. The subjects of the study were Class X students majoring in Beauty Cosmetology and SPA.

a) Analysis of Educational Game Feasibility

Data analysis for the feasibility test of the Wordwall educational game on daily face makeup was conducted using assessment sheets filled out by the validators, including subject matter experts and media experts. The validation process involved two media experts from BBPPMPV and two subject matter experts, consisting of one teacher and one lecturer from the field of beauty cosmetology and spa. All validators assessed various aspects of the product's feasibility, and the scoring results from each aspect are shown below:

Table 1. Overall Scoring Data from Media Validators

No	Aspect	Media Expert 1	Media Expert 2	Average	Category
1	Software engineering	4.80	4.80	4.80	Very Feasible
2	Visual communication	4.80	5.00	4.90	Very Feasible
	$\bar{x}$ Average Total Expert			4.85	Very Feasible

Source: Calculations Results (2024)

Table 2. Overall Scoring Data from Subject Matter Validators

No	Aspect	Media Expert 1	Media Expert 2	Average	Category
1	Learning design	4.75	4.88	4.82	Very Feasible
2	Presentation	4.67	5.00	4.84	Very Feasible
$\bar{x}$ Average Total Expert				4.83	Very Feasible

Source: Calculations Results (2024)

Based on the data analysis results, it was found that the overall average score across all aspects was 4.84. This score falls into the "very feasible" category according to the feasibility criteria established. This indicates that the Wordwall educational game on daily face makeup was rated very well in terms of content, appearance, usability, and alignment with learning objectives by the validators, both from the media expert and subject matter expert perspectives. Furthermore, the validation results confirm that the Wordwall educational game meets the standards of feasibility as an interactive learning resource. Therefore, the Wordwall educational game can be considered valid and ready for use as a learning media to support the learning process for students, especially in the Beauty Cosmetology and SPA program at Vocational High School. The use of such interactive media is expected to increase students learning interest, engagement, and enrich the variety of teaching methods applied by educators.

Table 3. Analysis of Kr and Ks Scores for Practicality Test by Teachers and Students

Validator	Indicator	Kr Score	Ks Score
Teacher	Software engineering Learning design Visual communication	0.96	0.93
Student	Software engineering Learning design Visual communication	0.99	1.01
	$\bar{x}$ Average Score	0.97	0.97

Table 4. Analysis of Practicality Test by Teachers and Students

No	Response Indicator	Average Score		Average	Category
		Teacher	Student		
1	Software Engineering	98.75 %	100 %	99.3 %	Very Practical
2	Learning Design	100 %	97.05 %	98.5 %	Very Practical
3	Visual Communication	90 %	98.52 %	94.2 %	Very Practical
	$\bar{x}$ Average Total for Users			97.3 %	Very Practical

Source: Calculation Results (2024)

Based on the practicality evaluation conducted by the validators, consisting of both teachers and students, the average practicality test score was found to be 97.3%, which is categorized as "very practical." This indicates that the Wordwall educational game for daily face makeup content can be considered practical and suitable for use as teaching material, especially in introductory practical sessions within the Beauty Cosmetology program. These results show that the educational game is not only easy to use but also effective in supporting the learning of practical skills required by students (Ghannem et al., 2019). Therefore, this game has the potential to be a highly useful tool for improving the quality of learning in the field of beauty cosmetology.

b) Effectiveness Test of Educational Games

Data analysis in this study was conducted through an effectiveness test of the developed media. The effectiveness test was used to determine the extent to which the learning media, in this case, the Wordwall educational game, could be used effectively and efficiently by users, both educators and students. The instrument used was a practicality assessment questionnaire completed by teachers and students after they had directly tried the media in the learning context. The results of this test serve as the basis for evaluating the ease of use, clarity of instructions, visual appeal, and the alignment of the content with the learning needs in the Beauty Cosmetology program.

