

Research Paper

Development of Website-Based Hybrid Learning Media to Address Learning Difficulties Among Junior High School

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Abstract. The development of website-based hybrid learning learning media is done to reduce constraints on traditional learning. The limitations of space and time dimesi become one of the shortcomings of traditional learning. Developing technological advances must also bring progress in the field of education. Therefore, currently the development of media that uses internet access is considered to be able to overcome the limitations of space and time dimensions. To overcome the limitations of the space and time dimensions, web-based hybrid learning learning media are developed. Development research conducted using the 4D model with 4 main stages, namely define, design, develop, and disseminate. Using assessments from 5 media experts. The trial was given to respondents, namely 11 grade 8 students of Muhammadiyah Middle School in Madiun City. The results of expert validation stated that website-based hybrid learning learning media met the feasibility standard as a learning medium with a percentage of 96.4%. The results of the small-scale trial also stated that the website-based hybrid learning learning media received good responses from students by 83.33%. Learning difficulties experienced by students decreased by a percentage from 83.33% to 31.57%.

Keywords: Learning Media, Hybrid Learning, Websites, Learning Difficulties.

1. INTRODUCTION

The current educational system in Indonesia is not fully aligned with the rapid advancements in technology [1], [2]. Many teachers still rely on traditional teaching methods, despite the fact that technological advancements have introduced innovative learning models. These learning models serve as alternatives to overcome the limitations of traditional teaching methods. One such innovation is commonly referred to as e-learning. According to Karjo et al. [3], e-learning is an internet-based application that connects teachers and students in an online learning environment. E-learning addresses the constraints of space, time, and learning resources between teachers and students. In an e-learning setup, teachers and students do not need to be in the same place or time. Learning activities can take place anytime and anywhere, bypassing these limitations. E-learning represents a new approach to integrating learning processes by combining traditional learning, distance learning, and various other learning models into a hybrid learning system.

The quality of education in Indonesia is significantly influenced by Astuti et al. [4], the teaching and learning processes as well as the individuals involved, particularly the students. Students in Grade 8 at SMP Muhammadiyah in Madiun City face a high level of learning difficulties. Based on survey results and interviews conducted, 83.33% of students reported experiencing learning challenges. They indicated that the allocated school hours were insufficient for studying physics, and class time was often unutilized because educators frequently attended training sessions. This issue is further exacerbated by Zeng et al. [5] the limited number of educators available at the school.

According to research conducted by Nurmuzayyana et al. [6] qualified as valid and suitable for use to improve students' cognitive learning outcomes. The media developed is in the form of

learning media with an online system. The advantage of this media is that it contains learning videos that are used as learning resources [7], [8]. The videos are videos taken from various sources and then edited with the researcher's voice dubbing. The learning media also has a discussion forum feature as a means of discussion between teachers and students. Every product must have shortcomings, as well as the media developed by Lange and Costley [9]. There are several shortcomings in the media, namely: 1) There are no teaching materials other than videos, for example files that can be downloaded, 2) There is no download and upload feature for assignments, 3) There is no special access that distinguishes students and teachers, 4) There is no prototype to be carried out on other materials [10].

Based on the problems and relevant research that have been raised, it is necessary to develop hybrid learning media based on websites as an effort to maximize the use of the internet in education. The use of internet technology is predicted to overcome the limitations of space and time dimensions because the media can be accessed anywhere and anytime. The development of this learning media is different from that developed by Abdulrahaman et al. [11]. The difference in this development can be said to be an advantage that has not existed in previous research. The media developed has a website homepage that contains a dialog box with teacher and student access codes to log in to the learning media. There is a study room that contains short materials with a download feature to read the whole thing. This study room is also equipped with a learning video feature that can be viewed online and can also be downloaded to be viewed offline. In the task room menu, there is a collection of evaluation tasks that students must work on after receiving the material. The tasks are in the form of files that can be downloaded and must be uploaded when completed. The learning media developed also has a discussion room feature that students can use to communicate with teachers.

