Humanika: Kajian Ilmiah Mata Kuliah Umum, ISSN: 1412-1271 (p);2579-4248 (e).
Vol. 26. No. 1. (2026). pp. 83-98 doi: 10.21831/hum.v26i1.89659

Development of interactive learning media based on *augmented reality* in the material of Indonesian regional map grade 5 MIN 19 Jakarta

Salsabila Rantika's Nakwah
Universitas Muhammadiyah Jakarta, Indonesia

Lativa Qurrotaini
Universitas Muhammadiyah Jakarta, Indonesia

Corresponding Author: nakwahsalsabilarantika@gmail.com

Abstract
The existing problem is how to develop interactive learning media based on Augmented Reality in the material of the Indonesian Regional Map so that it is valid. In this application there are Info features, AR Objects, Teaching Modules, Materials, Quizzes, and Profile Developer. The method used is Research and Development (RnD) with the ADDIE Development Model (Analyze, Design, Development, Implementation, and Evaluation). This research was conducted at MIN 19 JAKARTA with research subjects of class 5C students. The results of the study showed that the developed learning media was very valid based on the assessment of material experts with a percentage of 95%, the assessment of media experts with a percentage of 94.5%, and the assessment of language experts with a percentage of 95%. Small Group Test 1 with a percentage of 89%, Small Group Test 2 with a percentage of 95%, and Large Group Test with a percentage of 90.95% all showed very valid results. The effectiveness of the media was measured using N-Gain. The Small Group Test 1 score was 76.85%, with a Valid score. The Small Group Trial 2 score was 81%, and the Large Group Trial score was 80.45%. Teacher responses were 78%, with a Valid score, and Student responses were 87%, with a Valid score. The Learning Success Test also showed valid results with a score of 85.47%.

Keywords: ADDIE Learning Media, Augmented Reality, Indonesian Regional Map

Abstrak
Permasalahan yang ada bagaimana mengembangkan media pembelajaran interaktif berbasis *Augmented Reality* dalam materi Peta Wilayah Indonesia agar valid. Dalam aplikasi terdapat fitur Info, Objek AR, Modul Ajar, Materi, dan Quiz. Metode yang digunakan Adalah *Research and Development* (RnD) dengan Model Pengembangan ADDIE (Analyze, Design, Development, Implementation, and Evaluation). Penelitian dilaksanakan di MIN 19 JAKARTA dengan subjek penelitian siswa kelas 5C. Hasil penelitian menunjukkan media pembelajaran penilaian dari ahli materi (95%), ahli media (94,5%), dan ahli bahasa dengan (95%). Adapun Uji Perorangan, Uji

Kelompok Kecil, dan Uji Kelompok besar dapat di nilai yaitu Uji Coba Kelompok Kecil 1 (89%), Uji Coba Kelompok Kecil 2 (95%), dan Uji Coba Kelompok Besar (90,95%). Tingkat efektivitas media diukur menggunakan N-Gain Uji Coba Kelompok Kecil 1 (76,85%), Uji Coba Kelompok Kecil 2 (81%), Uji Coba Kelompok Besar (80,45%). Respon Guru termasuk (78%), dan Respon Siswa (87%). Uji Keberhasilan pembelajaran (85,47%).

Kata Kunci: Media Pembelajaran ADDIE, *Augmented Reality*, Peta Wilayah Indonesia

Introduction

In Education, the Minister of Education and Culture Regulation No. 12 of 2024 concerning the implementation of the Independent Curriculum for early childhood, primary, and secondary education (Permendikbudristek, 2024) is discussed. Regarding the Minister of Education and Culture Regulation No. 12 of 2024 concerning the implementation of the independent curriculum, the curriculum is not only focused on textbooks or maps. Education plays a crucial role in shaping the character and knowledge of the younger generation. The implementation of interactive learning media, especially*Augmented Reality* It goes beyond mere entertainment and is recognized for its fundamental potential, particularly regarding the topic of the Indonesian Regional Map. However, such content is often delivered through visual media, including maps and globes. This learning approach may not be effective for fifth-grade students.

