Inovasi Kurikulum *- p-ISSN 1829-6750 & e-ISSN 2798-1363*
Volume 21 No 3 (2024) 1371-1382

Inovasi Kurikulum
https://ejournal.upi.edu/index.php/JIK

Development of human digestive organ media based on Assemblr EDU

Arnelia Dwi Yasa[1], Farida Nur Kumala[2], Rujian Nur Andi Alfianto[3], Moh Salimi[4]
[1,2,3]Universitas PGRI Kanjuruhan Malang, Malang, Indonesia
[4]Universitas Sebelas Maret, Surakarta, Indonesia
arnelia@unikama.ac.id[1], faridankumala@unikama.ac.id[2], alfiantoandi32@gmail.com[3], salimi@staff.uns.ac.id[4]

ABSTRACT
This study focuses on developing and evaluating a new learning media called Assemblr EDU-based human digestive organs media for elementary science learning. The motivation behind this research is the limitation of current learning materials, such as books and worksheets, which hinder students' understanding of the subject. The ADDIE development research model is employed, with 5th-grade students as the subjects. The study utilizes descriptive data analysis techniques and collects data through questionnaires using a Likert scale. The media is evaluated by material experts, media experts, linguists, teachers, and students. The results reveal that the media is considered feasible, with 88.5 percent of media experts rating it as "Very Feasible," 90 percent of material experts evaluating it as "Very Feasible," and 62.5 percent of linguists considering it as "Feasible." Furthermore, a practicality test conducted with teachers and students shows a 90 percent positive response. The effectiveness test, assessed through a t-test, demonstrates significant improvement in learning outcomes. Overall, the Assemblr EDU-based human digestive organ media proves feasible, practical, and effective in enhancing learning in elementary science.

ARTICLE INFO
Article History:
Received: 21 Mar 2024
Revised: 15 Jun 2024
Accepted: 19 Jun 2024
Available online: 23 Jun 2024
Publish: 30 Aug 2024

Keyword:
Assemblr EDU, human digestive organs; science

Open access
Inovasi Kurikulum is a peer-reviewed open-access journal.

ABSTRAK
Keterbatasan media pembelajaran khususnya pada pembelajaran IPA yang hanya menggunakan buku dan LKS saja tentang organ pencernaan manusia menyebabkan siswa kurang memahami materi yang disampaikan, sehingga pengembangan media pembelajaran perlu dilakukan. Tujuan penelitian ini untuk mendeskripsikan pengembangan media alat pencernaan manusia berbasis Assemblr EDU pada pembelajaran IPA SD serta mengetahui kelayakan, kepraktisan dan keefektifan media tersebut. Penelitian ini menggunakan model penelitian pengembangan ADDIE dengan subjek penelitian kelas 5 Sekolah Dasar. Penelitian ini menggunakan teknik analisis data deskriptif, dengan angket menggunakan skala likert oleh ahli materi, ahli media, ahli bahasa, serta respon guru dan siswa untuk pengumpulan data. Berdasarkan analisis data, hasil penelitian menunjukkan validasi ahli media menilai penggunaan media ini layak digunakan dengan hasil akhir 88,5 persen dinilai "Sangat Layak", validasi ahli materi 90 persen dinilai "Sangat Layak", dan validasi ahli bahasa 62,5 persen dinilai "Layak". Sedangkan, uji praktikalitas diperoleh dari angket respon guru dan siswa mencapai 90 persen. Uji efektivitas yang dinilai melalui uji-t menunjukkan peningkatan hasil belajar yang signifikan. Media organ pencernaan manusia berbasis Assemblr EDU pada pembelajaran IPA SD layak, praktis dan efektif dalam meningkatkan pembelajaran.
Kata Kunci: *Assemblr EDU; organ pencernaan manusia; IPA*

How to cite (APA 7)
Yasa, A. D., Farida, N. K., Alfianto, R. N. A., & Salimi, M. (2024). Development of human digestive organ media based on Assemblr EDU. *Inovasi Kurikulum, 21*(3), 1371-1382.

Peer review
This article has been peer-reviewed through the journal's standard double-blind peer review, where both the reviewers and authors are anonymised during review.

https://doi.org/10.17509/jik.v21i3.71204

INTRODUCTION

The implementation of Kurikulum Merdeka In elementary school, Ilmu Pengetahuan Alam (IPA) subjects are combined or integrated with Ilmu Pengetahuan Sosial (IPS) subjects in order to understand the surrounding environment (Fannisa et al., 2023; Fatonah et al., 2023; Surul & Septiliana, 2023). In addition, the use of technology in the learning process cannot be separated from the nature of science in Kurikulum Merdeka in elementary schools (Febriska *et al.,* 2023; Suryati & Jalinus, 2023; Zidan & Qamariah, 2023). IPA in Kurikulum Merdeka in elementary schools should integrate technology as a learning medium, and adopt an approach or learning model that makes students' skills and creativity the primary focus in the learning process. (Mabsutsah et al., 2023; Saputra et al., 2023). In grade 5 of elementary school, one of the IPA materials taught in Kurikulum Merdeka is the human digestive system. The material on the human digestive system is a series of sequential and concrete events, so if the material is only presented in text form, it is not enough to give students a comprehensive understanding of the human digestive system process (Noviyanti & Margunayasa, 2020; Uskola et al., 2022; Zulfarina et al., 2021).

