

Development of Augmented Reality (AR) Media Based on Science Literacy for Grade IV Students at SDN Gunung Maddah 2

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Abstract — The use of Augmented Reality (AR) presents new opportunities to increase students' scientific literacy in the 21st century education era. One of them is Augmented Reality and Virtual Reality technology which is now starting to be widely used as a learning medium. Through platforms like Assemblr EDU, teachers can deliver interactive, visual, and immersive learning. This AR integration helps increase scientific literacy while emphasizing the importance of technology in forming a competent generation. This research aims to develop Augmented Reality (AR) Media Based on Scientific Literacy that is valid, practical, and effective as well as increasing the scientific literacy of class IV students at SDN Gunung Maddah 2. The type of research used in this research is research and development (Research and Development) with the ADDIE development model, namely analysis, design, development, implementation and evaluation. Data analysis techniques use qualitative and quantitative analysis. Research methods are interviews and questionnaires. The results of the research show that: 1) Augmented Reality media based on scientific literacy is categorized as very suitable for use as learning media, 2) Augmented Reality media based on scientific literacy is categorized as very practical because it is easy for students to use, interesting and helps understand the material, 3) Augmented Reality media based on scientific literacy is categorized as very effective and has a significant impact in increasing students' scientific literacy.

Keywords— *Augmented Reality Media, Science Literacy, assembler edu.*

INTRODUCTION

In the 21st century, almost all equipment used in life has been digital or technology-based. In line with this, the industrial world has entered the 4th industrial change or what is often called the industrial revolution 4.0. The term was first coined in Germany in 2011 called the Industrial Revolution marked by the digital revolution (Satya, 2018) . Technology-based learning in the 21st century is important to support students in learning, innovating, and utilizing technology and information media.

Education is a key factor in the development of a nation. One important aspect in the education process is the development of students' critical thinking skills. Education is one of the many forms of manifestation of human culture that is moving forward and the conditions of development that must continue to be updated following the times (Trisnawati, 2020) .

Learning technology continues to develop along with the times. According to Anisa, (2021) Digital technology is now a means of supporting education, enabling access to information and supporting the learning process and academic assignments. The application of technology in learning activities is delivered through all electronic media such as: audio/video, interactive TV, compact discs (CDs), and the internet (Jamun, 2018) .

Facts on the ground prove that at SDN Gunung Maddah 2, the use of media in learning still faces obstacles, especially in the application of technology. Many elementary school teachers are less skilled in using smartphones, so that learning, such as in the material "Plant Body Parts" in grade IV, still relies on lecture methods with limited media. As a result, the delivery of the material is less interesting, student understanding is not optimal, and they have difficulty imagining the concepts being taught.

Media development in learning is very necessary, with the aim that students are interested in participating in learning in class and easily understand the lesson material (Lestari, 2016) . According to Yaumi, (2017) added that learning media is a communication tool as a message carrier from the giver to the recipient of the message can be used to convey learning objectives. From the existing problems, researchers created Augmented Reality (AR) Media based on scientific literacy, because the media is very influential for students in the learning process activities and hopes to help students understand the contents of the material and learn about Science and Technology so that students can keep up with the times. In today's era, one of the learning media that needs to be provided is electronic-based media.

One of the technologies used in media is Augmented Reality which combines the virtual and real worlds by projecting 3D objects in real-time through a camera (Wahid, 2017) . In line with Ramadani, (2020) that augmented reality is a way that can be done to visualize images in 3D using technology.

Augmented Reality and Virtual Reality technology are currently widely used as learning media. According to Hakim, (2018) Augmented Reality is a technology that integrates the real and digital worlds in 2D or 3D in real-time in one environment. Augmented Reality is a technology that integrates the virtual and real worlds by projecting virtual 3D objects in real-time through a camera (Wahid, 2017) .

Augmented Reality is a technology used in learning to improve the effectiveness of the teaching and learning process. AR combines 2D and 3D virtual objects with the real environment, projecting the objects in real-time (Isnaeni, 2023) . The advantages of augmented reality according to Young, (2015) are as follows: 1) Interaction feels real because virtual objects are displayed directly on the screen and can interact with users. 2) Implementation is cheaper because it does not require special devices.