Meanwhile, before conducting the effectiveness test on the improvement of student learning outcomes, prerequisite tests in the form of normality and homogeneity tests were first conducted. The normality test aimed to determine whether the obtained data followed a normal distribution, while the homogeneity test was used to ensure that the variances of the two data groups being compared were uniform or homogeneous. After meeting these prerequisites, the effectiveness analysis was carried out using two statistical approaches: the N-Gain Score test and the Independent Sample t-test. The N-Gain test was used to measure the improvement in students decision-making abilities before and after using the developed learning media. Meanwhile, the Independent Sample t-test was used to examine significant differences between the experimental and control groups.

c) N-Gain Test

The N-Gain test was conducted to measure the level of improvement in students learning outcomes by comparing pre-test and post-test scores. This method uses the normality gain (N-Gain) formula, which is calculated based on the difference between scores before and after the learning process, assuming the ideal score is 100. In this study, the N-Gain calculation was performed using SPSS software to obtain accurate results. The calculated N-Gain scores were then converted into percentages (%) for easier analysis and interpretation. The complete output of the N-Gain test is presented in the table in the appendix (N-Gain Score Output Table). The results from this output were summarized and presented in a table to facilitate the readers understanding of the effectiveness of the developed learning media.

Table 5. N-Gain Score of the Effectiveness Questionnaire for the Wordwall Educational Game

No	Experimental Class N-Gain Score (%)	No	Control Class N-Gain Score (%)
Average	81.21	Average	46.47
Minimum	72.49	Minimum	37.40
Maximal	89.71	Maximal	54.30

Source: Calculation Results (2024)

Based on the N-Gain score calculations in this study, the average N-Gain score for the experimental class was 81.21%, with a minimum score of 72.49% and a maximum score of 89.71%. This indicates that there was a high level of improvement in learning outcomes after using the Wordwall educational game-based learning media. Meanwhile, the control class achieved an average N-Gain score of 46.47%, with a minimum score of 37.40% and a maximum score of 54.30%. This result shows moderate to low improvement in learning outcomes, occurring without the use of innovative learning media, unlike the experimental group. These scores were then interpreted using the following N-Gain effectiveness interpretation table:

Table 6. N-Gain Score Interpretation

Percentage (%)	Interpretation
<40	Not Effective
40-55	Less Effective
56-75	Moderately Effective
>76	Effective

Source : (Arikunto, 1999)

Based on the interpretation of N-Gain effectiveness, as explained earlier, it can be concluded that the average N-Gain score for the experimental class, which was 81.21%, falls into the high category. This indicates that the application of the Wordwall educational game for daily face makeup at Vocational High Schools proved effective in improving students learning outcomes. Conversely, the control class, which used conventional teaching methods, had an average N-Gain score of 46.47%, which is classified as moderate. This suggests that the conventional approach was less effective in improving vocational students learning outcomes, particularly in the beauty cosmetology and SPA competencies. Therefore, the use of

innovative learning media like the Wordwall educational game has a significant positive impact on improving understanding and learning outcomes for students, while also supporting an active and enjoyable learning approach in Vocational High Schools environments.

d) T test

To determine whether there is a significant difference between the learning outcomes of students in the experimental class and the control class, statistical analysis was performed using an Independent Sample t-test. This test aims to compare the post-test scores between the two groups to evaluate the effectiveness of the Wordwall educational game-based learning media. The analysis was conducted using SPSS software, with the data used being the post-test scores from both the experimental and control classes. Based on the SPSS calculation for pre-test and post-test responses, the results are shown in Table 6, which presents the t-test results for the pre-test and post-test of the experimental and control classes:

Table 7. t Test Results for Pre Test of Control and Experimental Classes

Data	Levene Statistic	t-test	Significance Level
N-Gain (%)	0.990	31.500	0.000

Source: Calculation Results (2024)

Based on the output of the Independent Sample t-test for pre-test data, it was found that the significance score (Sig.) for Levene's Test for Equality of Variances was 0.990. Since this value is greater than the significance level of 0.05 (0.990 > 0.05), it can be concluded that the variance of N-Gain (%) data between the experimental and control classes is homogeneous, meaning there is

no significant difference in variance between the two groups.

