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Development of Augmented Reality (AR) Learning Media in Science Learning

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Abstract

This research is based on the lack of use of learning media in science learning; as we know, science learning is learning that cannot be sensed abstractly; for that, in science learning, students need media to help understand the concept of the material being studied. For this reason, the researcher formulated the problem, "How is the development, feasibility, and response of students to augmented reality media?". The purpose of this development research is to produce augmented reality learning media. This type of development research (RnD) uses the ADDIE development model for analysis, design, development, implementation, and evaluation. Based on the research results obtained from the results of the feasibility test of media experts and material experts, the results were very feasible, and the results of student respondents obtained very effective results. The results show that augmented reality media is practical and possible for science learning.

Keywords: *Augmented Reality Media, Human Digestive System, Science Lessons*

INTRODUCTION

According to Ki Hadjar Dewantara, education is one of the means to encourage change and form a civilization, so paying attention to nature and the nature of the times is necessary. With this nature, educators must understand that they have different characteristics; for this reason, in the era of the 4.0 revolution, educators must equip students with technology-based 21st-century skills (Carolina, 2022). Technological developments in the world of education provide convenience in the learning process. With these developments, there may be a change in the orientation of learning, initially in the form of presenting knowledge from one party, into a process of guidance for interactive knowledge exploration by involving students. The shift from teacher-centered learning philosophy to student-centered learning will shape students' character. According to Kevin and Keren in the journal (Komara, 2018), Character education is an effort to improve good habits obtained through habits carried out in schools and communities that can form character, in line with the National Education System Law No. 20 of 2003.

Science is a discipline consisting of physical sciences and biological sciences. What is studied in physics includes chemistry, geology, astronomy, and meteorology, while biological sciences study nature and life, such as biology, physiology, zoology, and so on (Mariana, 2009). Science learning is learning that cannot be sensed abstractly; it needs media or props in the application of learning to make it easier for children to understand the material explained by the teacher so that children can play an active role in the learning process. This can be seen from the observations and interviews conducted at SDN Cidahu 1 in June 2024. This school still uses the media of package books and videos displayed using projectors during science learning. However, the application of learning media could be more extensive. In the science learning process, students are only given the task of observing the pictures and writings on the package book without being given concrete examples of the process of the digestive system in humans. For this reason, in the era of digitalization, an educator, in addition to having to be good in the field of pedagogy, is required to upgrade his abilities in the field of science and

technology (IT) because, in the science learning process, an educator must realize creative, innovative and fun learning, so that learning goals can be achieved. The purpose of science learning is that students can understand the environment, develop curiosity, develop process skills, and understand science concepts in daily life.

According to Sadiman (Karo-Karo & Rohani, 2018), The word media comes from Latin and is a plural form of the word medium, which means intermediary or introduction. In the extensive dictionary of the Indonesian Language, media is a means of communication such as newspapers, magazines, radio, television, films, posters, and banners. This opinion is the same as the opinion (Istiqlal, 2018). Media is a plural word from Latin, namely medium, which means intermediary. The term intermediary here is "anything that can channel information from the source to the recipient of information. The development of media today continues to experience disruptions, including Augmented Reality. According to Maulana *et al.* (2024), Augmented Reality, or AR, is a modern technology-based tool that integrates 3D objects into the real environment using a device's camera. The development of augmented reality learning media has been used in the learning process. Saputra *et al.* (2022) conducted a research entitled Augmented Reality in Science Learning for Elementary School Students, which has proven very good for learning. Wibowo *et al.* (2022) also utilized Augmented Reality in her research, with the title Development of Augmented Reality-Based Learning Media on Class V Animal Classification Materials in Elementary Schools, with excellent results used in learning. According to Irawan & Yatri (2022), the research title "Development of Augmented Reality Learning Media on Elementary School Plant Structure Materials" has also been proven to be very good in learning. The development of this learning media contains videos of material on the digestive system and organs of the human digestive system in the form of 3D objects; this learning can be operated using an Android smartphone by scanning the barcode on the barcode card of the digestive system.