Augmented reality aims to take the real world as a basis by combining several virtual technologies and adding contextual data so that human understanding as its users becomes clearer (Riadi, 2017) . Augmented Reality enriches perception by integrating the virtual world in education, enabling real interaction in digital format. This technology presents innovative learning by combining digital materials and media tools, and can be accessed via mobile devices and PCs after the application is downloaded. (Pratama, 2018) .

Assemblr Edu is a platform for creating interactive learning media with interesting features, providing objects in 2D and 3D formats. This Augmented Reality (AR)-based application has a significant impact on student knowledge and activities (Wibowo et al., 2022) . The Assemblr application utilizes Augmented Reality (AR) to make learning more interesting via mobile phones. With 3D objects and text, such as vehicles, animals, and plants, this application creates an interactive and visual learning experience that increases student interest (Hakim, 2018) .

The benefits of augmented reality media assisted by the Assemblr Edu application are that it provides space for students to imagine. Assemblr Edu makes it easy for users to create interesting media with practical access via mobile phones and stable internet. In addition to critical thinking, students are also targeted to master scientific literacy to face future challenges (Dayelma, 2019) .

Science literacy is the understanding and application of scientific concepts for decision-making and roles in state, culture, and economy. This literacy includes the understanding and application of science in everyday life (OECD, 2019) . Science literacy is the process of preparing students to achieve the ability to understand and process scientific information. The goal is to train students' abilities in analyzing, connecting information, and solving problems (Prahastiwi, 2019) .

The scientific literacy indicators formulated by PISA (Bybee, 2015) include four main aspects: (a) recognizing situations related to science and technology, (b) understanding the natural world and technology based on scientific knowledge, (c) demonstrating competence through identifying questions, explaining phenomena, and using evidence in arguments and decisions, and (d) having a positive attitude towards science, supporting scientific investigations, and being responsible for the environment.

According to previous research conducted by Arrum, (2021) which produced interactive Augmented Reality learning media. The results of his research stated that the use of interactive learning media based on Augmented Reality through the Assemblr application helps develop learning interest and gives a more interesting learning impression for students.

Previous research conducted by Ashari et al., (2022) which produced Augmented Reality-based learning media. The results of the study showed that Augmented Reality media knows the validity, practicality and effectiveness of Augmented Reality-based media included in the very practical and effective category.

Previous research conducted by Sutrisno, (2024) which produced Augmented Reality-based learning media can improve students' scientific literacy. The results of the study showed that 1) The use of interactive media assemblr edu based on augmented reality is feasible and valid for use as a learning medium, 2) Interactive media assemblr edu based on augmented reality produces good results and has a significant effect on improving students' scientific literacy.

Based on the explanation mentioned above, it can be concluded that AR-based media greatly influences the learning process. The media that will be developed in this study is augmented reality (AR) media based on scientific literacy. Which has the latest by using the Assembler Edu application where the part that students want to know can be clicked which will later come out with an understanding and its function so that with this media it can make it easier to understand the science learning that will be studied and students can increase their enthusiasm in reading. While previous research has been done by Sutrisno, (2024) where this augmented reality media is only a picture and its name.

Based on the explanation, the researcher raised the title "Development of Augmented Reality (AR) Media Based on Science Literacy for Grade IV Students at SDN Gunung Maddah 2". The way to enable students to learn independently and achieve the expected learning outcomes, especially in science and science material, it is necessary to develop learning media that is in accordance with the 21st century, namely digital-based learning media, one of which is the use of augmented reality media in learning.

METHOD

This study uses the R&D (*Research and Development*) method. According to Nurhalimah et al., (2017) explains that research with the R&D method has a structured procedure so that it is suitable for producing certain products, and testing the feasibility, practicality, and effectiveness of the product.

The research model used is the ADDIE model (*Analysis, Development, Design, Implementation, and Evaluation*). The research on the development of Augmented Reality media based on Science Literacy uses the ADDIE research method including Analysis, Design, Development, Implementation, and Evaluation (Puspasari, 2019).