Next, for the t-test analysis, the calculated t value was 31.500, while the t-table value at a degree of freedom (df) = 33 and a 5% significance level ($\alpha = 0.05$) was 1.692. Since the calculated t value > t-table value (31.500 > 1.692), it can be concluded that there is a significant difference between the experimental class and the control class. This means that after being given the treatment, which involved the use of the Wordwall educational game-based learning media for daily face makeup material, the career decision-making ability of students in the experimental class improved significantly compared to the control class, which used conventional teaching methods. This is further supported by the 2-tailed Sig. value of 0.000, which is smaller than the significance level of 0.05. Therefore, the results of the Independent Sample t-test show that the use of Wordwall media is proven to be effective and has a significant impact on improving students learning outcomes, particularly in the context of teaching in the Beauty Cosmetology and SPA program at vocational high schools.

Discussion

The final result of this research and development is a learning media in the form of an educational game using the Wordwall platform, developed to improve student learning outcomes on the topic of daily face makeup for students in the Vocational High School Beauty Cosmetology and SPA program. The development of the media was done in stages through a series of procedures including validation by Media Experts, Subject Matter Experts, user trials, and followed by an effectiveness test on the research subjects. Validation was carried out directly in the field to gather empirical data, which was used as the basis for revising the product to produce learning media that is feasible and effective.

Educational games as digital learning media have the potential to create a more engaging, interactive, and enjoyable learning atmosphere (Wei & Wang, 2022). The use of games in the learning process has been proven to increase the effectiveness and efficiency of learning, while also encouraging students to learn

independently. Additionally, educational games facilitate the understanding of material through a more flexible approach, as they can be accessed anytime and anywhere according to students learning needs. Furthermore, educational games help reduce the monotony of learning, without eliminating the essence of the learning process itself. The presence of instant feedback in games also provides positive stimulation for students, while simultaneously training problem-solving skills. Therefore, this media not only serves as a learning aid but also as a tool for the development of students cognitive competencies (Rais & Riska, 2018).

The feasibility study of the game development is based on the feedback assessment forms from Media Experts, BBPPMPV, and Subject Matter Experts from lecturers and teachers in the field of vocational beauty cosmetology. The practicality test is based on the feedback from game users (students and teachers), and the effectiveness test is based on the post-test scores of students in the experimental group. The validity of a developed product can be determined based on the results of the validation activities (Suharsono & Istiqomah, 2014).

The next step, after the validation test, concluded that the Wordwall educational game for daily face makeup content has become a final product and is very feasible to be used by students to improve their learning outcomes on the daily face makeup material. This conclusion of feasibility for the Wordwall educational game was derived from the validation results from two media experts and two subject matter experts. During the media expert validation phase, two multimedia learning experts from the Vocational Arts and Culture Education Quality Assurance Center (BBPPMPV Seni dan Budaya) evaluated the software engineering aspect, which scored 4.80 with a very feasible criterion, and the visual communication aspect, which scored 4.85 with a very feasible criterion.

For the subject matter expert validation, which was conducted by lecturers and teachers in the field of vocational beauty cosmetology and SPA, the results were as follows: the learning design aspect scored 4.82 with a very feasible criterion, the presentation aspect scored 4.84 with a very feasible criterion, and the overall average

of all aspects in the subject matter validity test was 4.83 with a very feasible criterion.

Andira & Puspasari (2023) state that one of the objectives of development research is to promote the scientific and practical aspects of the final product. Learning media is a tool, a facility, or a variety of components in a student's environment that can stimulate learning activities (Rahma & Nurhayati, 2021). According to Widiastuti in (Nugraheny & Destiranti, 2017), here are some criteria for a good educational game:

1. Overall Value: The overall value of a game is centered on its design and the length of the game duration. A game should be designed to be attractive and interactive, with a timer feature to determine the game duration.
2. Usability: Easy to use and access is an important point of any game. The interface must be user-friendly so that users can easily access the application.
3. Accuracy: Accuracy refers to how well the game model or representation is implemented in the experiment or design.
4. Appropriateness: Appropriateness refers to how well the content and design of the game can be adapted to meet the needs of the user.
5. Relevance: Relevance means that the game content is applicable to the target users. To be relevant to users, the system should guide them in achieving the learning objectives. Since this application is intended for students, the interface design should be engaging, featuring bright colors.
6. Objectivity: Objectivity determines the user's goals and the criteria for success or failure. It includes features that show the results of the game.
7. Feedback: To help users understand whether their performance aligns with the game's objectives, feedback must be provided. This can include animations and sound effects that indicate success or failure.