With the advancement of technology, AR-based interactive learning media offers innovative and engaging solutions throughout the educational process. Science learning media, presented through applications, supports teachers in efficiently delivering subject matter while helping students understand the material being taught. In the context of technology, learning is part of human excellence. Augmented Reality has become a highly efficient learning tool, particularly in the education and training sectors. By utilizing Augmented Reality, individuals have the opportunity to interactively acquire knowledge regarding Indonesia's geographical position and conditions, its astronomical position and conditions, and the impact of geographical position on endemic flora and fauna in Indonesia. AR technology connects the real world with virtual components, producing an integrated experience that enhances the way humans interpret their environment. AR is a contemporary manifestation of human efforts to "bring" knowledge directly into the real world.

Development is the process of converting design specifications into a physical form related to a structured learning framework, including gradual improvements and process evaluation by building an empirical basis for the creation of learning and non-learning experiences (Abdul Karim, Dini Savitri, and Hasbullah, 2020). Meanwhile, the design of the learning process is implemented in a logical and systematic manner to illustrate all elements that will be realized in the implementation of educational activities. Media functions as an educational resource, so the concept of learning media can be interpreted broadly to include people, objects, or events that support the process of acquiring knowledge and skills by students (Adi Wijayanto et. al., 2021). Meanwhile, media acts as a channel, tool, and connector in the communication process of teaching and learning (Fadilah et. al., 2021). Learning is an effort carried out deliberately with the aim of acquiring the knowledge, abilities, skills, and attitudes necessary to carry out certain tasks,

thereby supporting an effective learning process for students (Adi Wijayanto et. al., 2020: 20).

According to the KBBI (Big Indonesian Dictionary), interactive learning media are computer-related tools or facilities that are interactive and enable reciprocal action between users. Meanwhile, an effective computer-based communication system can produce, store, display, and re-access various information in the form of text, images, sound, video, or animation (Priyambodo, 2012:100). Interactive learning media includes various software and hardware that can be used as a link to convey material from a source.

Learning is a learning process that can provide feedback to users based on the input provided by the media (Arrosyida and Suprapto, 2021:3). Meanwhile, this media delivery system delivers computer material, so that students not only hear and see videos or sounds but are also actively involved, and this feedback will influence the speed and sequence of material delivery (Amatullah, D. C; Sutrisno, 2022).

Augmented Reality (AR) AR is a technology system that allows people to see the real world along with integrated virtual objects. This integration is realized as a real environment enhanced by the incorporation of virtual objects using appropriate display technology, while interactivity can be achieved through specified input devices. AR empowers people to observe the real environment with additional objects inserted or combined within the existing setting (Hapsari, T.O.R.N., & Wulandari, A., 2020).*Augmented Reality (AR)* attempts to integrate the 2D or 3D digital world into the real environment and display these virtual objects in real-time (Sudyatmika et. al., 2014). Meanwhile, technology offers real-time integration of digital content with access to real-world information. The methods currently being developed in AR consist of two types, namely Marker-Based Tracking and Markerless Augmented Reality (Arifin and Fahrizal, 2021). Marker-Based Tracking in AR technology planning where the system requires a marker in the form of an image to be analyzed in building 3D objects (Agil and Sitio, 2022). Meanwhile, Markerless Augmented Reality is an AR method that does not require markers to project digital elements with tools provided by Qualcomm (Miyanti et. al., 2023).

The use of educational media in the context of the Indonesian Regional Map material, particularly at MIN 19 JAKARTA, has shown very high potential to provide benefits, especially in increasing knowledge and creativity among students. Interactive teaching media includes various types such as educational applications and digital learning aids. The successful implementation of interactive learning media requires educational institutions to have a fast and stable internet connection and appropriate communication devices such as computers or tablets for teachers and students. However, not all educational institutions have the necessary technological infrastructure, especially those located in remote areas. In addition, the maintenance of devices and network systems is a crucial aspect that must be considered to ensure the smooth operation of interactive learning media.

Utilizing interactive learning media requires teachers to have sufficient technological knowledge and skills. Teachers organize interactive content and support interaction and collaboration among students. Schools need to provide appropriate training to teachers to enable them to effectively use interactive learning media to overcome challenges. This training can include the application of technology to develop interactive content and teaching methods aligned with interactive learning media.