METHOD

This research was conducted at SDN Cidahu 1, Kopo District, Banten Province. This type of research is research and development (R&D); this research uses the ADDIE development method, which has five stages, according to Sugiyono (2015), namely analysis, design, development, implementation, and evaluation. At the analysis stage, performance analysis and needs analysis are used. Performance analysis aims to discover and clarify the problems faced by the schools being researched, starting from the teaching materials used in schools and then finding solutions to develop learning media. Meanwhile, needs analysis aims to determine a learning medium students need to improve the quality of learning and increase students' enthusiasm for learning in science learning.

In the second stage, namely design. At this stage, the process of designing alternative solutions to overcome the problems that have been identified is carried out. Several design processes are carried out at this stage, namely designing a model starting from the design, materials, and storyboard images that will be used in the structure design. In addition to designing the design, research instruments include a questionnaire on the validity of media experts, the validity of material experts, a questionnaire on student responses, and interview guidelines. After determining the design process, the next step is to proceed to the third stage of making learning media. The third stage was to create augmented reality-based learning media on human digestive system materials. At this stage, augmented reality-based learning media

began to be developed per what had been set in the design stage. The creation of this learning media uses the Assembler Studio software application.

After the product was developed, the media was tested, and this trial aimed at the response of grade V students of SDN Cidahu 1. So that the researcher can produce qualitative and quantitative descriptive data. Qualitative data was obtained from the results of teacher interviews, questionnaires of student respondents on the developed media, and quantitative descriptive data obtained from sectors obtained from media experts, material experts, and student response questionnaires. The data collection used in this development research uses material expert validation sheet instruments, media expert validation instruments, and student respondent questionnaire sheets. The instrument serves to validate the media and determine the feasibility of the product being developed. This feasibility test is carried out by validators or experts who are competent in their fields, including media experts and material experts.

Meanwhile, student respondent instruments are used during product trials to determine students' responses to the developed learning media and to obtain feasibility data on the developed media. The data analysis used in this study uses a formula measured using the Likert Scale. According to (Sugiyono, 2016), the Likert scale measures a person's attitudes, opinions, and perceptions about social phenomena.

RESULTS AND DISCUSSION

This development and research were carried out at SD Negeri Cidahu 1, and the product resulting from this development research is a card named "Sicerna." this card contains a barcode to access materials. The material used to develop this learning media is IPAS (Science and Social Studies), based on an independent curriculum. One of the branches of science that the author takes focuses on science with the field of biological sciences, titled human digestive system material. Development of science learning media using Augmented reality (AR) The development of this learning media uses the ADDIE model, including 1) Analysis (analysis), which, at this stage, conducts performance analysis and needs analysis. The performance analysis stage aims to determine the extent to which science learning in grade 5 is going well and the actual situation. At this stage, the researcher interviewed a 5th-grade teacher of SD Negeri Cidahu 1. As a result of the interview, the researcher obtained information that SD Negeri Cidahu 1 in 2022-2023 began to use the independent curriculum. The 5th-grade teacher revealed that he had difficulty finding suitable media for 5th-grade students in learning sciences, especially science. The media used is commonly used in science learning in grade 5 SDN Cidahu 1, only looking at YouTube videos and images in the package book. Needs analysis is a continuous process to determine what media students need to improve classroom learning quality. With that, researchers developed Augmented Reality (AR) learning media as a means of learning; where in the era of digitalization now, students like to use smartphones, so that students can use them anywhere and anytime, and learning using electronic media can be adjusted to the demands of an increasingly sophisticated era. 2) Design The design stage is the stage of learning media design, which includes making storyboards, collecting design objects by the selected material, and then compiling instruments for testing the feasibility of learning media made as a source of student learning. Then, the storyboard and the collection of design objects. 3) Development at this stage of development is making or assembling all components, such as videos, materials, music, and card design, into learning media using Assembler Studio software to create 3D images and Canva to create material videos.