2. METHOD

The research method that is the basis of this research is Research and Development. The development model that is used as a reference is the Four D model. This Four D development model is a learning material development model developed by Liang et al. [12]. This model has 4 main stages, namely: define with the results in the form of problems experienced by students and literature reviews, design with the results in the form of preparation of instruments and media designs that are developed, develop produces a prototype of web-based hybrid learning media, and disseminate in the form of distributing questionnaires and product trials.

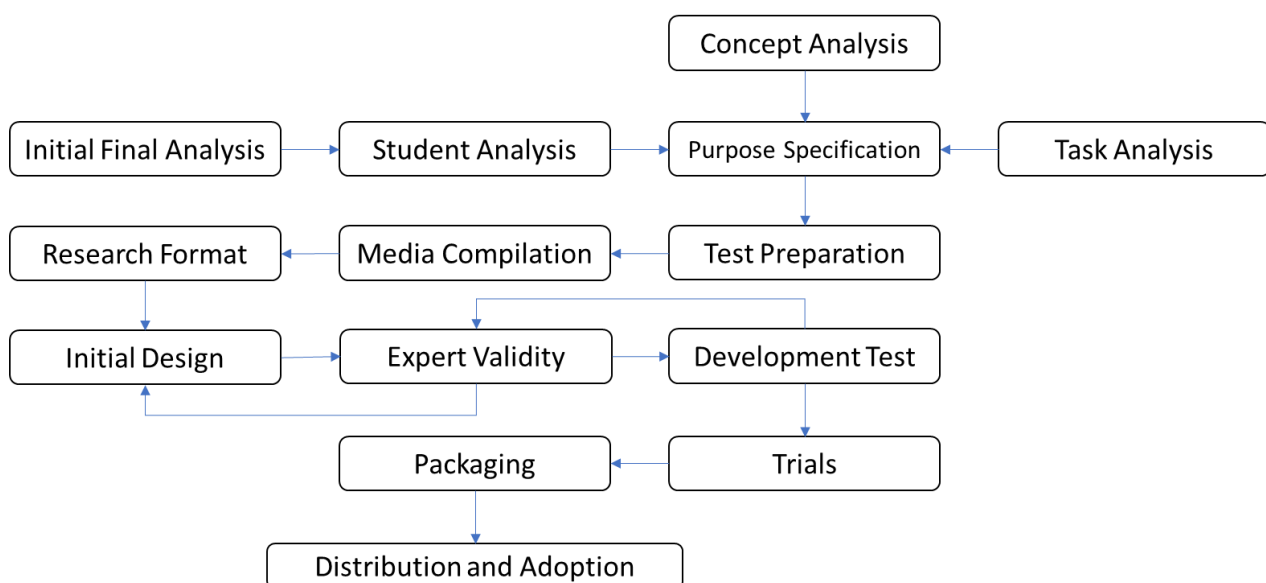


Figure 1. Four D Research Model Chart

This research method and research model are used to produce products in the form of website-based learning media. The products that have been developed are then tested for their feasibility using validity tests and small-scale trials. The Four D research model chart can be seen in **Figure 1**. The subjects in this study were 8th grade students of SMP Muhammadiyah 1 Kota Madiun. In the small class test, the product was tested on 6 8th grade students of SMP Muhammadiyah Kota Madiun. The instruments used in this development research were unstructured interviews, media validation sheets, student response questionnaires. The data collection method in this study was by questionnaire technique to determine the feasibility of the media and student responses to the media developed.

3. RESULT AND DISCUSSION

At the define stage, the first step is to define student needs, namely the analysis of media completeness and information collection conducted through unstructured interviews with students and educators [13]. The results of the interview showed that the electronic learning media used were only in the form of power points and textbooks owned by only educators. The media and teaching materials used were sufficient to support learning activities in the classroom, but the media and teaching materials had not completely reduced the constraints on traditional learning to overcome time constraints [14]. On the other hand, learning has not utilized internet technology even though many students are already good at using the internet. At the design stage, it was carried out as a design, the website homepage was designed as a teacher and student login menu. Teachers have accounts that have been registered on the website, while students must first register by creating an account using an individual e-mail. This homepage login design is designed so that students can learn independently without being disturbed by other students by using individual accounts. On the dashboard page there is a logo for the hybrid learning system media designed using CorelDraw X4. The logo on the dashboard is an infinity symbol which means infinite, with this logo it is hoped that the learning media developed will become a media and learning resource that is not limited by space and time. For the teacher dashboard, not only the logo is displayed, there are visitor statistics that show how many visitors last accessed the website. Teachers can see and monitor students who visit the learning media periodically.