Interviews with the homeroom teacher of class 5C revealed that the learning process was

suboptimal because the teacher only used textbooks, which had been adapted by the school. This led to students showing a decline in interest in science lessons. Consequently, the use of AR-based interactive learning modules and media could substantially improve educational effectiveness.

Methods

This study uses the Research and Development (RnD) research method with the ADDIE development model with the steps of Analysis, Design, Development, Implementation, and Evaluation (Sugiyono et. al., 2019). Based on the opinions of these experts, the Research and Development (RnD) research method is a process that aims to improve the quality of existing products so that they can be used by students. This development process is carried out in several stages, namely identifying problems, designing products, improving products and implementing products by students. The ADDIE Model media development process is based on Figure 1. Stages of the ADDIE Model after going through a revision process first. If the initial stage is considered appropriate and nothing needs to be improved, then it can proceed to the next stage, and so on until the evaluation stage.

Figure 1. ADDIE Model Stages

Analysis Stages is the initial stage to find problem analysis in the learning process with weaknesses, namely teachers delivering the material of the Indonesian Regional Map using less effective lecture methods, limited learning resources such as textbooks and visual media such as wall maps and globes for teaching aids in the Indonesian Regional Map material. Needs analysis to understand how far students' success in developing AR-based interactive learning media in the Indonesian Regional Map material requires Teaching Modules, Lesson Plans, and Learning Applications. Curriculum Analysis to find out the curriculum implemented in schools used as research objects. Analysis of student characteristics to collect information about student characteristics during science learning regarding the Indonesian Regional Map material, this process is carried out by observing and interviewing.

Planning Stages aims to design according to Core Competencies, Learning Outcomes, Learning Objectives, and Pancasila Student Profiles to design the contents of books and applications to be created. Researchers design AR-based interactive learning media equipped with teaching modules and lesson plans on the curriculum and relevant learning tools for science subjects including 3D-based Indonesian Regional Map material. Researchers design a marker that will be used to display 3D images in the application. Researchers design the appearance of applications and objects from AR west monsoon winds, AR east monsoon winds,

AR endemic flora and fauna in each region so that they can be used in applications using Assembler Studio, Sketchfab, Google Fonts, Powerpoint, iSpring Suite 10, and Website 2APK Builder Pro.

Development Stages The aim of this research is to create a teaching module where the researcher compiles a comprehensive teaching module based on a previously planned design. In the AR application creation stage, the researcher is in the process of creating the AR-MAPINDO application and including all the designs of the Indonesian Regional Map discussing the AR west monsoon winds, AR east monsoon winds, AR endemic flora and fauna, and the Indonesian Regional Map material. The product printing used is using the AR-MAPINDO application.

MAPINDO, CD, AR-MAPINDO user guidebook. Validation test was carried out by three experts, namely material expert, media expert, and language expert.

Implementation Stages This was done by testing a product that had been created to mimic the situation that would normally occur in schools during learning activities. AR-based interactive learning media was tested on small groups, and an initial assessment was conducted to identify any shortcomings. The AR-based interactive learning media will then be improved for application to students in study groups.

Evaluation Stages The products created will be tested under relevant conditions at school during teaching and learning activities. AR-based interactive learning media will be tested in small groups, with an initial assessment to identify weaknesses in the media, which will then be improved so that it can be used by students in learning groups.

The research subjects were 20 students divided into small group trial 1, namely 10 students, small group trial 2, namely 15 students, and large group trial 20 students with the participant selection method using simple random sampling. Validation of material experts, validation of media experts, and validation of language experts to determine the validity, effectiveness of the product and feasibility of the product. Data collection techniques are observation, interviews, questionnaires, documentation, and pretest posttest. Observations and interviews were conducted by the homeroom teacher of 5C. The questionnaire was conducted by validation of material experts, validation of media experts, validation of language experts to determine the feasibility and effectiveness of the product of an AR-based interactive learning media. The questionnaire sheet in the expert test used a 5-point Likert scale with categories Very Valid to Invalid. Student pretest posttest was calculated using Individual Test, Small Group Test, Large Group Test. Product effectiveness was carried out using Pretest 1, Posttest 1, Pretest 2, Posttest 2 calculated using N Gain and Success Test. Validity calculations can be calculated using the Aiken's V Validation formula which uses the Gregory method. The data obtained were analyzed using descriptive and categorical methods to assess the feasibility of the media developed through questionnaires administered to material expert validation, media expert validation, and language expert validation. The questionnaire assessment results were summed and then averaged. The scores obtained can be categorized as shown in Table 1. The Expert Validation Index is as follows:

Table 1. Expert Validation Index

Interval	Category
81-100%	Very good
61-80%	Good

41-60%	Enough
21-40%	Low
1-20%	Very Low

Source: Gregory Method, Candiasa, 2010

Finding and discussion

Level of analysis The research conducted was to analyze the problems encountered by the research subjects by interviewing the homeroom teacher of class 5C. From the results of the homeroom teacher interview, it appears that the learning process is not optimal because the teacher only uses teaching modules that have been adapted by the school in the form of textbooks, so that students show a decreased interest in participating in science learning. As a result, the use of teaching modules and interactive learning media based on AR can substantially increase the effectiveness of education.

Planning stage This is done by compiling the first Augmented Reality-Based Interactive Learning Media by searching for learning materials. The learning materials in the Grade 5 Science book Chapter 6 with the material theme of the Indonesian Regional Map. Preparing source books and other references such as blogs or Wikipedia. Next, designing the content of AR-based interactive learning media which consists of the initial media display, main menu display, info menu display, AR object menu display, teaching module display, material menu display, quiz menu display, and developer profile menu display.

Figure 1. Initial Media View
Source: Researcher, 2025.

Figure 2. Media Menu Display
Source: Researcher, 2025.

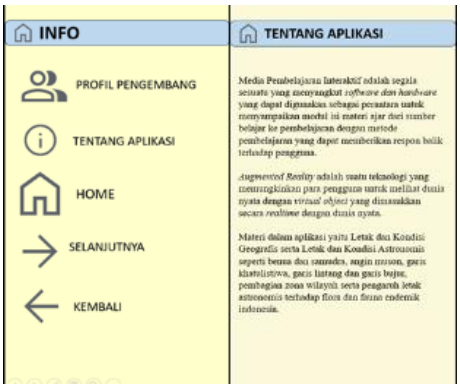

Figure 3. Info Menu Display
Source: Researcher, 2025

Figure 4. AR Object Menu View

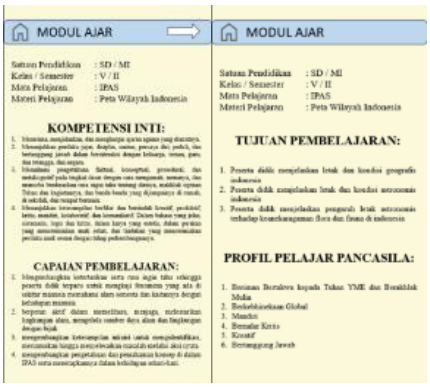

Figure 5. Teaching Module Menu Display
Source: Researcher, 2025.