Furthermore, at this stage, it aims to see the extent of the progress of the media designed and validated by media and material experts. After obtaining an assessment from the feasibility test, the criticism and suggestions of the validator revise the learning media. 4) Implementation At this stage, the learning media that has been developed is then implemented to grade V students of SDN Cidahu 1 on May 27, 2024. This media test was implemented with the first trial, namely a tiny group trial involving students to determine the response and attractiveness of Augmented Reality learning media. Then, after the first trial, the researcher re-evaluated what was still an obstacle to the learning media that was tested, after which it was tested again in a large group trial involving 20 students at SDN Cidahu 1. This trial was carried out to find out the response of the product developed. 5) Evaluation. The evaluation stage will be carried out with formative evaluation because this type of evaluation is related to the stage of development research to improve the resulting development product.

At this evaluation stage, an evaluation is carried out based on suggestions obtained from experts, both media experts and material experts, using validation sheets that will be used to improve the products that researchers have developed. This stage is carried out so that researchers produce products that are suitable for use. The design of science learning media using android-based augmented reality (AR) is needed; there is a need for a sketch design to describe the creation of media; the sketch is in the form of a storyboard in the product design adjusted to the independent curriculum starting from CP, TP, ATP. The design of this science learning media development product uses the help of Assembler Studio and Canva applications. Card display card digestion system.

Figure 1 Digestive system card

Main page view

This view is the initial display after scanning the barcode on the digestive system card. This main page has a menu that includes a material menu and an AR menu.

Figure 2 Main Menu Display

The display of the video

page of the material contains material on the human digestive system; there are animations and images of the digestive system. Then, there are back and following buttons to go back or continue to the next page.

Figure 3. Material Video Display

AR page views

On this page, there is a 3D image of the human digestive organs, and there is a brief explanation of the explanation of the human digestive organs.

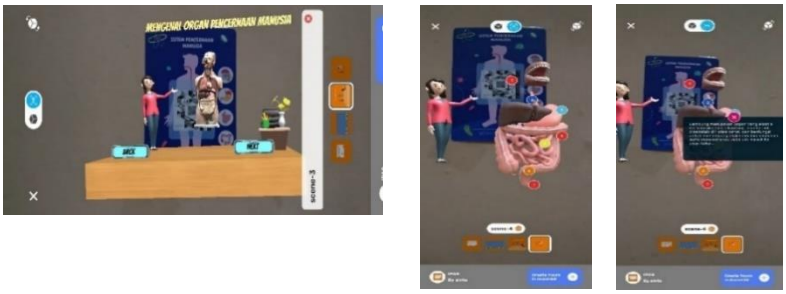

Figure 4. AR page views

The products that have been developed are then validated by media experts and material experts.

Table 1.Media Expert Assessment

Assessment Aspects	Scores
	Media Expert
Design	38
Quality Aspects	27
Effectiveness Aspect	11
Interactive Aspect	19
Total	95
Score percentage	95%
Criteria	Very Worthy

Based on the assessment results by media experts, it can be known that the number of scores from each assessment indicator is 95%, with the number of percentages known that this augmented reality learning media is declared very feasible. This is because of the design, which makes learning more enjoyable.

Table 2. Material Expert Assessment

Assessment Aspects	Score
	Material Expert
Material	43

Assessment Aspects	Score
	Material Expert
Language	35
Presentation Techniques	12
Total	90
Score percentage	90%
Criteria	Very Worthy

Meanwhile, the results of research from material experts obtained a score of 90% based on the assessment by material experts. It can be seen that the material contained in this augmented reality learning media is declared very feasible because the learning media of the "Sicerna" card follows the independent curriculum. Thus, this learning media already includes material that aligns with educational goals and learning outcomes. The material presented only focuses on learning IPAS, especially science, with material on the human digestive system in grade 5 of elementary school. From the description above, an average result of 92.5% was obtained based on media experts and material experts. It can be concluded that the learning media that has been developed is suitable for use and has been revised by expert advice. Augmented reality learning media is used in learning activities after it is considered feasible and improvements are made. The learning media is used by students in learning in the classroom.