Next, there are two main designs in the learning media that are developed, namely the study room menu and discussion room. In the study room menu, there are learning materials and videos that are designed to be as attractive as possible so that students are interested in learning. The materials can be downloaded in .docx format and videos can be viewed online or downloaded in mp4 format. Learning materials are made using Microsoft Word 2010 and videos are made using Adobe Premiere Pro. The design of these learning materials and videos is designed to overcome the limitations of learning resources and media at SMP Muhammadiyah 1 Kota Madiun. In addition to materials and videos, the study room menu also contains features for downloading and uploading evaluation assignments in .docx and .pdf formats with a maximum size of 5 megabytes. This feature is designed to overcome the limitations of space and time which are one of the factors causing learning difficulties. Students can receive and collect evaluation assignments without meeting the teacher face to face using this feature.

This study room menu is equipped with an offline feature that functions to activate and deactivate the study room menu. If the feature is disabled, students cannot access the material and cannot submit assignments by the specified deadline [15]. This feature teaches students to be disciplined in submitting assignments even without face-to-face meetings with the teacher, so that students who are late for the deadline cannot upload their answers. The second main menu is the discussion room which is designed so that students and teachers can have discussions to discuss learning without having to meet face-to-face. The features in this discussion room are designed by utilizing one-way communication to shorten the time. Teachers can observe all students' discussions in one discussion room. This design is intended to overcome the limitations of space and time, so that communication in the learning process continues anytime and anywhere. The next menu is the

assignment room which contains a collection of assignments and evaluation questions given by the teacher to students to be worked on. The design of this menu aims to allow teachers to give assignments outside of class hours and students can submit assignments without having to meet the teacher [16]. The next additional menu on the teacher's page is the inbox and student data menu. There is a collection of student answers that have been uploaded on the inbox page, so that teachers can easily download student answers. The student data menu is designed in the form of student data that has been registered in the developed learning media. The following is an initial view of the media that researchers will develop:

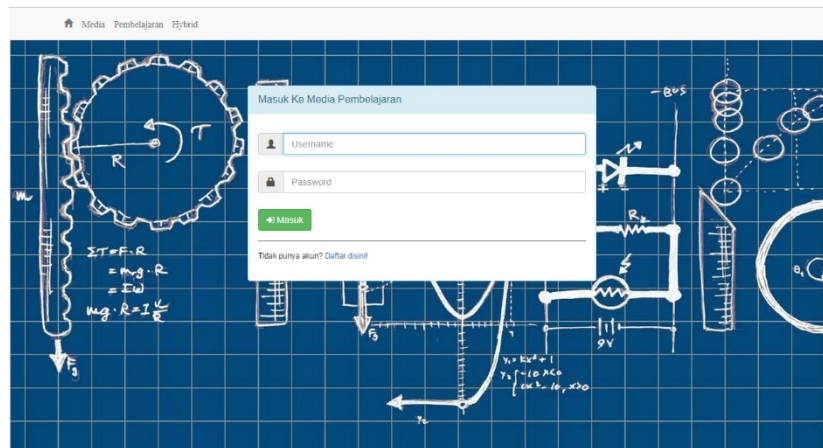


Figure 2. Image of Initial Design of Learning Media

Table 1. Usefulness of Website Features

No	Feature	Description
1	Home	In the form of a dialog box for logging in students and teachers who can only log in with a registered account
2	Study room	In the form of substance pressure material that is exposed briefly and can only be seen in its entirety after being downloaded, equipped with learning videos that can be viewed online or downloaded.
3	Duty room	In the form of space for a collection of evaluation questions that must be downloaded and uploaded after being done
4	Discussion room	A space for online communication between students and teachers.