Figure 6. Material Menu Display
Source: Researcher, 2025

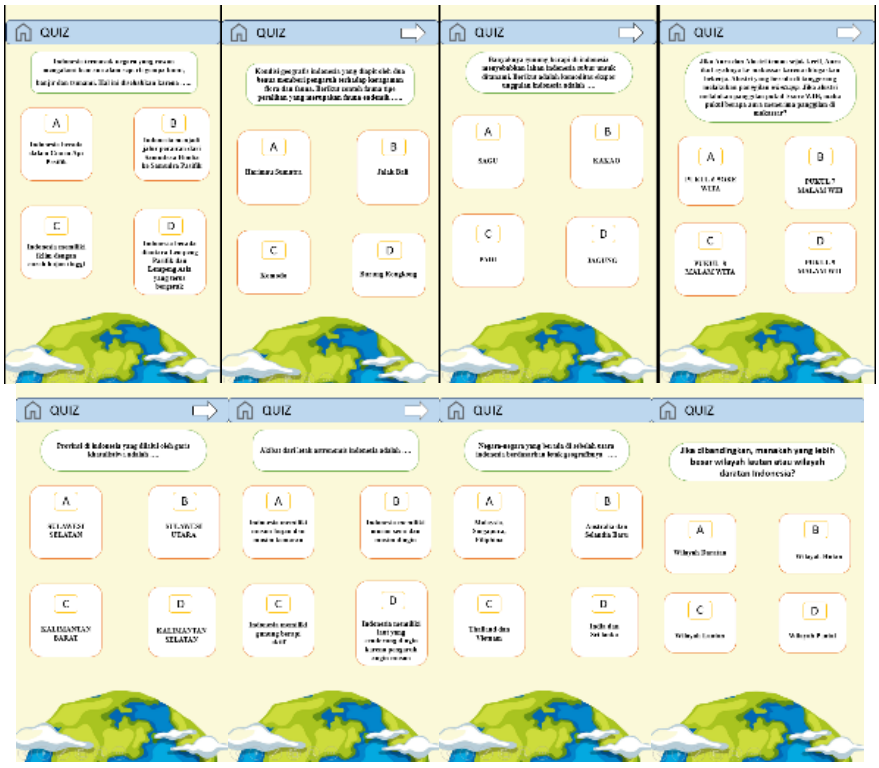

Figure 7. Menu Quiz

Figure 8. Developer Profile Menu Display
Source: Researcher, 2025.

Development Stag, After the learning media has been developed and is ready to be implemented in learning, the media is first checked and validated by material and media experts. The results of the testing by media and material experts are shown in Figure 9. The Expert Validation Index is as follows.

Figure 9. Expert Validation Index

No.	Ahli/Pakar	Skor Ideal	Skor Aktual	AP%	Kategori
1	Ahli Materi Pembelajaran	100	87	87%	Valid
2	Ahli Media Pembelajaran	100	100	100%	Sangat Valid
3	Ahli Bahasa Pembelajaran	100	96	96%	Sangat Valid

Based on Figure 9. Expert Validation Index, it can be seen that the feasibility of the developed learning media is included in the valid to very valid category, so it can be said that it is an interactive learning media based on...*Augmented Reality* suitable for use as a learning medium in grade 5 of elementary school.

Planning Stage, The pretest and posttest were conducted by providing interactive learning media to students, then students were asked to fill out a learning interest questionnaire that had been provided, the questionnaire containing 20 statements. The results of the analysis of student responses are shown in Table 2. The following N-GAIN score criteria.

Table 2. N-GAIN Score Criteria

Mark	Category
g > 0,7	High
0,2 < g ≤ 0,7	Currently
g < 0,2	Low

Source: Researcher, 2025.

Table 3. Results of the validation assessment by experts

NO	ASPECT	TOTAL SCORE			FLAT FLAT SCORE	VALIDITY CATEGORY
		1	2	3		
1	Suitability of Material to Objectives Learning	35	60	65	80	VERY VALID
2	Accuracy of Regional Map Material Indonesia	0	60	85	72,5	VALID
3	Updates on Regional Map Material Indonesia	20	60	100	90	VERY VALID

4	Push Curiosity	20	60	70	75	VALID
5	Presentation Techniques	20	40	100	80	VERY VALID
6	Presentation Support	55	60	90	100	VERY VALID
7	Presentation Learning	40	55	65	97,5	VERY VALID

Source: Researcher, 2025.

Table 3. Results of the Material Expert Validation Assessment discusses the validation conducted by material experts to assess the effectiveness of the developed learning materials. It was concluded that the developed learning materials met the eligibility criteria in terms of suitability for objectives, accuracy, currency, presentation techniques, presentation support, and learning presentation. However, the map accuracy and the material's ability to stimulate curiosity need improvement to ensure all components reach a highly valid level.

Table 4. Results of media expert validation assessment

NO	ASPECT	TOTAL SCORE			AVERAGE SCORE	VALIDITY CATEGORY
		1	2	3		
1	Appearance Application	55	60	100	87,5	VALID
2	Application Cover Design	29	60	100	94	VERY VALID
3	Application material or content	11	85	100	98	VERY VALID
4	Reliable (reliable)	5	90	100	97,5	VERY VALID
5	Usability (easy used)	20	40	100	80	VALID
6	Compatibility	3	40	100	71,5	VALID

7	Guide Usage	6	80	100	93	VERY VALID

Source: Researcher, 2025.