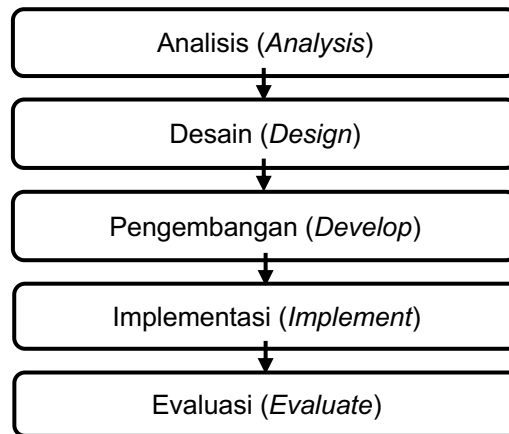


Figure 1.1 ADDIE Flow

In the analysis stage, researchers will assess learning activities in schools to identify problems that arise during the learning process. In addition, interviews with teachers and students of grade IV SDN Gunung Maddah 2 were also conducted to deepen understanding of existing problems.

At the design stage, the design of *Augmented Reality Media based on Science Literacy* is adjusted to the results of the analysis. The process begins by creating material about Plant Body Parts that support the achievement and learning objectives in the science content. In the planning of the material, it is made in *blender software*, the creation of 3D assets that *are exported* can support the *glb type*. Then the 3D model that has been *exported* will be imported into the *assembler editor*, for additional interactions, annotations will be added to each part of the plant in the 3D model.

In the development stage, the concept designed in the design stage is realized concretely. Furthermore, the *Science Literacy-based Augmented Reality Media* is validated by expert lecturers, including media, material, and language experts.

In the implementation stage, the researcher conducted a trial of *Augmented Reality (AR) Media based on Science Literacy* on teachers and students of grade IV of SDN Gunung Maddah 2. The trial was conducted on two groups of students: a small group (7 students) and a large group (15 students). The researcher taught science material about plant body parts, and a questionnaire was given to teachers and students to be filled in according to the instructions.

Evaluation stage, the final stage is the evaluation stage where the researcher evaluates the research results.



Figure 1.2 Research implementation flow

Data collection techniques in this study include observation, documentation, product validation sheets, and questionnaires for teachers and student responses. Data analysis was carried out using qualitative and quantitative methods to process product test results.

Qualitative data analysis processes data in the form of words, images, or symbols that cannot be measured quantitatively, with the aim of understanding the meaning, process, and context of social phenomena. Meanwhile, quantitative data analysis uses statistical techniques to analyze data that has been processed, in order to answer research questions or test hypotheses.

Data Analysis of the Feasibility of *Augmented Reality Media Based on Science Literacy* is known through data analysis from validation of media expert lecturers, material experts, and language experts. According to Andriani, (2019) Student response

questionnaires have scoring rules to calculate feasibility, practicality, effectiveness, namely score 4 Strongly Agree, Score 3 Agree, Score 2 Less Agree, Score 1 Disagree.

Data Analysis of the feasibility of *Augmented Reality Media* based on *Science Literacy* can be seen through the assessment of each aspect with the expected level of feasibility, the media is said to be suitable for use by students, namely passing the test from expert lecturers who assess through the questionnaire that has been provided, the formula to find out the value is $P = \text{Percentage}$, The number of scores achieved divided by the highest score multiplied by 100%, therefore it will find the value of the feasibility of the media. The results obtained from media experts 93% are in the "very feasible" category, material experts 89% are in the "very feasible" category, language experts 97% are in the "very feasible" category. The *Augmented Reality media* that is developed can be said to be feasible if it gets a percentage result of more than 75%. (Rukoyatun, 2018) .

Augmented Reality Media based on *Science Literacy* is seen through teacher practicality data and student practicality data. Student practicality data is obtained from student response questionnaires to the learning process, which is then analyzed using the number of students who give positive responses according to the aspects asked, then calculate the percentage with the formula $P = \text{Percentage of responses}$, Number of student responses per child divided by the number of responses of all students multiplied by 100%, therefore it will find the value of the practicality of the media.