However, problems still occur during its implementation. Based on observations and interviews conducted by researchers at one of the elementary schools in Malang Regency, SDN 3 Bambang. The observations and interviews show that the school has provided teaching materials and learning media. However, the learning media provided are limited because of the geographical area of SDN 03 Bambang, located on the outskirts of Malang Regency. Educators are limited to using theme books and LKS as the only source of teaching materials during the learning process. However, the theme book tends to encourage students to only read and understand the core material through long texts with less interesting presentations, so that students do not understand the material presented. The Ilmu Pengetahuan Alam (IPA) learning process on the material on human digestive organs shows that learning is carried out without using adequate supporting materials. In this context, educators only explain human digestive organs through the available theme books. At the end of learning, students are only given evaluation questions already available in the theme book. In addition, in this era of technology, teachers must follow the developments of the times that demand the use of existing technology in the learning process (Susanto et al., 2020).

Based on these problems, the researcher intends to develop technology-based learning media that provide concrete experiences as a supporting tool in learning, especially in Ilmu Pengetahuan Alam (IPA) on the human digestive organs. From the problems explained, the researcher wants to develop a learning medium that allows the delivery of material that is difficult to understand orally or in writing to be explained better through the medium. Therefore, the solution to this problem is to utilize Assemblr EDU as a learning medium. Assemblr EDU can be a tool for educators in delivering material to students during the learning process. With the Assamblr EDU media, students can understand previously abstract material to be more concrete (Nengsih et al., 2023; Nevarini et al., 2023; Tarigan et al., 2023).

The advantage of using Assemblr EDU-based human digestive organ media is that students can see and observe human digestive organs such as the mouth to the anus in 3D forms, so that they can understand more deeply about the function and structure of the organs displayed (Lissa'adah & Widiyatmoko, 2023; Murdhani et al., 2023). In addition, this learning media can create engaging and interactive learning, so that it can increase students' interest in participating in learning (Prasetiawati et al., 2023; Sabil et al., 2023; Triana & Hariyastuti, 2024). *Assemblr EDU stands out compared to other Augmented Reality applications because it provides very user-friendly animations, allowing users to easily use it without the need for an in-depth understanding of complex programming* (Ardhani et al., 2022; Sanusi et al., 2021). In addition, the human digestive organ media based on Assemblr EDU is considered suitable for learning, supported by other similar research, which found that the validation by material experts reached the criteria for very suitable suitability (Tuta et al., 2022; Zulfarina et al., 2021). Meanwhile, in the assessment of media experts, the eligibility criteria are very feasible. The assessment places this learning media in the very

https://doi.org/10.17509/jik.v21i3.71204

feasible category for learning. Assemblr EDU is recognized as effective in improving student learning outcomes.

In previous studies that have been written, this study has novelty compared to previous studies, namely, the first from the research location. The researcher conducted the research at SDN 3 Bambang, Wajak District, Malang Regency. Then, in previous studies, there was still no one who developed human digestive organ material for grade 5 Elementary School using this application; most used other applications to develop it. In addition, the researcher also included a poster with a picture of the human digestive system and its explanation. A QR code was then used to display the animation of the human digestive system. This study focused on grade 5 Elementary School students because the material on human digestive organs was introduced at this level. Therefore, the researcher planned to develop human digestive organ learning media based on Assemblr EDU in elementary school, Ilmu Pengetahuan Alam (IPA). This study aimed to describe the development of human digestive organ media based on Assemblr EDU in elementary school Ilmu Pengetahuan Alam (IPA) and to determine the media's feasibility, practicality, and effectiveness.

LITERATURE REVIEW

Ilmu Pengetahuan Alam (IPA)

Ilmu Pengetahuan Alam (IPA) is a branch of knowledge investigating all aspects of natural phenomena, including living things and inanimate objects (Nasution, 2017; Rustam & Fauzi, 2019). IPA is not merely a product of human thought, but is the result of observations and experiments on natural phenomena in this universe (Schizas *et al*., 2016; Siponen & Klaavuniemi, 2021). One of the learning materials IPA is the human digestive organ with a discussion of the role and mechanisms of organs from the mouth to the anus in breaking down food into nutrients needed by the body, involving interaction with other body systems, and has the aim of expanding students' understanding of aspects of health and nutrition (Fitria, 2023; Reinoso & Delgado-Iglesias, 2020).