At the develop stage, what is done is validation by media experts. The media experts who were used as validators in this study were 5 validators consisting of 3 IT expert lecturers at PGRI Madiun University and 2 SMK teachers. The results of expert validation were obtained from a questionnaire given by the researcher to the media expert who would assess the media. The three validators gave an assessment according to the assessment indicators in the questionnaire. The results of the media expert assessment are presented in the following table:

Table 2. Media Expert Validation Results

No	Indicator	Media Expert				
		X1	X2	X3	X4	X5
1	Ease of use of the menu	2	2	2	2	2
2	Efficiency of website use	2	2	2	2	2
3	Ease of accessing the website address	3	3	3	2	3
4	Actualization of website content	2	2	2	2	2
5	Use of the main menu	2	3	2	3	2
6	Use of the user menu (sign up and log in)	3	3	3	3	3
7	Use of user menu	2	2	2	2	2
8	Use of upload and download menu	2	2	2	2	2
9	Communication	2	2	2	2	2

No	Indicator	Media Expert				
		X1	X2	X3	X4	X5
10	Simplicity and attractiveness	2	2	2	2	2
11	Visual quality	2	2	2	2	2
12	Use of moving media (animation, movie video)	2	1	2	2	1
13	Use of layout	2	2	2	2	2
Total		28	26	28	26	27
Average		1	0.93	1	0.93	0.96
Percentage		100%	93%	100%	93%	96%
Feasibility		96,4%				
Description		Very Feasible				

The results of the assessment of 5 media expert validators of the developed product showed an average value of 96.4%, which means that overall the developed media received a very feasible category. While the descriptive data obtained from the validation results are in the form of responses from an open questionnaire containing comments or suggestions from validators. After going through the expert validation stage there are several things that need to be revised. Data from the results of responses by validators are used as a reference to improve the product so that it can be used for testing.

Table 3. Suggestions and Improvements from Validators

Advice	Improvements
Need to add video dubbing	Not done due to limitations
Homepage background changed according to physics character	Already changed as suggested
Add offline access feature	Not done due to limitations