The results obtained from teachers were 96.9% in the "very feasible" category, small groups 91.9 % in the "very feasible" category, and large groups 94.5 % in the "very feasible" category. The results obtained on the Practicality Criteria with a Percentage Range of 76% -100% are said to be Very Practical, 51% - 75% are said to be practical, 26% - 50% are said to be Quite practical, 0% - 25% are said to be Not practical (Sahida, 2018) . The *Augmented Reality media* that is developed can be said to be practical if it gets a percentage result of more than 50%.

Table 1. 1 Science Literacy Indicators

No	Indicator
1	recognize situations related to <i>science</i> and technology
2	understand the natural world and technology based on scientific knowledge
3	explanation of phenomena, and the use of evidence in arguments and decisions
4	have a positive attitude toward <i>science</i> , support scientific inquiry, and be environmentally responsible

Table 1.2 Product Effectiveness Criteria Average Student Score

Average range	Effectiveness criteria
81-100	Very effective
71-80	Effective
51-70	Less effective
< 50	Ineffective

Table 1.3 N-Gain Levels

N-Gain Value	Category
$G > 0.7$	Tall
$0.3 \leq g \leq 0.7$	Currently
$G < 0.3$	Low

Source : (Sudarmaji, 2015)

Effectiveness analysis on *augmented reality media based on scientific literacy* was conducted by researchers on 15 students. The first stage of the t-test, namely this test is carried out to determine the difference in average between two samples that are the same but given different treatments, but with the condition that the data distribution is classified as normal (Setianingsih, 2020) . Determination of acceptance or rejection criteria, H_a or H_o at a significance level of 5%: a) If $t \text{ count} > t \text{ table}$, then H_o is rejected H_a is accepted or said to be significant, meaning that partially the independent variable (X) has a significant effect on the dependent variable (Y), then the hypothesis is accepted. b) If $t \text{ count} < t \text{ table}$, then H_o is accepted and H_a is rejected, then it is said to be insignificant, meaning that partially the independent variable (X) has no significant effect on the dependent variable (Y) then the hypothesis is rejected.

Furthermore, the normalized-Gain test Harahap, (2022) said that the analysis of student effectiveness was obtained when the product developed by the researcher was tested on a limited basis through a student learning outcome test (Posttest), by meeting the minimum completion criteria (KKM) which is ≥ 70 according to the standard. Based on the formula adapted from Sudjana, (2009) the calculation of effectiveness can use the following formula: Description: $N = \text{Value obtained by students}$, $n = \text{Score obtained divided by the total number of students}$, After the student learning outcome value is obtained, to determine the effectiveness of *Augmented Reality Media* based on *Science Literacy* using the following categories:

The results obtained from effectiveness can be assessed by observing the results of student tests after going through the media trial stage, namely 81.8% in the "Very Effective" category. The following are the effectiveness criteria, namely <50 ineffective, 51-70 less effective, 71-80 effective, 81-100 very effective. (Sudarmaji, 2015)

RESULTS AND DISCUSSION

RESULTS

Analysis stage, the research on the development of *Augmented Reality Media* based on *Science Literacy* uses the *ADDIE research method*. And in the analysis stage, researchers use observation techniques during learning activities. At this stage, interviews were conducted with teachers and students of grade IV SDN Gunung Maddah with the aim of strengthening the problem analysis.

The design stage in the design stage of *Augmented Reality Media* based on *Science Literacy* is adjusted to the results of the analysis. The first stage of design is that researchers begin to design designs that will be developed according to the material on plant body parts in class IV. The first stage that will be carried out is the media creation process starting with the creation of 3D assets using *blender software*, for the use of materials on *textures* using *image textures* so that later the exported 3D model can support the *glb type*. Then the 3D model is *exported* into a *glb file* via the *export feature* in *blender*. Then the *exported* 3D model will be *imported* on the *assembler editor*, which later for the addition of interactions will be added annotations on each part of the plant in the 3D model, using the *sticky annotation feature* on the 3D *edu assembly*, and continued with a trial first, if the media is finished, then it can be *published* into the class that has been created on *Assemblr edu*. Access to materials can be done by entering the *barcode code* shared by the teacher. The second stage, the researcher compiled a research instrument that will be used to assess the developed media. Research instruments include validation questionnaires, media experts, material experts, language experts.