Augmented Reality (AR) Learning Media

Learning media are tools that play a role in the teaching and learning process, increasing the message's clarity and ensuring that learning objectives are achieved effectively and efficiently. (Andriyani & Suniasih, 2021; Arifin et al., 2021; Frananda et al., 2023). Learning media acts as a tool that stimulates the mind, intending to trigger the learning process (Hikmah et al., 2022; Pradana & Uthman, 2023; Sholihin et al., 2020). One of the learning media technologies that provides concrete experiences to students is Augmented Reality (Astuti et al., 2020; Nelson et al., 2022). *Augmented Reality is a technology that combines real-world elements with virtual world elements, either in two-dimensional or three-dimensional form, and displays them simultaneously in a real physical environment* (Jingen-Liang & Elliot, 2021; Rauschnabel *et al.*, 2022).

Azuma said that Augmented Reality includes three characteristics: a combination of the real world with the virtual world, interactive in real time, and displayed in three dimensions (Saraswati, 2023). The application of Augmented Reality is innovative and creative when used in learning media because it can create a real-time hybrid learning experience by combining real and virtual objects displayed in two or three dimensions. This learning method allows students to understand difficult learning materials better, increase learning motivation, provide interactive learning, and engage in real learning activities. Inanova & Inanov added that learning by utilizing Augmented Reality can improve student understanding and perception of learning materials (Saraswati, 2023). In addition, using this technology in education is

https://doi.org/10.17509/jik.v21i3.71204

recommended because it can reduce student safety risks and does not require significant funds and space (Enzai, 2021).

The use of Augmented Reality technology in IPA learning is highly recommended because learning IPA requires a large amount of equipment and threatens student safety, so the use of Augmented Reality can be a solution to reduce the budget and protect student safety. Several studies have also shown that learning methods with Augmented Reality can improve students' understanding of learning materials faster than other methods. However, the development of learning methods with Augmented Reality is not that affordable, because many developments of Augmented Reality learning methods require a large budget to develop interactive content for students and teachers (Enzai, 2021).

Assemblr EDU

The application of Augmented Reality (AR) technology can be found in the Assemblr EDU application (Carrión-Robles *et al.,* 2023; Enzai *et al*., 2021; Safitri *et al.,* 2023). Assemblr EDU is an application that allows teachers to create 3D content visualized in Augmented Reality and placed in the real world, so students can easily access it (Ulfah, 2022). Assemblr EDU is a platform for creating three-dimensional works realized in the form of Augmented Reality and placed in the real world, so users can easily access them. Using Assemblr EDU can increase learning efficiency because this application presents interesting features like animation, audio, and video. The features in Assemblr EDU do not require complex programming, can present work anywhere, can be viewed from various angles, and can be edited (Saraswati, 2023).

METHODS

The research approach used by researchers is the Research and Development approach. Development of human digestive organ media based on Assemblr EDU in learning IPA SD has been developed by adhering to the five stages of the ADDIE development model (see **Figure 1**), including analysis, design, development, implementation, and evaluation (Purnama, 2023). The analysis process is carried out to determine the needs of the curriculum and students, and then the design of the organized learning media based on Assemblr EDU is designed. After that, the development stage is validated by material, media, and language experts, followed by the implementation stage to test the product's practicality. Finally, the evaluation stage is carried out by testing the product's effectiveness.

https://doi.org/10.17509/jik.v21i3.71204

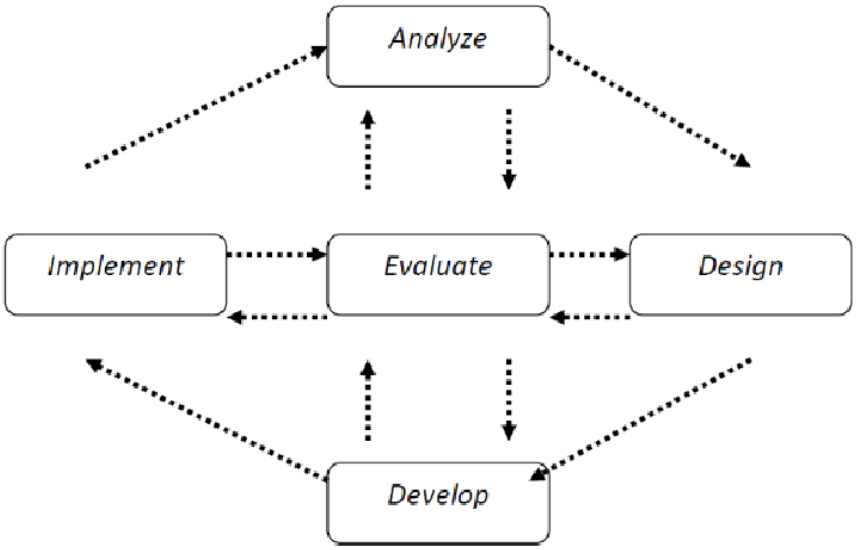

Figure 1. ADDIE Model Design
Source: Nadiyah & Faaizah (2015)

This study's research subjects were product validation and product trial subjects. The product validation subjects consisted of material, language, and media experts. Meanwhile, the product trial subjects were students and teachers of grade V of SDN 3 Bambang. In this development research, data were collected through questionnaire/survey distribution techniques using three main instruments: validation questionnaire sheets, student and teacher response questionnaire sheets, and pretest-posttest sheets. This study applies descriptive data analysis techniques to analyze product validity and practicality data, where data was obtained by filling out questionnaires using a Likert scale by material experts, media experts, language experts, and teacher and student responses. The Likert scale was chosen to measure a person's opinion or response to something. The Likert scale includes four answer variations (Galante, 2022). Score 1 for the “inferior” category, score 2 for the “poor” category, score 3 for the “good” category, and score 4 for the “outstanding” category..