Table 4. Results of the Media Expert Validation Assessment discusses media expert validation, an evaluation process conducted by media experts to assess the suitability of the application as a learning tool. It was concluded that the developed learning media application is suitable for use in the learning process, both in terms of design, content, and functionality. However, improvements are needed in the application's compatibility and appearance so that this media can be used more optimally across various devices and is more visually appealing.

Table 5. Results of the language expert validation assessment

NO	ASPECT	AMOUNT SCORE		AVERAGE SCORE	CRITERIA VALIDITY
		1	2		
1	Lugas	70	90	80	VALID
2	Communicative	80	100	90	VERY VALID
3	Dialogic and interactive	80	100	90	VERY VALID
4	Suitability with student development	80	100	90	VERY VALID
5	Conformity with language rules	80	10	90	VERY VALID

Table 5. Results of the Language Expert Validation Assessment discusses validation by language experts. Validation by language experts was conducted to assess the extent to which the language aspects of the learning media were appropriate. It can be concluded that this learning media has met the eligibility criteria in terms of language, including clarity, effectiveness, interactivity, and its suitability for student development and Indonesian language rules. Slight improvements in clarity are needed to improve the language quality to the "Very Valid" category overall.

Development Stage, After the learning media has been developed and is ready to be implemented in learning, the media is first checked and validated by material and media experts.

The results of the testing by media and material experts are shown in Figure 9. The Expert Validation Index is as follows.

Figure 9. Expert Validation Index

No.	Ahli/Pakar	Skor Ideal	Skor Aktual	AP%	Kategori
1	Ahli Materi Pembelajaran	100	87	87%	Valid
2	Ahli Media Pembelajaran	100	100	100%	Sangat Valid
3	Ahli Bahasa Pembelajaran	100	96	96%	Sangat Valid

Source : Researcher, 2025

Based on Figure 9. Expert Validation Index, it can be seen that the feasibility of the developed learning media is included in the valid to very valid category, so it can be said that it is an interactive learning media based on...*Augmented Reality* suitable for use as a learning medium in grade 5 of elementary school.

Based on the pretest and posttest test table, it is divided into pretest 1, posttest 1, pretest 2, and posttest 2, where each pretest and posttest contains a small group test 1, a small group test 2, and a large group test. In the N-Gain results of the small group test 1 pretest 1, where the percentage assessment is 19.10% with a low category, in the N-Gain results of the small group test 2 pretest 2, where the percentage assessment is 76.85% with a medium category, while in the N-Gain results of the large group test posttest 1, the percentage is 33.34% with a low category and the N-Gain results of the large group test posttest 2, the percentage is 80.45% with a high category.

Evaluation Stage, Based on the results of the expert test and the validity of the media, it can be said to be suitable and valid for use, although the results of the expert test still found that the material needed to be improved, namely the material in the media because the material was too much and the images presented were small and unclear, so this media needed to be revised slightly before being tested in elementary schools

Conclusion

Based on the results found, it is concluded that interactive learning media based on Augmented Reality on the learning interest of fifth grade elementary school students is declared valid and suitable for use. This is due to several factors, namely as follows. First, the interactive learning media application based on Augmented Reality named AR-MAPINDO has been developed through the Research and Development (RnD) method.

The five-step ADDIE development model demonstrated positive results, indicating that the AR-MAPINDO application was the right product for evaluating the Indonesian Regional Map material. Second, in the design phase, researchers created a product design using PowerPoint, Sketchfab, and Assembler Studio.

Third, in the development stage, researchers printed the designs that had been made using DVDs, Guidebooks, and AR-MAPINDO Applications that had been tested by three expert validations, namely material expert validation, media expert validation, and language expert validation. Fourth, the AR-MAPINDO application was tested on a product involving 20 students from class 5C MIN 19 JAKARTA, during the evaluation and learning process, students showed high enthusiasm. Fifth, researchers were able to identify weaknesses in the AR-MAPINDO

application and make necessary improvements.