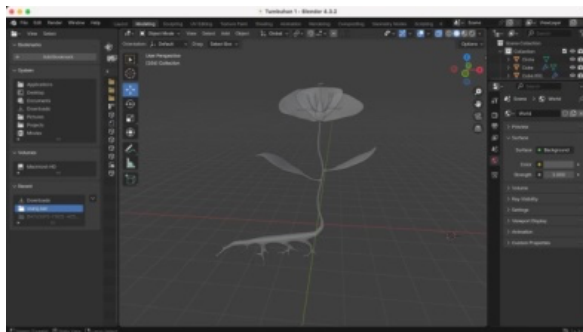


Figure 1.3 Design for creating 3D media assets using *Blender software*



Figure 1.4 Design of media creation in *assembler editor*



Figure 1.5 Media barcode

Development stage, this stage is a continuation stage by concretizing all the concepts that have been designed at the design stage. Furthermore, *Augmented Reality Media* based on *Science Literacy* using the *assembler edu application* with plant body parts material in grade IV of elementary school is validated by expert validator lecturers, namely media experts, material experts and language experts. From the validation results of *augmented reality media* using the *assembler edu application*, it shows that the results of the feasibility test based on media expert validation are 93% in the "very feasible" category, material experts 89% in the "very feasible" category, language experts 97% in the "very feasible" category.

Table 1.4 Expert Validation Test Data

Validation	Lecturer Name	Institution of Origin	Presentation	Category
Media Expert	AG, M.Pd	PGRI University of Kanjuruhan Malang	93%	Very Worth It
Subject Matter Expert	CS, M.Pd	PGRI University of Kanjuruhan Malang	89%	Very Worth It
Linguist	R, M.Hum	PGRI University of Kanjuruhan Malang	97%	Very Worth It

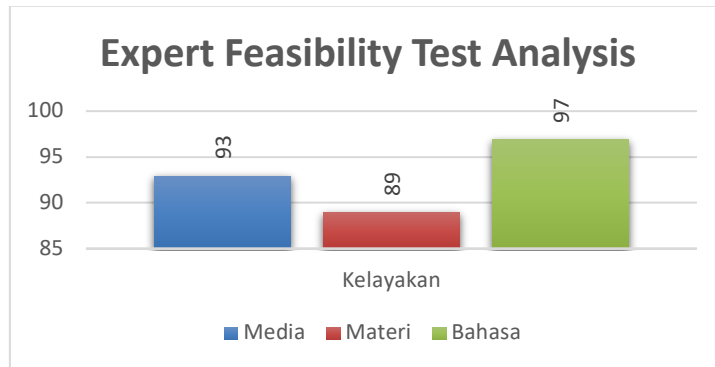


Figure 1.6 Eligibility results

Implementation stage, this implementation stage is carried out with a teacher's practicality test, a test on small groups of 7 students, and a test on large groups of 15 fourth-grade students at SDN Gunung Maddah 2 as research subjects. The researcher teaches the subject of Science on Plant Body Parts. The questionnaire that has been given to teachers and students is asked to be filled in according to the instructions for filling. The results of the practicality test by the teacher obtained an average percentage of 96.9% with the category "Very Practical". The assessment of the results of student responses in the field trial was limited to small groups getting a percentage of 91.9%, in large groups getting a percentage of 94.5%.