The product's feasibility and practicality are assessed by calculating the weight of each response and producing an average score. The assessment of each aspect of the product being developed uses a Likert Scale: a product is considered feasible and practical if the average evaluation of each element at least meets the criteria for being practical or viable, according to the calculation (Andini et al., 2023). (Andini et al., 2023). The categories include the very feasible/practical category, with a percentage of more than 80% to 100%. The practical/viable category has a percentage of more than 60% to 80%. The less feasible/practical category has a percentage of more than 40% to 60%. The unfeasible/practical category has a percentage of more than 20% to 40%. Meanwhile, the very unfeasible/impractical category has a percentage of 0% to 20% (Anggito & Sartono, 2022). Analysis of the effectiveness of learning media, researchers use the t-test formula (Amini & Lena, 2019; Hanif, 2020).

RESULT AND DISCUSSION

In the first stage, the analysis was conducted to analyze elementary school students' needs, curriculum, and characteristics. Teachers only use student books for learning. In addition, in the material on human digestive organs, students are only asked to read the material and then are given questions after the activity. Thus, media is needed to make students understand the abstract material on human digestive organs more concrete, namely, human digestive organ media based on Assemblr EDU.

https://doi.org/10.17509/jik.v21i3.71204

In the second stage, namely, the design of human digestive organ media based on Assemblr EDU with material about human digestive organs in grade 5 of Elementary School, this material is compiled using the Assemblr EDU application. It consists of Augmented Reality animations in the form of QR Codes. This QR Code is designed to be more attractive in the form of a poster containing a text explanation of the human digestive organs (**Figure 2**).

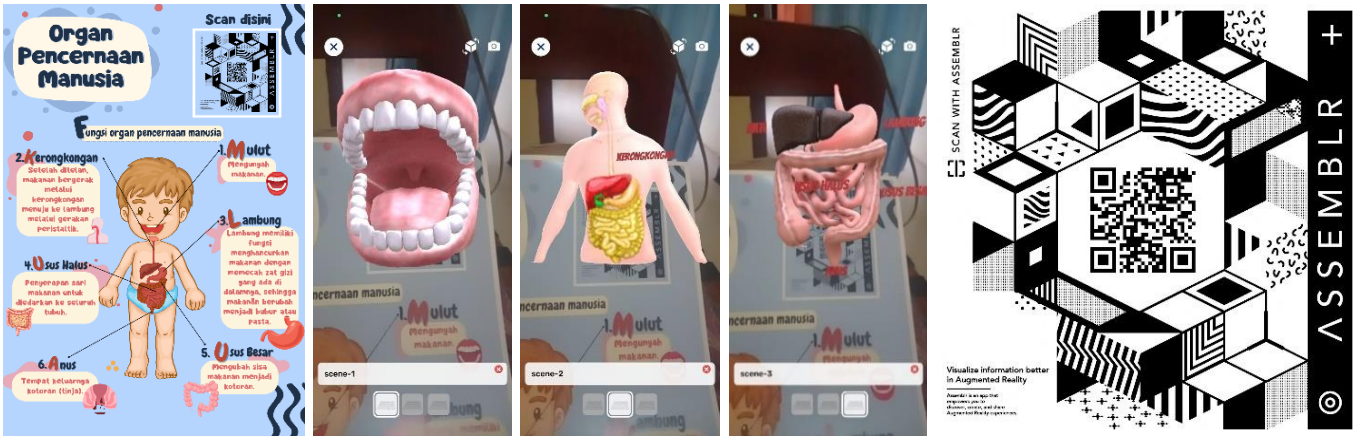

Figure 2. Human digestive organ media design based on Assemblr EDU
Source: Research Documentation, 2024

Third, the development stage was validated by material, media, and language experts. The results were that the material expert got a feasibility score of 90% with a very feasible category, the media expert got a feasibility score of 88.5% with a very feasible category, and the language expert got a feasibility score of 62.5% with a viable category. This is because the media the researcher developed in the material aspect is based on the learning achievements. Then, for the media aspect, it can convey messages well to students, and some animations can increase students' learning motivation. In terms of language, this media is produced by EYD, and the language used is also for student development.