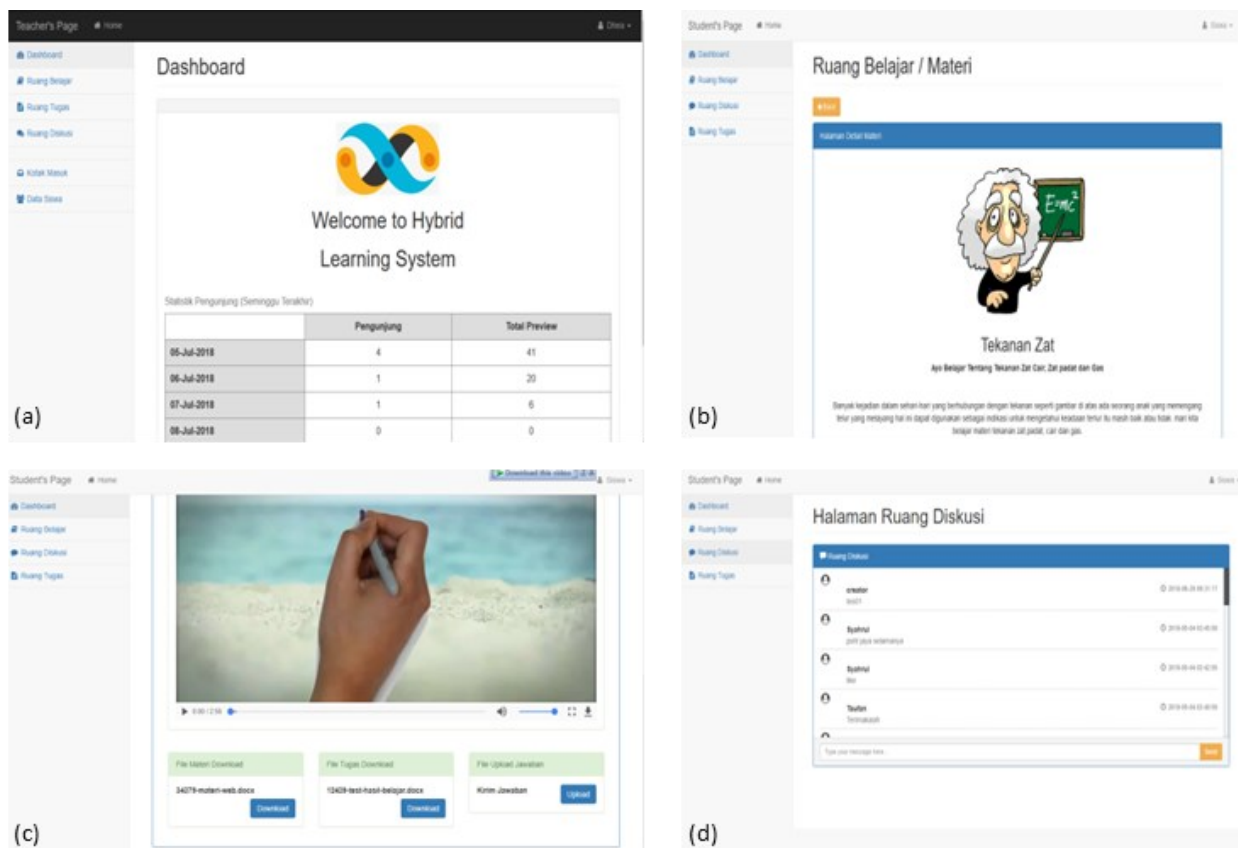


Figure 3. Learning Media Display (a) Learning Media Dashboard, (b) Study Room View, (c) Learning Video Display, and (d) Discussion Room View

At this stage, a small class test was conducted with the subject of 6 grade 8 students of Muhammadiyah Junior High School. The data taken from this small class trial was in the form of student responses to the products developed. The student response data contains 10 indicators with 20 statement items. The questionnaire was filled in by 6 8th grade students who had used the development product. The assessment uses a percentage which is then interpreted to find out the responses of the respondents. The results obtained from the calculation of the student response questionnaire show that 83.33% of students gave a good response to the product, so it can be said that the product is in the very feasible category.

The limited class trial was conducted after conducting a small class trial, with a subject of 12 8th grade students of SMP Muhammadiyah 1 Madiun City. The data taken in the limited class trial was the same as the data in the small class trial. The results of the student response questionnaire in the limited class trial were 83.33% which was categorized as very good. From the small class and limited class trials conducted, the criteria were high, so it can be concluded that the product developed can be categorized as very good. The test results for the learning difficulty questionnaire before using the learning media of 83.33% can decrease to a figure of 31.54% after using the learning media. In the disseminate hold, the website-based hybrid learning media is feasible to use and distribute to other class.

Discussion

The findings of this study reveal the feasibility and effectiveness of the website-based hybrid learning media in addressing several limitations of conventional learning methods, particularly those related to time and space constraints. With an average feasibility score of 96.4% from media expert validators and positive responses from students (83.33%), the developed media demonstrates a high level of acceptance and usability. Furthermore, the observed reduction in learning difficulties, from 83.33% before implementation to 31.54% after its use, highlights the media's potential to significantly improve the learning process.

While the results are promising, certain limitations warrant further attention. For instance, the absence of video dubbing and offline access features, as suggested by validators, indicates a missed opportunity to make the media more accessible, especially for students with limited internet connectivity or varying learning preferences. Moreover, the use of unstructured interviews as the primary method for needs analysis might have limited the comprehensiveness of the initial data collection. Incorporating more diverse and systematic methods, such as focus group discussions or surveys, could have provided a more nuanced understanding of user needs.

The implementation phase also focused primarily on technical validation and user responses but did not address long-term usability or integration into broader curriculum objectives. Future studies could explore these aspects by conducting longitudinal studies to measure the sustained impact of hybrid learning media on academic performance and engagement. This result aligns with findings that emphasize the role of digital learning tools in enhancing student engagement and overcoming traditional learning barriers. For example, studies by Murillo-Zamorano et al. [17] and Puspita and Kurniawan [18] highlighted the effectiveness of blended learning in improving flexibility and learner autonomy. However, this study diverges by offering a more structured and accessible framework through features like a discussion room and evaluation tools, which were not extensively explored in earlier research.