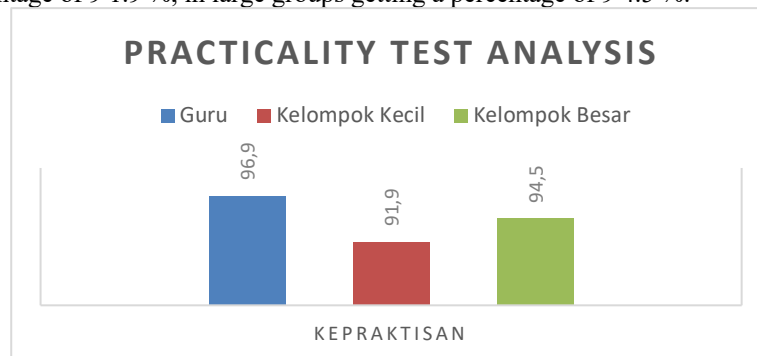


Figure 1.7 Practical results

Evaluation Stage, The results of the evaluation questions with the scores obtained by students were carried out by means of a limited field trial by 15 fourth grade students at SDN Gunung Maddah 2 which aims to determine the effectiveness of *Science Literacy-Based Augmented Reality Media* used during the learning process. In this effectiveness test there are several steps, namely the t-test, and the N-Gain test.

In the initial stage, this study applied a paired t-test to determine whether there was a significant difference between the values before (*pre-test*) and after (*post-test*) the treatment. This test is used to compare the average difference of two paired samples and assess its effect on data normality. The hypotheses tested in this study include H_0 , namely the absence of a significant effect between the *pre-test* and *post-test* after the use of *Augmented Reality Media based on scientific literacy* on student learning outcomes, and H_a , namely the presence of a significant effect. The test decision is determined based on a significance level of 5%, where if $sig < 0.05$ then H_a is accepted, while if $sig > 0.05$ then H_0 is accepted.

Table 1.5 Paired Samples Statistics

Pair	Mean	N	Std. Deviation	Std. Error Mean
Pretest	57.67	15	19.69	5.08
Posttest	90.33	15	13.59	3.51

		Paired Samples Test					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
Pair	pretest – posttest	-32.67	11.78	2.58	Lower	Upper			
					-37.42	-26.58	-12.67	14	.000

From the calculation results obtained a significance value of 0.000. Because the value is smaller than 0.05 (sig <0.05), then Ha is accepted. This shows that in large groups, there is a significant influence between the results of the *pre-test* (before using *Augmented Reality* Media based on *scientific literacy*) and *post-test* (after using *Augmented Reality* Media based on *scientific literacy*) on student learning outcomes.

From the results of the statistical test, the t-Stat value = -12.67 with degrees of freedom (df) = 14 was obtained. The p-value obtained for the two-tailed test was 0.0000000047, which is much smaller than 0.05. This shows that there is a very significant difference between the values before and after treatment.

In addition, in the two-tailed test, the t-critical value obtained was 2.14, while the t-statistic value was -12.67, which in absolute value is much larger. Thus, because |t-statistic| > t-critical (12.67 > 2.14), Ho is rejected. This indicates a significant difference between Data 1 and Data 2, so it can be concluded that the treatment given has a significant impact on increasing the results.

In conclusion, the results of this analysis prove that there is a real and significant difference between the conditions before and after treatment. The increase in the average value from 57.67 to 90.33. The average increase of 32 from Data 1 to Data 2, indicates that the treatment given has succeeded in increasing the results significantly.

Furthermore, to determine the level of student success, namely by determining the *pre - test score*. and *post - test* first. After that, the *post - test value is subtracted from the pre - test value*, then find the ideal value by subtracting the pre-test value by 100. Next, to find the N - Gain score value, namely by dividing the *Post-Pre* by the ideal score and getting the N - Gain score. To get the N - Gain score percentage, the method is to multiply the N - Gain Score by 100 to get the level of effectiveness, which is classified as high, medium or low.

To determine the level of effectiveness, namely by averaging the N - Gain score percentage of all students.

