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Development of human digestive organ media based on Assemblr EDU

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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.

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

INTRODUCTION

The implementation of Kurikulum Merdeka In elementary school, Ilmu Pengetahuan Alam (IPA) subjects are combined or integrated with Social Sciences (IPS) subjects 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). Science learning 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 main focus of the learning process (Mabsutsah *et al.*, 2023; Saputra *et al.*, 2023). In grade 5 of elementary school, one of the science 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, namely at SDN 3 Bambang. The observations and interviews show that the school has provided teaching materials and learning media. Still, the learning media offered is 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 exciting presentations so that students do not understand the material presented. The scientific learning process on the material of human digestive organs shows that learning is carried out without 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 technology era, 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 Natural Sciences (IPA) on the human digestive organs. From the problems explained, the researcher wants to develop a learning media that allows the delivery of material challenging to understand orally or in writing to be explained better through the media. Therefore, the solution to this problem is utilizing Assemblr EDU as a learning medium. Assemblr EDU can be a tool for educators to deliver material to students during the learning process. With the Assembly EDU media, students can understand the 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 exciting 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 Assembly 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 as a very viable tool for learning. Assemblr EDU is recognized as effective in improving student learning outcomes.

In previous studies that have been written, this study is new 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, no one had developed human digestive organ material for grade 5 elementary school using this application, and most used other applications to build it. In addition, the researcher also included a poster with a picture of the human digestive organ and its explanation, which was then accompanied by a QR code to display the animation of the human digestive organ. This study focused on grade 5 Elementary School students because the material on the human digestive organ was introduced at this level. Therefore, the researcher planned to develop human digestive organ learning media based on Assemblr EDU in elementary school science learning. This study aimed to describe the development of human digestive organ media based on Assemblr EDU in elementary school science learning 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 creatures 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 the universe (Schizas *et al.*, 2016; Siponen & Klaavuniemi, 2021). One of the IPA learning materials is the human digestive organs, 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 interactions with other body systems, and has the aim of expanding students' understanding of health and nutrition aspects (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, increase the clarity of the message conveyed, and ensure that learning objectives are achieved effectively and efficiently (Andriyani & Suniasih, 2021; Arifin *et al.*, 2021; Frananda *et al.*, 2023). Learning media is 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 provide 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 natural physical environment (Jingen-Liang & Elliot, 2021; Rauschnabel *et al.*, 2022).

Azuma said that Augmented Reality includes three characteristics: a combination of the natural 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 natural and virtual objects displayed in two or three dimensions. This learning method allows students to understand complex learning materials better, increases learning motivation, and provides interactive learning and authentic 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 recommended because it can reduce student safety risks and does not require significant funds and space (Enzai, 2021).

Augmented reality technology in science learning is highly recommended because science learning requires significant equipment and threatens student safety. Therefore, 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 less 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 that users can easily access them. Using Assemblr EDU can increase learning efficiency because this application presents exciting features, such as animation, audio, video. The features in Assemblr EDU do not require complex programming, can present work anywhere, can be given from various angles, and can be edited (Saraswati, 2023).

METHODS

The research approach used by the researcher is the Research and Development approach. The development of human digestive organ media based on Assemblr EDU in elementary school science learning has been developed by complying with the five stages of the ADDIE development model (see **Image 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 organ 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, in which the product's practicality is tested. Finally, the evaluation stage is carried out to test the product's effectiveness.
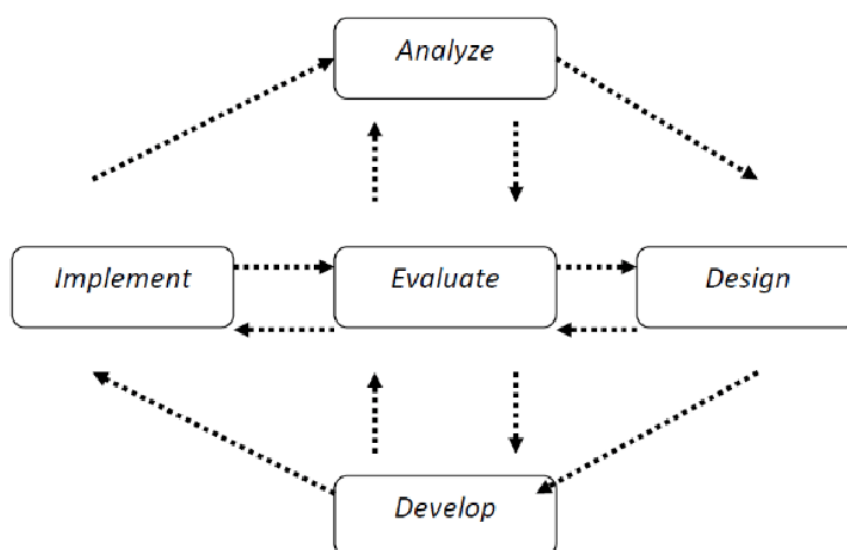
Image 1. ADDIE Model Design
Source: Nadiyah & Faaizah (2015)

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 was collected through questionnaire/survey distribution techniques using three main instruments: validation questionnaire sheets, student and teacher response questionnaire sheets, and pretest post-test 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 feasible or practical, according to the calculation (Andini et al., 2023). The categories include the very feasible/practical category, which has 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%. At the same time, the very unfeasible/practical category has a percentage of 0% to 20% (Anggito & Sartono, 2022). In an 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 the needs, curriculum, and characteristics of students in elementary school. Teachers only use student books in learning. In addition, in the material on human digestive organs, students are only asked to read the material, and then questions are given after the activity. Thus, media is needed to make students understand the abstract material on human digestive organs more concretely, namely human digestive organ media based on Assemblr EDU.