The fourth stage, the implementation stage, involved applying the media to the product trial subjects, which were then tested for practicality by distributing questionnaires to teachers and students. The results, namely the teacher's response got a score of 96.3% and the students ' response got a score of 89.5%, so the media developed is in the very feasible category. This is because one makes it easier for teachers to integrate the media into the learning process, helps deliver material, has an attractive appearance, and provides a fun learning experience for students.

The fifth stage, namely the evaluation stage, is carried out by testing the effectiveness of the media developed on student learning outcomes. This study uses the one-group pretest-posttest design, where the sample group receives treatment (independent variable). However, the initial ability of the sample is known in advance through a pretest. After the treatment, the study results are observed by conducting a post-test. Normality testing is carried out to determine whether the pretest and post-test data have a normal distribution. The following are the results of normality testing using JASP.

Table 1. Data normality test (Shapiro-Wilk)

	Pretest	**Posttest**
p-value of Shapiro-Wilk	0,606	0,097

Source: Research Results, 2024

https://doi.org/10.17509/jik.v21i3.71204

Based on Table 1, the results of the Normality test output above show that the pretest data = 0.606 > 0.05, so the data is usually distributed. For post-test = 0.097 > 0.05, then the data is usually distributed. Then, a t-test was conducted using JASP to determine the effectiveness of the Assemblr EDU-based digestive organ media. The T-test was conducted to test the hypothesis based on the data that had been obtained. The proposed hypothesis is as follows:

H0: There is no difference in student learning outcomes between before and after learning using human digestive organ media based on Assemblr EDU.
H1: There are differences in student learning outcomes between before and after learning using human digestive organ media based on Assemblr EDU.

Criteria: if p > 0.001, then H0 is accepted, and if p < 0.001, then H0 is rejected, and H1 is accepted. The following are the results of the t-test using JASP:

Table 2. Paired Samples T-Test

		t	df	p	Pretest Average	Posttest Average
Pretest	Posttest	-14,659	10	< 0,001	50,455	83,636

Source: Research Results, 2024

Table 2 shows that p < 0.001, and there is an increase in the average test score before and after learning using human digestive organ media based on Assemblr EDU. Judging from the p-value, H0 is rejected, H1 is accepted, so it can be concluded that there is a difference in student learning outcomes between before and after learning using human digestive organ media based on Assemblr EDU. Thus, human digestive organ media based on Assemblr EDU is effective for learning.

Discussion

In the feasibility test, after going through a validation process by media, material, and language experts, the percentage of learning media was calculated by researchers according to the criteria explained in the method section. The study's results showed that the validity of the human digestive organ media based on Assemblr EDU by media experts reached 88.5%. Material experts gave a percentage of 90%. Meanwhile, language experts gave a percentage of 62.5%. Thus, it can be concluded that human digestive organ media based on Assemblr EDU is feasible. This is because the media researchers developed in terms of material aspects are based on learning outcomes. Then, for the media aspect, it can convey messages well to students, and some animations can increase students' learning motivation. In terms of language, this media is produced by EYD, and the language used is also influenced by student development.

Then, the practicality test, the human digestive organ media based on Assemblr EDU, can be assessed for its practicality through assessments from teachers and students (Arbia et al., 2020; Dinayusadewi & Agustika, 2020; Djou et al., 2022). After the human digestive organ media based on Assemblr EDU was considered "Feasible", a trial was conducted involving teachers and students. The results of the teacher's assessment showed a percentage of 96.3% in the "Very Practical" category. Meanwhile, the student assessment rate after implementation was 89.5%. Then, the percentage of teachers and students was 90%, so this medium was considered "Practical" in its use. Based on the analysis, the response to the media developed by the researcher was quite good due to several factors. First, teachers can easily integrate this learning media into the learning process. Second, learning media helps teachers in delivering learning materials. Third, the appearance of the learning media is well-designed and attractive. Fourth, the learning media provides students with an easy and enjoyable learning experience. This is in line with

https://doi.org/10.17509/jik.v21i3.71204

previous research, the study said that the practicality of the Assemblr EDU media reached a practical level (Ardyansyah & Rahayu, 2023; Irmy et al., 2023; Khozain, 2023). This is due to the attractiveness of the media and good media presentation, so students are motivated to participate in learning.

The effectiveness test concluded that from the t-test results, it was found that p <0.001. So H0 is rejected and H1 is accepted. So it can be concluded that there is a difference in student learning outcomes between before and after learning using human digestive organ media based on Assemblr EDU. Based on this, Human digestive organ media based on Assemblr EDU in learning elementary school IPA is considered effective in improving student learning outcomes. According to other studies, Assemblr EDU-based media is effective in learning (Triana & Hariyastuti, 2024; Maqfiroh & Munahefi, 2022). From the analysis, the presser the researcher developed is effective because students easily understand the material presented using this medium. Using human digestive organ media based on Assemblr EDU, students can see concretely the previously abstract organs to imagine. This is in line with the research conducted, stating that Assemblr EDU-based media can improve students' understanding of the material presented (Rosyidah & Khatijah, 2023).