Despite these advancements, the research still lags behind studies that have successfully implemented adaptive learning systems or AI-driven tools to personalize the learning experience. For instance, studies by Gupta et al. [19] and Ahmad and Hussaini [20] demonstrated the potential of AI in tailoring educational content to individual student needs, which remains unaddressed in this study. Furthermore, the reliance on student registration and manual account creation could be streamlined with modern authentication technologies such as Single Sign-On (SSO) or integration with existing educational platforms.

4. CONCLUSION

The results of research on the development of website-based hybrid learning media in overcoming the limitations of the dimensions of space and time using the Four D development model concluded that the website-based hybrid learning media developed can meet the eligibility standards as learning media. The results of the expert validation assessment conducted by the media on the developed product received a percentage of 96.4% with a very feasible category. The website-based hybrid learning media developed received a percentage of 83.33% in small and limited class trials so that it can be interpreted as very good and can reduce the percentage of student learning difficulties by 31.57%.

5. AUTHOR DECLARATION

Author contributions and responsibilities - The authors made major contributions to the conception and design of the study. The authors took responsibility for data analysis, interpretation and discussion of results. The authors read and approved the final manuscript.

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Declaration of generative AI and AI-assisted technologies in the writing process - During the preparation of this work the author did not use AI for writing, editing, or anything else related to the manuscript.

6. REFERENCES

- [1] P. Rahmatpour, M. Chehrzad, A. Ghanbari, and S.-R. Sadat-Ebrahimi, 'Academic burnout as an educational complication and promotion barrier among undergraduate students: A cross-sectional study', *Journal of Education and Health Promotion*, vol. 8, 2019, doi: 10.4103/jehp.jehp_165_19.
- [2] W. Achmad, 'Social Policy: How is the Innovation in the Integrated Service and Referral System (SLRT) Services in the City of Bandung?', *Journal of Social Work and Science Education*, vol. 5, no. 2, Art. no. 2, Apr. 2024, doi: 10.52690/jswse.v5i2.797.
- [3] C. H. Karjo, W. Andreani, A. Herawati, Y. Ying, A. P. Yasyfin, and K. Marie, 'Teachers' Challenges and Needs in E-Learning Environment', in *2021 International Seminar on Application for Technology of Information and Communication (iSemantic)*, Sep. 2021, pp. 405–409. doi: 10.1109/iSemantic52711.2021.9573242.
- [4] E. D. Astuti, H. Tannady, A. Lahiya, D. Supriatna, and E. S. Handayani, 'The Analysis of Relationship Between Quality of Graduates and Education Financing Management in Private Islamic School', *Journal on Education*, vol. 5, no. 3, Art. no. 3, Feb. 2023, doi: 10.31004/joe.v5i3.1556.
- [5] L. Zeng *et al.*, 'Advancements in nanoparticle-based treatment approaches for skin cancer therapy', *Mol Cancer*, vol. 22, no. 1, p. 10, Jan. 2023, doi: 10.1186/s12943-022-01708-4.
- [6] N. Nurmuzayyana, J. Jamilah, A. T. O. Rivai, and M. Rijal, 'A Quasi-Experimental Study: The Influence of Web-Enhanced Learning on Student Learning Independence in the Human Movement System', *Biosfer: Jurnal Tadris Biologi*, vol. 14, no. 1, pp. 11–21, Jul. 2023, doi: 10.24042/biosfer.v14i1.16138.
- [7] A. Alfurqan and M. D. Susanti, 'Effectiveness of Visual Media Use in Islamic Religious Education Learning in Junior High School', *Attanwir: Jurnal Keislaman dan Pendidikan*, vol. 12, no. 2, Art. no. 2, Sep. 2021, doi: 10.53915/jurnalkeislamanpendidikan.v12i2.92.
- [8] I. P. Sari, R. K. Sormin, A. Purba, A. P. Rahayu, and E. E. Khairas, 'Effectiveness of Flash Card Media To Improve Early Childhood English Letter and Vocabulary Recognition in Reading', *Journal of Education and Learning Research*, vol. 1, no. 1, Art. no. 1, Aug. 2023, doi: 10.62208/jelr.1.1.p.1-7.
- [9] C. Lange and J. Costley, 'Improving online video lectures: learning challenges created by media', *Int J Educ Technol High Educ*, vol. 17, no. 1, p. 16, May 2020, doi: 10.1186/s41239-020-00190-6.
- [10] C. Bertolini, G. Ruggeri, and M. Galante, 'A measurement system for the assessment of the effectiveness of sound-insulating multilayers against structure-borne excitation: design, prototyping and validation', *INTER-NOISE and NOISE-CON Congress and Conference Proceedings*, vol. 268, no. 4, pp. 4763–4774, Nov. 2023, doi: 10.3397/IN_2023_0677.
- [11] M. D. Abdulrahman *et al.*, 'Multimedia tools in the teaching and learning processes: A systematic review', *Heliyon*, vol. 6, no. 11, Nov. 2020, doi: 10.1016/j.heliyon.2020.e05312.
- [12] X. Liang, Q. Guan, K. C. Clarke, S. Liu, B. Wang, and Y. Yao, 'Understanding the drivers of sustainable land expansion using a patch-generating land use simulation (PLUS) model: A case study in Wuhan, China', *Computers, Environment and Urban Systems*, vol. 85, p. 101569, Jan. 2021, doi: 10.1016/j.compenvurbsys.2020.101569.