Based on the explanation above, the practicality test of the Wordwall game was conducted with teachers and students from the Beauty Cosmetology and SPA program.

The user validation phase was carried out by teachers and students from the Beauty Cosmetology and SPA program. In this phase, the software engineering indicator received a score of 99.3% with a very practical criterion, the learning design indicator received a score of 98.5% with a very practical criterion, and the visual communication indicator received a score of 94.2% with a very practical criterion. Based on these indicators from the responses of students and teachers, the average score of the user validation was 97.3%, which is categorized as very practical.

The main goal of using educational game media is to improve the efficiency and effectiveness of teaching and learning activities in schools, including time, resources, facilities, and personnel, to achieve optimal goals that ultimately lead to improved student learning outcomes (Susanti & Kurniawan, 2020). The effectiveness of the developed game relates to the goal of the game development, which is connected to improving the quality of learning and solving problems in the classroom. This study aims to improve the learning outcomes of students in the Beauty Cosmetology and SPA program, particularly on the topic of daily face makeup, based on the results of students pre-test and post-test performances. The effectiveness of the game can be determined through the student practical assessment scores. Data analysis shows that the Wordwall educational game for daily face makeup is effective and significant when applied in learning activities.

Effectiveness in a classroom is influenced by four key factors, referred to as the "four key teaching effectiveness cards," which are outcome, clarity, participation, and enthusiasm (Walls, 1999). The game is structured systematically to make it easier for students to master the lesson material. The success achieved by students gives satisfaction to teachers, as they feel they have performed their professional duties well.

Based on the effectiveness test of the Wordwall educational game for daily face makeup, the independent sample t-test table shows that it can be concluded that, for both the experimental and control classes, before the treatment with the Wordwall educational game for daily face makeup, the groups were homogeneous. After the t-test, the conclusion is that the game is effective and significant.

The Wordwall educational game for daily face makeup can be used by students in Vocational High Schools, specifically in the Beauty Cosmetology and SPA program. This game is categorized as very feasible, very practical, effective, and significant in improving students learning outcomes on daily face makeup material. The results of this study align with the research conducted by Rahma & Nurhayati (2021), Hartanti (2019), and Wafiqni & Putri (2021), which states that educational games can significantly improve student learning outcomes.

The novelty of this research lies in the development of interactive digital learning media that is contextual, specifically the Wordwall educational game, which is applied to teach daily face makeup in the Beauty Cosmetology and SPA Program at Vocational High Schools. This media was developed as an alternative to conventional teaching methods, which tend to be theoretical and demonstrative, and less able to facilitate students active engagement optimally. Based on the validation results, this media received a "very feasible" and "very practical" category, showing significant effectiveness in improving student learning outcomes. Therefore, the use of Wordwall educational games not only contributes to innovation in vocational learning media but also broadens the use of digital technology to support the achievement of practical competencies in vocational subjects.

CONCLUSION

Based on the results of the research and development, it can be concluded that the Wordwall educational game-based learning media is effective in supporting the learning process on daily face makeup material at Vocational High Schools, especially in the Beauty Cosmetology program. This media was developed using the ADDIE model approach, which includes the stages of needs analysis, content design, media development, implementation in learning, and comprehensive evaluation. All of these stages were carried out with the involvement of media and subject matter experts to ensure that the game produced is truly suitable for students characteristics and learning objectives.

This educational game is considered to improve student interest and motivation, as it is presented in an interactive and enjoyable manner. Furthermore, positive responses from teachers and students indicate that this media is easy to use and relevant to the learning needs in the classroom. The results of the implementation show that the use of Wordwall can help students understand the material more effectively, while also creating a more active and enjoyable learning environment. Therefore, the Wordwall educational game is suitable to be used as an innovative alternative learning media in practical learning at Vocational High Schools, especially in enhancing student learning outcomes and engagement.