In the second stage, 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 and consists of Augmented Reality animations in QR Codes. This QR Code is designed to be more attractive in the form of a poster containing a text explanation about human digestive organs (**Image 2**).
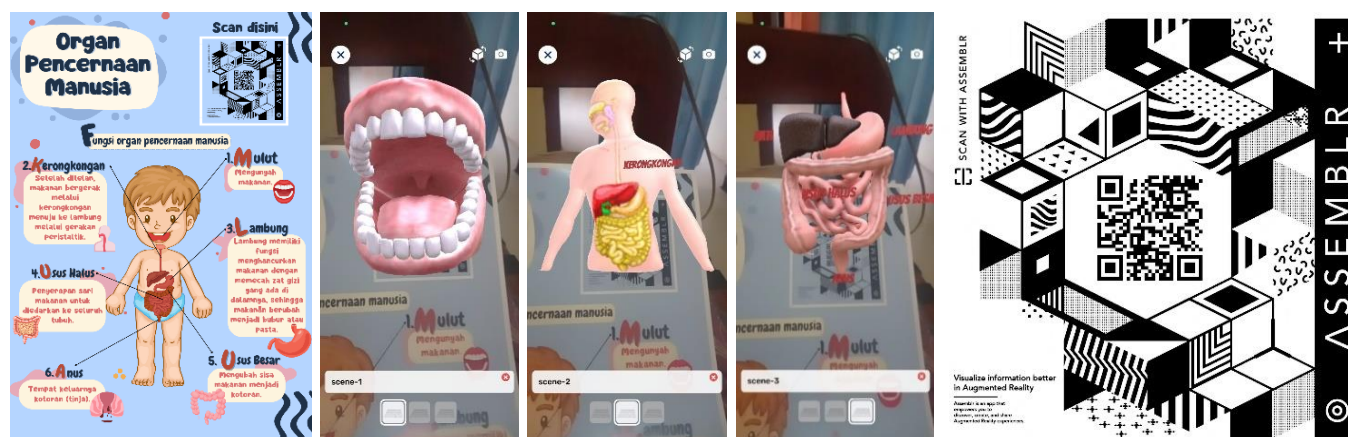
Iamge 2. Desain media organ pencernaan manusia berbasis *Assemblr EDU*
Sumber: Dokumentasi Penelitian, 2024

Third, the development stage was validated by material, media, and language experts. The results were that the material experts got a feasibility score of 90% with a very feasible category, the media experts got a feasibility score of 88.5% with a very feasible category, and the language experts 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, the media aspect can convey messages well to students, and some animations can increase students' learning motivation. In terms of language, this media follows EYD, and the language used also follows student development.

The fourth stage, namely the implementation stage, applied the media to the product trial subjects and was then tested for practicality by distributing questionnaires to teachers and students. The results were that the teacher's response got a score of 96.3%, and the students got a score of 89.5%, so the media developed was in the very feasible category. One reason is that it 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-Post-test design, where the sample group receives treatment (independent variable). Still, the initial ability of the sample is known in advance through a pretest. After treatment is given, 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

Sumber: Hasil Penelitian, 2024

Based on **Table 1**, the results of the Normality test output above show that the pretest data = 0.606 > 0.05, then the data is typically 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 performed 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

1376

using human digestive organ media based on Assemblr EDU

H1 : There is a difference 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. Here are the results of the T-test using JASP:

Table 2. Paired Samples T-Test

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

Sumber: Hasil Penelitian, 2024

From **Table 2,** it was found that p <0.001, and there was 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, 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. Thus, human digestive organ media based on Assemblr EDU is practical for learning.

Discussion

In the feasibility test, after going through a validation process by media, material, and language experts, researchers calculated the percentage of learning media 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 press researchers developed material aspects by learning outcomes. Then, the media aspect can convey messages well to students, and some animations can increase students' learning motivation. In terms of language, this media follows EYD, and the language used follows 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 media 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 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 the fact that good media presentation motivates students 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 elementary school science learning is

considered effective in improving student learning outcomes. This is in accordance with other studies which say that Assemblr EDU-based media is practical to use in learning (Triana & Hariyastuti, 2024; Maqfiroh & Munahefi, 2022). From the analysis, the press the researcher developed is effective because students easily understand the material presented using this media. 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 in elementary school science learning was validated 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. Effectiveness test, human digestive organ media based on Assemblr EDU in elementary school science learning was carried out by a t-test, so it was found that this media was considered adequate in learning. Based on the assessment of the criteria for human digestive organ media based on Assemblr EDU in elementary school science learning, 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 elementary school science learning 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 exciting and compelling. Meanwhile, suggestions for further research are to redevelop learning with AR animation of human digestive organs.

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