Sixth, the calculation using a 5-point Likert scale from the results of expert validation trials shows that the assessment of material experts is 95% with a valid category, the assessment of media experts is 94.5% with a very valid category, the assessment of language experts is 90% with a very valid category. Seventh, Individual Test, Small Group Test and Large Group Trial can be concluded that small group trial 1 is valid with a percentage of 89%, small group trial 2 is very valid with a percentage of 95%, large group trial is very valid with a percentage of 90.95%.

Eighth, the effectiveness of media in the AR-MAPINDO application according to the N Gain calculation shows a large increase that the level of the High category with group 1 trials percentage of 76.85%, group 2 trials percentage of 81%, large group trials 80.45%. Ninth, the AR-MAPINDO application, it can be concluded that the Teacher Response Test is in the Quite Valid category with a percentage of 71% and the student trial is in the valid category with a percentage of 87% and the Success Test is in the valid category with a percentage of 85.47%.

This interactive Augmented Reality-based learning media is suitable for use in assisting fifth-grade teachers in delivering material and fostering student interest and engagement in learning activities. Suggestions for future researchers developing AR-based interactive learning media include developing similar media. on different materials and different grade levels, as well as adding other interactive features such as educational games or discussion forums to make learning more active and collaborative.

References

Abdul Karim, Dini Savitri, and Hasbullah. 2020. "Development of Android-Based Mathematics Learning Media in Grade 4 of Elementary School."*Lebesgue Journal: Scientific Journal of Mathematics Education, Mathematics and Statistics*1(2): 63–75. doi:10.46306/lb.v1i2.17.

Afifah, Nur, Otang Kurniaman, and Eddy Noviana. 2022. "Development of Interactive Learning Media in Indonesian Language Learning for Grade III Elementary Schools."*Journal of Educational Activities*1(1): 33–42. doi:10.33578/kpd.v1i1.24.

Agil, Muhammad, and Sartika Lina Mulani Sitio. 2022. "Implementation of the Markerless Augmented Reality Method for Android-Based Fruit Name Education."*Journal of Informatics Dynamics*14(2): 105–15. doi:10.35315/informatika.v14i2.919.

Agustini, Putu Dewi, Ketut Agustini, and Ida Bagus Nyoman Pascima. 2023. "Development of Interactive Learning Media Based on Discovery Learning in English Subjects with Descriptive Material at SMP Negeri 4 Singaraja."*Collection of Articles by Informatics Engineering Education Students (KARMAPATI)*12(1): 95–106.

Ahmad Izzan, and Neni Nuraeni. 2023. "Learning Media Perspective of the Qur'an Surah Al Baqarah Verse 31."*Masagi Journal*(c): 1–7. doi:10.37968/masagi.v2i1.378.

Amatullah, D. C; Sutrisno, J. 2022. "Development of Interactive Learning Media on Flat-Sided Space Material for Class VIII of Al-Azhar 3 Junior High School, Bandar Lampung, 2021/2022 Academic Year."*Lentera: Scientific Journal of Education*15(Vol. 15, No. 1, (2022)): 243–50.

Arifin, Muhammad, and Mico Fahrizal. 2021. "Introducing Fauna Types as a Learning Medium Using the AR (Augmented Reality) Method."*Data Portal Journal*6(1): 1–22.

Asmayanti, Astri, Isah Cahyani, and Nuny Sulistiany Idris. 2020. "ADDIE Model for Developing Teaching Materials for Writing Experience-Based Explanatory Texts."*XIV International Language Exam Seminar*: 259–67.

Asry, Asyraful Insan. 2019. "Application of Augmented Reality with Marker-Based Tracking Method on Virtual House Models."*Subject: Journal of Informatics*1(2): 52–58. doi:10.26618/ainet.v1i2.2294.

Bahiyah, Nurul, Petrus Sokibi, and Imam Muttaqin. 2020. "Product Recognition Application Using Augmented Reality with the Marker Method."*Journal of Intelligent Systems*3(3): 184–91. doi:10.37396/jsc.v3i3.89.