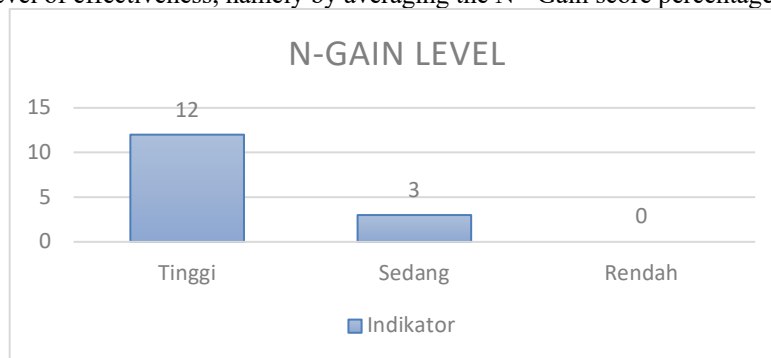


Figure 1.8 N-Gain Level Results

In the data processing that the researcher did to find out the effectiveness results, the researcher used the N-Gain level formula. Effectiveness was obtained from the results of the pre-test and *post-test* of students.

When I conducted a *pre-test* and *post-test study*, the results were categorized as very effective with a percentage of 81.8%. In calculating the N-Gain level, we must know the *pre-test and post-test scores* of each student. To find out the N-Gain score, the *pre-test results are subtracted from the post-test results*.

DISCUSSION

In the 21st century, almost all equipment in life has been digital or technology-based. Along with that, the industrial world entered the era of the Industrial Revolution 4.0, which was first introduced in Germany in 2011 and was marked by the digital

revolution (Satya, 2018). Technology-based learning is crucial in 21st-century education to support students in learning, innovating, and utilizing technology and information media.

Learning technology continues to develop along with the times. According to Anisa, (2021) digital technology is now the main means in education, supporting learning, access to information, and academic assignments. Its application includes various electronic media, such as audio/video, interactive TV, CDs, and the internet. (Jamun, 2018). The learning process in the classroom must be integrated with currently developing technology (Hartini, 2019). One of them is the integration of technology in learning media.

Media development in learning is very necessary, with the aim that students are interested in participating in learning in class and easily understand the lesson material (Lestari, 2016). According to Yaumi, (2017) Learning media functions as a communication tool to convey messages and learning objectives. Its use can increase students' interest in learning new material presented by the teacher, so that it is easier to understand. (Nurrita, 2018).

One of the technologies that will be associated with the media, namely Augmented Reality and Virtual Reality Technology, is currently widely used as a learning medium. According to Hakim, (2018) Augmented Reality combines the real and virtual worlds in 2D or 3D form which is projected in real-time into the real environment. Augmented reality is a technology that projects virtual objects in 3D form into the real world in real-time via a camera (Wahid, 2017). In line with Ramadani, (2020) that augmented reality allows visualization of 3D images through technology.

Science literacy is the understanding of scientific concepts and processes that enable a person to make informed decisions and participate in the fields of state, culture, and economy. This literacy also includes the application of science in everyday life. (OECD, 2019). Science literacy prepares students to achieve learning goals by improving critical thinking skills. Students are invited to connect new information with previous knowledge to solve or find solutions to a problem. (Prahastiwi, 2019).

From the existing problems, researchers created Augmented Reality Media based on Science Literacy, because the media is very influential for students in the learning process activities and hopes to help students understand the contents of the material and learn about Science and Technology so that students can keep up with the times. In today's era, one of the learning media that needs to be provided is electronic-based media. This is in line with Nur Kumala's research, (2023) Entering the 21st century world of work requires preparation, including mastery of skills and application of technology in learning.

This Augmented Reality and Virtual Reality media will later be tested on several experts, namely media experts, material experts and language experts. Learning devices are said to be valid if expert assessments show that the development of the device has internal consistency between each aspect assessed, namely the relationship between components in the learning device. Furthermore, Hala, (2015) stated that if all aspects of the assessment have met the validity criteria, then the media developed is declared suitable for use in learning. In line with research conducted by Arrum, (2021) which produced interactive Augmented Reality learning media. The results of his research stated that the use of interactive learning media based on Augmented Reality through the Assemblr application helps develop learning interest and gives the impression of more interesting learning for students.