CONCLUSION

Human digestive organ media based on Assemblr EDU for learning the IPA in elementary school. Validation tests were conducted by various experts, such as media experts, material experts, and language experts. On average, this media received a feasibility score in the "Very Feasible" category. Teachers and students assessed the practicality test and were in the "Practical" category in its use. Effectiveness test, human digestive organ media based on Assemblr EDU in learning IPA elementary school, a t-test was conducted, so it was found that this media was considered adequate in learning. Based on assessing the criteria for human digestive organ media based on Assemblr EDU in learning IPA elementary school, it can be concluded that the media has met three essential criteria: feasibility, practicality, and effectiveness. Therefore, the human digestive organ media based on Assemblr EDU in learning IPA elementary school that has been developed can be considered ready to be used in the learning process. The existence of this media makes it easier for students to understand the material on human digestive organs. This innovation is highly recommended for elementary school teachers in developing and making learning more interesting and compelling. Meanwhile, suggestions for further research are to redevelop learning with AR animation of human digestive organs.

AUTHOR'S NOTE

The author declares that this article is free from conflict of interest. The author ensures that all data and content of this article are original and free from plagiarism. The author also thanks SDN 3 Bambang for their support and assistance during the research process.

https://doi.org/10.17509/jik.v21i3.71204

REFERENCES

Amini, R., & Lena, M. S. (2019). The effectiveness of the integrated learning model in improving the students' competence at elementary school. *Unnes Science Education Journal, 8*(1), 1-13.

Andini, D. W., Annisa, F. Y., Praheto, B. E., & Taryatman, T. (2023). The development of the sariswara method in accommodating the students' diversity in thematic learning material of elementary school. *Jurnal Prima Edukasia, 11*(1), 72-80.

Andriyani, N. L., & Suniasih, N. W. (2021). Development of learning videos based on animals' problem-solving characteristics and their habitats in IPA subjects for 6th-grade students. *Journal of Education Technology, 5*(1), 37-47.

Anggito, A., & Sartono, E. K. E. (2022). The development of multicultural education comics to embed tolerance character for 4th grade of elementary school. *Jurnal Prima Edukasia, 10*(1), 66-81.

Arbia, S. M., Maasawet, E. T., & Masruhim, M. A. (2020). The development of learning tools oriented industrial revolution 4.0 to improve students' creative thinking skills*. International Journal of Sciences: Basic and Applied Research (IJSBAR), 51*(2), 117-131.

Ardhani, R., Setiyanto, S., & Permatahati, I. (2022). Augmented reality 3d heart as learning media at midwifery lab University of'Aisyiyah Surakarta. *International Journal of Computer and Information System (IJCIS), 3*(1), 1-5.

Ardyansyah, A., & Rahayu, S. (2023). Development and implementation of augmented reality-based card game learning media with environmental literacy in improving students' understanding of carbon compounds. *Orbital: The Electronic Journal of Chemistry, 15*(2), 118-126.

Arifin, M. B. U. B., Rindaningsih, I., & Kalimah, S. (2021). Development of smart play wheel learning media to improve student learning outcomes in islamic elementary schools. *Journal of Physics: Conference Series, 1779*(1), 1-6.

Astuti, F. N., Suranto, S., & Masykuri, M. (2020). The appropriateness of developing the media: Experts' validation and students' response of learning media based on augmented reality technology for natural science lesson. *Journal of Physics: Conference Series, 1567*(4), 1-6.

Carrión-Robles, F., Espinoza-Celi, V., & Vargas-Saritama, A. (2023). The use of augmented reality through assemblr edu to inspire writing in an Ecuadorian EFL distance program. *International Journal of Engineering Pedagogy, 13*(5), 1-12.

Dinayusadewi, N. P., & Agustika, G. N. S. (2020). Development of augmented reality application as a mathematics learning media in elementary school geometry materials. *Journal of Education Technology, 4*(2), 204-210.

Djou, A., Buhungo, T. J., Supartin, S., & Arbie, A. (2022). Practicality of learning devices in problem-based learning implementation in contextual teaching and learning approach. *Jurnal Pijar Mipa, 17*(6), 748-753.

Enzai, N. I. M., Ahmad, N., Ghani, M. A. H. A., Rais, S. S., & Mohamed, S. (2021). Development of augmented reality (AR) for innovative teaching and learning in engineering education. *Asian Journal of University Education, 16*(4), 99-108.

Fannisa, A. A., Anggraini, D., Romdani, K. N., & Dewi, M. T. (2023). The challenges of learning social science in the" merdeka" curriculum in elementary schools. *Mandalika: Journal of Social Science, 1*(2), 52-59.

Fatonah, S., Chasanah, U., & Lusiana, L. (2023). Implementation of the independent curriculum in

https://doi.org/10.17509/jik.v21i3.71204

natural and social science learning to strengthen elementary students'independence. *Al-Bidayah: Jurnal Pendidikan Dasar Islam, 15*(2), 203-224.