REFERENCES

Ali, M. K., & Sukardi, S. (2021). Pengembangan Model Evaluasi Pembelajaran Daring di Sekolah Menengah Kejuruan. *JRTI (Jurnal Riset Tindakan Indonesia)*, *6*(2), 161. https://doi.org/10.29210/3003991000

Andira, N. E., & Puspasari, D. (2023). Pengembangan Media Pembelajaran Interaktif Google Site Berbantuan Game Wordwall Pada Mata Pelajaran Kearsipan Kelas X OTPdi SMK Negeri 1 Jombang. : : *Journal Of Social Science Research*, *3*(2), 4299–4312.

Arrosyad, M. I., Antika, D., Dzulqa, E. T., Balqis, M., Muhammadiyah, U., & Belitung, B. (2023). Analisis Penggunaan Wordwall Sebagai Media Pembelajaran Terpadu untuk Meningkatkan Daya Tarik Belajar Siswa di Sekolah Dasar. *IJM: Indonesian Journal of Multidisciplinary*, *1*, 414–423. https://journal.csspublishing/index.php/ijm

Asyuyuti, I. B., Sudana, I. M., & … (2021). The Development of Industrial Culture Learning Module to Improve Students' Soft Skill at Smk Muhammadiyah 2 Kuningan. *Journal of Vocational and …*, *7*(28), 1–8. https://journal.unnes.ac.id/nju/jvce/article/view/34965

Ghannem, A., Khenissi, M. A., Essalmi, F., & Qaffas, A. A. (2019, December 1). Educational Computer Game for learning History: Impact on learners' level of knowledge and learners' satisfaction. *2019 7th International Conference on ICT and Accessibility, ICTA 2019*. https://doi.org/10.1109/ICTA49490.2019.9144967

Habib Alfian, M., Qudus, N., & Endroyo, B. (2021). Development of E-Modules Building Drawings with Autocad for Construction and Property Business Department Students of SMK N 1 Blora. *Journal of Vocational Career Education*, *6*(1), 46–57. https://doi.org/10.15294/JVCE.V6I1.33961

Haelermans, C., & van der Eem, M. (2018). Increasing student involvement to decrease underachievement: Experimental evidence on gender differences in performance. *Journal of Human Capital*, *12*(4), 669–700. https://doi.org/10.1086/700189

Hartanti, D. (2019). Meningkatkan Motivasi Belajar Siswa dengan Media Pembelajaran Interaktif Game Kahoot Berbasis Hypermedia. *Prosiding Seminar Nasional*, *1*(1), 78–85. https://jurnal.ustjogja.ac.id/index.php/snpep2019/article/view/5631

Kosasih, Y., Sutopo, Y., & Wahyuningsih, E. (2023). The Development of CLO3D Software E-Module for Digital Creation of Party Attire Patterns And Designs. *Journal of Vocational Career Education*, *8*(1), 9–16. https://doi.org/10.15294/JVCE.V8I1.47241

Maghfiroh, K., Roudlotul, M. I., & Semarang, H. (2018). Penggunaan Media Word Wall untuk Meningkatkan Hasil Belajar Matematika Pada Siswa Kelas IV MI Roudlotul Huda. *Jpk*, *4*(1), 64–70. https://journal.unnes.ac.id/nju/index.php/jpk

Martínez-Domingo, J. A., Aznar-Díaz, I., Romero-Rodríguez, J. M., & Victoria-Maldonado, J. J. (2025). Use of Instagram as an Educational Tool with Pre-Service Teachers and the Impact on Digital Competence in Communication and Collaboration. *Education Sciences*, *15*(2). https://doi.org/10.3390/educsci15020149

Nugraheny, D., & Destiranti, A. (2017). Penerapan Edugame Interaktif Untuk Pengenalan Pakaian Adat Nasional Indonesia. *Angkasa: Jurnal Ilmiah Bidang Teknologi*, *8*(1), 137. https://doi.org/10.28989/angkasa.v8i1.139