- [13] H. H. Dewi, S. M. M. Hidayatulloh, S. Sukarno, A. E. Lestari, I. L. Dewi, and D. S. Ciptaningrum, 'English Materials Development For An Undergraduate Communication Study Program: A Need Analysis In Indonesian Context', *LLT Journal: A Journal on Language and Language Teaching*, vol. 26, no. 1, Art. no. 1, Apr. 2023, doi: 10.24071/llt.v26i1.5208.
- [14] N. Diana, S. Latifah, Yuberti, H. Komikesari, M. H. Rohman, and Lady Tiyan, 'Developing an e-learning-based critical-thinking assessment as a physics learning evaluation media with Kahoot! interactive quiz', *J. Phys.: Conf. Ser.*, vol. 1796, no. 1, p. 012055, Feb. 2021, doi: 10.1088/1742-6596/1796/1/012055.
- [15] H. Fibriasari, W. Andayani, T. T. A. Putri, and N. Harijanja, 'Learning Management System Now and in The Future: Study Case from the Indonesian University Students', *International Journal of Information and Education Technology (IJJET)*, vol. 13, no. 1, Art. no. 1, Jan. 2023.
- [16] M. Cevikbas and G. Kaiser, 'Flipped classroom as a reform-oriented approach to teaching mathematics', *ZDM Mathematics Education*, vol. 52, no. 7, pp. 1291–1305, Dec. 2020, doi: 10.1007/s11858-020-01191-5.
- [17] L. R. Murillo-Zamorano, J. Á. López Sánchez, and A. L. Godoy-Caballero, 'How the flipped classroom affects knowledge, skills, and engagement in higher education: Effects on students' satisfaction', *Computers & Education*, vol. 141, p. 103608, Nov. 2019, doi: 10.1016/j.compedu.2019.103608.
- [18] W. Puspita and N. Kurniawan, 'Improving Early Childhood Language Skills by Telling Stories Using Finger Puppets: A Classroom Action Research', *GENIUS: Indonesian Journal of Early Childhood Education*, vol. 5, no. 1, Art. no. 1, Feb. 2024, doi: 10.35719/gns.v5i1.155.
- [19] S. Gupta, S. Modgil, S. Bhattacharyya, and I. Bose, 'Artificial intelligence for decision support systems in the field of operations research: review and future scope of research', *Ann Oper Res*, vol. 308, no. 1, pp. 215–274, Jan. 2022, doi: 10.1007/s10479-020-03856-6.
- [20] N. A. N. Ahmad and M. Hussaini, 'A Usability Testing of a Higher Education Mobile Application Among Postgraduate and Undergraduate Students.', *International Journal of Interactive Mobile Technologies*, vol. 15, no. 9, 2021.



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