Febriska, I., Wati, R., & Lubis, R. R. (2023). Development of e-books in natural science (IPA) lessons based on discovery learning for high class students in primary schools. *International Journal of Students Education, 1*(2), 623-628.

Fitria, T. N. (2023). Augmented reality (AR) and virtual reality (VR) technology in education: Media of teaching and learning: A review. *International Journal of Computer and Information System (IJCIS), 4*(1), 14-25.

Frananda, A., Werry, T., & Wais, A. (2023). The utilization of the design application for Arabic learning. *Journal International of Lingua and Technology, 2*(1), 60-70.

Galante, A. (2022). Plurilingual and pluricultural competence (PPC) scale: The inseparability of language and culture. *International Journal of Multilingualism, 19*(4), 477-498.

Hanif, M. (2020). The development and effectiveness of motion graphic animation videos to improve primary school students' sciences learning outcomes. *International Journal of Instruction, 13*(3), 247-266.

Hikmah, D., Petoukhoff, G., & Papaioannou, J. (2022). The utilization of the animiz application as a media for Arabic language learning on students. *Jiltech: Journal International of Lingua & Technology, 1*(2), 1-12.

Irmy, A. S., Hendri, N., Anugrah, S., & Zuwirna, Z. (2023). Augmented reality media development using assemblr studio web in class VIII social science subjects at MTsN. *Jurnal Ilmiah Mandala Education, 9*(4), 3078-3082.

Jingen-Liang, L., & Elliot, S. (2021). A systematic review of augmented reality tourism research: What is now and what is next?. *Tourism and Hospitality Research, 21*(1), 15-30.

Khozain, N. (2023). Development of android-based indonesian cultural exploration educational game for madrasah ibtidaiyah students. *Mudarrisa: Jurnal Kajian Pendidikan Islam, 15*(2), 243-268.

Lissa'adah, L., & Widiyatmoko, A. (2023). The effectiveness of augmented reality based on Assemblr Edu to increase learning interest and student learning outcomes. *Journal of Environmental and Science Education, 3*(2), 79-85.

Mabsutsah, N., Hariyadi, S., & Prihatin, J. (2023). The readiness of science teachers to implement differentiated learning and integrated stem in ecology subject of the "merdeka" curriculum in junior high school. *Bioedukasi, 21*(2), 99-110.

Maqfiroh, S. L., & Munahefi, D. N. (2022). Development of teaching materials of flat side spaces building based on problem based learning with assemblr assistance to improve students' spatial ability. *Unnes Journal of Mathematics Education, 11*(3), 228-238.

Murdhani, I. D. A. S., Oktavia, Y. P., & Sholeh, M. (2023). Educational media introduction to human internal and external organs for high school students based on augmented reality by using the Assemblr application. *International Journal of Applied Sciences and Smart Technologies, 5*(1), 89-100.

Nadiyah, R. S., & Faaizah, S. (2015). The development of online project based collaborative learning using ADDIE model. *Procedia-Social and Behavioral Sciences, 195*, 1803-1812.

Nasution, W. N. (2017). The effects of learning model and achievement motivation on natural science learning outcomes of students at state islamic elementary schools in Medan, Indonesia. *Journal of*

https://doi.org/10.17509/jik.v21i3.71204

Education and Training, 4(2), 131-150.

Nelson, S., Darni, R., & Haris, F. (2022). Development Augmented Reality (AR) learning media for pencak silat course at faculty of sports and science universitas negeri padang. *Educational Administration: Theory and Practice, 28*(1), 37-46.

Nengsih, N., Eka, A. E. S., & Sunandar, A. (2023). Development of augmented reality learning media based on Assemblr studio web in ecosystem material. *Jinop (Jurnal Inovasi Pembelajaran), 9*(2), 277-291.

Nevarini, M., Agustiani, R., & Zahra, A. (2023). Application of augmented reality in geometry learning in increasing student learning motivation. *Journal of Curriculum and Pedagogic Studies (JCPS), 2*(1), 40-50.

Noviyanti, D. A. P. M., & Margunayasa, I. G. (2020). Animal and human digestive system material of the fifth grade elementary school in the form of pop-up book media. *Journal of Education Technology, 4*(2), 161-169.

Pradana, M. D., & Uthman, Y. O. O.-O. (2023). Development of aqidah akhlak learning media "board game based on education fun on the theme of commendable morals (E-Fun A2M)" for high school students. *Assyfa Learning Journal, 1*(1), 25-36.

Prasetiawati, R. A., Hidayat, W., & Hendriana, H. (2023). The development of discovery learning assisted by geogebra and assemblr edu application to increase juinor high school students understanding ability on geometry. *Journal of Innovative Mathematics Learning* (*JIML), 6*(1), 35-46.

Purnama, P., Pattaufi, P., & H, N. (2023). Development of animation video assistant teaching science courses in SD Negeri 056 Lamasariang. *Inovasi Kurikulum, 20*(2), 351-362.