Purnama, S. (2016). Metode Penelitian Dan Pengembangan (Pengenalan Untuk Mengembangkan Produk Pembelajaran Bahasa Arab). *LITERASI (Jurnal Ilmu Pendidikan)*, *4*(1), 19. https://doi.org/10.21927/literasi.2013.4(1).19-32

Rahma, & Nurhayati. (2021). Pengembangan Media Interaktif Berbasis Game Edukasi Pada Pembelajaran Matematika. *Jurnal Edukasi Matematika Dan Sains*, *1*(1), 38–41.

Rais, M., & Riska, M. (2018). Pembelajaran Interaktif Edu-Game Pengenalan Profesi Berbasis Android Pada Siswa Paud. *Jurnal Psikologi Pendidikan Dan Konseling: Jurnal Kajian Psikologi Pendidikan Dan Bimbingan Konseling*, *4*(1), 38. https://doi.org/10.26858/jpkk.v4i1.3645

Ramadani, R. E., Basyirun, B., & Sudana, I. M. (2021). The Use of Android-Based E-module in Teaching Pastry & Bakery Product for Vocational School Students Majoring in Culinary Arts. *Journal of Vocational and Career Education*, *6*(4), 189–198. https://journal.unnes.ac.id/nju/index.php/jvce/article/view/38085

Saptaaji, A. B., Burhanudin, B., & Basukiyatno, B. (2023). Meningkatkan Kemampuan Berpikir Kritis dan Hasil Belajar Siswa Menggunakan Desain Pembelajaran Blended Learning dengan Wordwall. *Journal of Education Research*, *4*(3), 1503–1512.

Sari, R. K. (2021). Penelitian Kepustakaan Dalam Penelitian Pengembangan Pendidikan Bahasa Indonesia. *Jurnal Borneo Humaniora*, *4*(2), 60–69.

https://doi.org/10.35334/borneo_human iora.v4i2.2249

Suharsono, Y., & Istiqomah. (2014). Validitas Dan Reliabilitas Skala Self-Efficacy. *Jurnal Ilmiah Psikologi Terapan*, *2*(1), 144–151. http://202.52.52.22/index.php/jipt/articl e/download/1776/1864

Tegeh, I. M., & Kirna, I. M. (2013). Pengembangan Bahan Ajar Metode Penelitian Pendidikan dengan ADDIE Model. *Jurnal IKA*, *11*(1), 16. https://ejournal.undiksha.ac.id/index.ph p/IKA/article/view/1145

Violadini, R., & Mustika, D. (2021). *Jurnal basicedu*. *5*(3), 1210–1222.

Wafiqni, N., & Putri, F. M. (2021). Efektivitas Penggunaan Aplikasi Wordwall dalam Pembelajaran Daring (Online) Matematika pada Materi Bilangan Cacah Kelas 1 di MIN 2 Kota Tangerang Selatan. *Elementar : Jurnal Pendidikan Dasar*, *1*(1), 68–83.

https://doi.org/10.15408/elementar.v1i1. 20375

Wei, X., & Wang, J. (2022). An Experimental Inquiry into Early Childhood Language Learning based on Game Learning. *Proceedings - 2022 International Symposium on Educational Technology, ISET 2022*, 178–182. https://doi.org/10.1109/ISET55194.2022 .00045

Wibawa, B. (2017). *Manajemen Pendidikan : Teknologi Kejuruan dan Vokasi*. Bumi Aksara.

Widiyarto, S., Hadi, I., Alifah, S., Saputri, N. L., Hamonangan, R. H., Damayanti, N., Wulansari, L., & Zeinora, Z. (2023). Peran Minat Baca dan Praktek Kewirausahaan Untuk Meningkatkan Hasil Belajar Kewirausahaan Pada Siswa SMK di Kabupaten Bogor Jawa-Barat. *Jurnal Ilmiah Wahana Pendidikan*, *9*(10), 823–829.