Then, based on the assessment results from the students' analysis, the results were 85.2% based on the student respondent test involving 20 respondents, which was declared very feasible after the trial. From the description above, the augmented reality (AR) learning media developed generally is excellent and suitable for use. Still, several things need to be revised, such as the speed at which access is made. The student's response to this learning media was excellent; overall, they received a good response where their opinion that the media developed was interesting, both in terms of the clarity of the animation of the images of the digestive system, typefaces, and the use of language.

CONCLUSION

In this study, the media produced in the form of a card named "Sicerna" has been assessed and is suitable for use in learning, and it has met the criteria of media experts and linguists. Based on the assessment results by media experts, it can be known that the number of scores from each assessment indicator is 95%, with the number of percentages known that this augmented reality learning media is declared very feasible. Meanwhile, the results of research from material experts obtained a score of 90% based on assessments by media experts. The material contained in this augmented reality learning media is declared very feasible. From the description above, an average result of 92.5% was obtained based on media experts and material experts. Then, based on the assessment results from the student analysis after the trial, the results were 85.2% based on the student respondent test involving 20 respondents, which was declared very feasible to use.

However, this learning media has limitations, including the science learning materials, which are limited to the topic of the human digestive system. They only display meters and 3D images of the human digestive system. Therefore, teachers are advised to use this media during classroom learning, thus helping students understand the digestive system's process.

REFERENCES

Carolina, Y. D. (2022). *Augmented Reality* sebagai Media Pembelajaran Interaktif 3D untuk Meningkatkan Motivasi Belajar Siswa *Digital Native*. Ideguru: Jurnal Karya Ilmiah Guru, 8(1), 10-16. https://doi.org/10.51169/ideguru.v8i1.448

Dr. I Made Alit Mariana, M. W. (2009). Hakikat Ipa Dan Pendidikan Ipa. Bandung: Pusat Pengembangan Dan Pemberdayaan Pendidik Dan Tenaga Kependidikan Ilmu Pengetahuan Alam (Pppptk Ipa).\

Irawan, L., & Yatri, I. (2022). Pengembangan Media Pembelajaran *Augmented Reality* pada Materi Struktur Tumbuhan Sekolah Dasar. *Jurnal IDEAS*, 8(3), 971-978

Istiqlal, A. (2018). Manfaat Media Pembelajaran Dalam Proses Belajar Dan Mengajar Mahasiswa Di Perguruan Tinggi. *Jurnal Kepemimpinan Dan Pengurusan Sekolah*, 3(2); 139-144.

Karo-Karo, I. R., & Rohani. (2018). Manfaat Media Dalam Pembelajaran. *Axiom,* 7(1); 91-96

Komara, E. (2018). Penguatan Pendidikan Karakter dan Pembelajaran Abad 21. *South-East Asian Journal For Youth, Sports & Health Education*, 4(1); 17-26

Maulana, F. I., Rahayu, A., Zamahsari, G. K., Adi, P. D. P., Arifuddin, R., & Dirgantara, W. (2024, July). Augmented Reality in Higher Education: Literature Review. In *2024 International Seminar on Intelligent Technology and Its Applications (ISITIA)* (pp. 752-757). IEEE.

Saputra, D. S., Susilo, S. V., Abidin, Y., Mulyana, T. (2022). Augmented Reality In Science Learning For Elementary School Students. http://dx.doi.org/10.4108/eai.25-11-2021.2318819

Sugiyono. (2015). Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualittatif, dan R&D). Alfabeta

Sugiyono. (2016). Metode Penelitian Kuantitatif, Kualitatif dan R&D. Bandung: PT Alfabet.

Wibowo, V. R., Putri, K. E., & Mukmin, B. A. (2022). Pengembangan Media Pembelajaran Berbasis Augmented Reality pada Materi Penggolongan Hewan Kelas V Sekolah Dasar. *Jurnal Tindakan Kelas,* 3(1); 58-69