Rauschnabel, P. A., Babin, B. J., tom Dieck, M. C., Krey, N., & Jung, T. (2022). What is augmented reality marketing? Its definition, complexity, and future. *Journal of business research, 142*, 1140-1150.

Reinoso, R., & Delgado-Iglesias, J. (2020). Understanding pre-service teacher conceptual knowledge of human nutrition processes through drawings. *Journal of Baltic Science Education, 19*(6), 1008-1019.

Rosyidah, L. I., & Khatijah, A. (2023). Learning English with assembl edu-based augmented reality: Does the learning media matter?. *Ethical Lingua: Journal of Language Teaching and Literature, 10*(2), 1-12.

Rustam, N. I., & Fauzi, A. (2019). Effectiveness of integrated science textbook theme earthquake using connected model SSCS problem solving. *Journal of Physics: Conference Series, 1185*(1), 1-7.

Sabil, H., Kurniawan, D. A., Perdana, R., Rivani, P. A., & Widodo, R. I. (2023). The character of students' love for their homeland on electronic modules assisted by assemblr edu in learning. International *Journal of Elementary Education, 7*(2), 1-12.

Safitri, D., Marini, A., Auliya, A. F., & Wardhani, P. A. (2023). Development of augmented reality-based interactive learning media to increase interest in environmental education. *Eurasian Journal of Educational Research, 106*(1), 101-117.

Sanusi, M. S. B. A., Shukor, S. A. A., & Johari, J. (2021). Developing ar interface for interior modelling from 3d sensor. *Journal of Physics: Conference Series, 2107*(1), 1-8.

Saputra, A. M. A., Putra, P. P., Gani, I. P., Nuraini, I., & Fatmasari, F. H. (2023). The correlation between the merdeka curriculum and teaching challenges in the digital era in Indonesian secondary

https://doi.org/10.17509/jik.v21i3.71204

schools: Qualitative analysis study. *International Journal of Teaching and Learning, 1*(2), 139-150.

Saraswati, I. D. A. I., Putra, I. M. A. W., & Gunawan, I. M. A. O. (2023). Pengembangan media edukasi pengenalan profesi bagi PAUD melalui augmented reality menggunakan Assemblr. *Jurnal Informasi dan Teknologi, 5*(4), 348-357.

Schizas, D., Psillos, D., & Stamou, G. (2016). Nature of science or nature of the sciences?. *Science Education, 100*(4), 706-733.

Sholihin, M., Sari, R. C., Yuniarti, N., & Ilyana, S. (2020). A new way of teaching business ethics: The evaluation of virtual reality-based learning media. *The International Journal of Management Education, 18*(3), 1-13.

Siponen, M., & Klaavuniemi, T. (2021). Demystifying beliefs about the natural sciences in information system. *Journal of Information Technology, 36*(1), 56-68.

Surul, R., & Septiliana, L. (2023). Analysis of the implementation of ipas (natural and social sciences) learning in the merdeka curriculum. *Educatio: Journal of Education, 8*(3), 320-328.

Suryati, L., & Jalinus, N. (2023). Evaluation of the implementation of the independent curriculum with a technology-based learning model. *Jurnal Penelitian dan Pengembangan Pendidikan, 7*(3), 1-12.

Susanto, R., Rachmadtullah, R., & Rachbini, W. (2020). Technological and pedagogical models. *Journal of Ethnic and Cultural Studies, 7*(2), 1-14.

Tarigan, W. P. L., Kuswanto, H., & Tarigan, C. U. (2023). Local potential-integrated augmented reality booklet to facilitate student's curiosity and learning interest. *Anatolian Journal of Education, 8*(2), 195-206.

Triana, V., & Hariyastuti, A. (2024). The effect of using the assemblr edu application as a media for learning subjects in science on students' interests and learning outcomes (Case study: Bedug State Primary School 01). *Jurnal Pendidikan Dasar Nusantara, 9*(2), 280-288.

Tuta, B. B., Harta, J., & Purwasih, S. S. (2022). Development of assemblr edu-assisted augmented reality learning media on the topic of effect of surface area and temperature on reaction rate. *JCER (Journal of Chemistry Education Research), 6*(1), 44-57.

Ulfah, T. T. (2022). Analysis of the needs for developing an augmented reality-based ecosystem module assisted by the assemblr application for grade V elementary school. *Al-Bidayah: Jurnal Pendidikan Dasar Islam, 14*(2), 315-330.

Uskola, A., Zamalloa, T., & Achurra, A. (2024). Using multiple strategies in deepening the understanding of the digestive system. *Journal of Biological Education, 58*(2), 364-382.

Zidan, M. R., & Qamariah, Z. (2023). A Literature study on the implementation of merdeka curriculum. *Jurnal Riset Rumpun Ilmu Bahasa, 2*(2), 153-167.

Zulfarina, Z., Syafii, W., & Putri, D. G. (2021). E-magazine based on augmented reality digestive as digital learning media for learning interest. *Journal of Education Technology, 5*(3), 417-424.

https://doi.org/10.17509/jik.v21i3.71204