Aisyah Fadilah, Kiki Rizki Nurzakiyah, Nasywa Atha Kanya, Sulis Putri Hidayat, & Usep Setiawan. (2023). Understanding Media, Purpose, Function, Benefits and Urgency of Learning Media.*Journal of Student Research*, *1*(2), 01–17. https://doi.org/10.55606/jsr.v1i2.938

Hakim, Rifal Lukmanul. 2021. "AUGMENTED REALITY MEDIA APPLICATION IN ENHANCING SUNDA CULTURE Thesis Submitted to Fulfill One of the Requirements for the Degree of Master of Education in Sundanese Language and Culture by Rifal Lukmanul Hakim.". https://repository.upi.edu/60469/.

Miyanti, Violi, Asep Muhidin, and Dodit Ardiatma. 2023. "Implementation of the Markerless Augmented Reality Method as an Android-Based Home Furnishing Promotion Media."*MALCOM: Indonesian Journal of Machine Learning and Computer Science* 4(1): 71–77. doi:10.57152/malcom.v4i1.1019.

Nordin, F. N., Muhammad Isa, A. A. ., Zakaria, M. Z. ., Yahya, H. ., & Mohammad Nazmi, M. Z. . (2022). AR-Learn Model: A Model for Developing Augmented Reality (AR)-Based Learning Applications.*The Sultan Alauddin Sulaiman Shah Journal (JSASS)*, *9*(1), 31- 43. Retrieved from https://jsass.uis.edu.my/index.php/jsass/article/view/186

Satriansyah. (2016). The Use of Interactive Media in Learning the Concept of Work and Energy at Mtss Ulumul Quran Banda Aceh. Journal of Education. 1(1), 18-84.https://repository.ar-raniry.ac.id/.

. Rahmi, M. S. M., Budiman, M. A., & Widyaningrum, A. (2019). Development of Macromedia Flash 8 Interactive Learning Media in Thematic Learning of My Experience Theme.*International Journal of Elementary Education*, *3*(2), 178–185. https://doi.org/10.23887/ijee.v3i2.18524.

A. Arsari, Q.J. Adrian. (2020). Implementation of Augmented Reality in the Book "THE ART OF ANIMATION: 12 PRINCIPLES". 1(1), 109-119. Journal of Informatics and Software Engineering (JATIKA).http://dx.doi.org/10.33365/jatika.v1i1.230.

Hapsari, T. P. R. N., & Wulandari, A. (2020). Analysis of the Feasibility of Millennial Textbooks

Based on Augmented Reality (AR) as a Learning Media for Procedural Texts in Magelang.*Diglossia: Journal of Language, Literature, and Teaching Studies*, *3*(4), 351-364. https://doi.org/10.30872/diglosia.v3i4.125.

Candra W. L., Putri Rachmadyanti. (2023). DEVELOPMENT OF AUGMENTED REALITY BASED COLONIAL MAP LEARNING MEDIA ON THE COUNTRY MATERIAL OF ASAN GRADE VI ELEMENTARY SCHOOL. Journal of Elementary School Teacher Education Research. 11 (11). https://ejournal.unesa.ac.id/index.php/jurnal-penelitian pgsd/article/view/58966.

Kafilahudin, F. A., & Akbar, M. (2024). Development of Interactive Learning Media for Animal Respiratory Systems Based on 3D Augmented Reality.*Sudo Journal of Informatics Engineering*, *3*(1), 31–40. https://doi.org/10.56211/sudo.v3i1.469.

Goldy V.N, Reynaldi S. (2024). Development of Augmented Reality-Based Learning Media for Map Introduction for Elementary School Students in Central Maluku Regency. Scientific Journal of Informatics Research and Learning, 9 (1). https://jurnal.stkippgritulungagung.ac.id/index.php/jipi/article/view/5029.

Qurrotaini, L., & Putri, D. A. (2024). DEVELOPMENT OF MAPENA LEARNING MEDIA, CHILDREN'S MAP TOY IN ELEMENTARY SCHOOL SOCIAL STUDIES LEARNING.*Holistic Journal*, *7*(2), 131–137. https://doi.org/10.24853/holistika.7.2.131-137.