The results of the validation of augmented reality media using the assembler edu application show that the results of the feasibility test based on the validation of media experts 93% in the "very feasible" category, material experts 89% in the "very feasible" category, language experts 97% in the "very feasible" category with the "Very Feasible" category. This is in line with the validation criteria of Nuraini, (2020) Valid values obtained by achieving assessment indicators in the form of suitability of the presentation of learning materials with competency achievement indicators, media support for concept instillation, suitability of learning materials with learning objectives, correctness of the description of learning materials, order of presentation of learning materials, suitability of images and animations with descriptions of learning materials, suitability of practice questions with learning objectives, and clarity of descriptions of learning materials.

The results of the practicality of the Science Literacy-Based Augmented Reality Media can be seen through the implementation stage according to the ADDIE stage. The results of the interactive media practicality assessment were obtained from the assessment of prospective users (teachers) and student assessments. Based on the assessment results obtained from teachers, the percentage was 96.9% in the "Very Practical" category. The assessment carried out by students in small groups after the implementation process was carried out obtained a percentage of 91.9% from limited field trials and in large groups obtained a percentage of 94.5% so that the Augmented Reality Media developed was Very Practical for use in the food chain material of the Science subject.

The results of the effectiveness test of Augmented Reality Based on Science Literacy were carried out by working on evaluation questions by 15 students of SDN Gunung Maddah 2. The questions worked on were multiple choice with a total of 20 questions. The results of the effectiveness test obtained an average value of 81.8% which means the effectiveness criteria are "Very Effective". The average value obtained has shown the completion of student learning outcomes. So that the results increased because at the time of the pretest did not use media and at the time of the post-test after using augmented reality media based on science literacy.

The results of this t-test analysis prove that there is a real and significant difference between the conditions before and after treatment. The increase in the average value from 57.67 to 90.33. An average increase of 32 from Data 1 to Data 2, indicates that the treatment given has succeeded in increasing the results significantly.

This is in line with research conducted by Sutrisno, (2024) which produced Augmented Reality-based learning media that can improve students' scientific literacy. The results of the study showed that 1) The use of interactive media assemblr edu based on augmented reality is feasible and valid for use as a learning medium, 2) Interactive media assemblr edu based on augmented reality produces good results and has a significant effect on improving students' scientific literacy.

CONCLUSION AND SUGGESTIONS

In this development research, the product developed is a Science Literacy-Based Augmented Reality Media using the assembler edu application with plant body parts material in grade IV of elementary school. The research method used is the ADDIE research method which includes Analysis, Design, Development, Implementation and Evaluation. The Science Literacy-Based Augmented Reality Media product was validated by three validator experts, consisting of media expert validation obtaining the category "Very Eligible", material expert acquisition obtaining the category "Very Eligible", and language expert obtaining the category "Very Eligible". Analysis of the results of the practicality of Science Literacy-Based Augmented Reality Media including the results through a questionnaire response conducted by the teacher obtained the category "Very Practical". Assessment of student response results in limited field trials in small groups was categorized as "Very Practical", large groups received the category "Very Practical". From the results of the practicality test, Science Literacy-Based Augmented Reality Media was categorized as very practical because it was easy to use by students and interesting in learning, helping students understand the material. Augmented Reality Media Based on Science Literacy is declared very effective based on the average pretest test questions carried out by 15 fourth grade students of SDN Gunung Maddah 2 which have been obtained with the criteria of "Very Effective". Learning is very effective so that it will provide students with a pleasant experience, because good learning provides challenging and creative student experiences.

SUGGESTION

Based on the conclusion of the development of Augmented Reality Media based on Science Literacy, the researcher provides suggestions for teachers, namely that the results of this media development can be used by teachers as a reference and aid in learning activities to make learning more interesting and interactive, especially in the material on plant body parts for grade IV. Teachers are expected to innovate to develop learning media according to student needs. For students, this product can be used by students as an interactive learning media independently in the classroom or at home because it can be installed on a cellphone. For other researchers, the development of Augmented Reality Media based on Science Literacy can be used as a reference by other researchers and is expected to develop more creative, fun and exciting products related to the material on plant body parts for grade IV in order to improve the quality of learning for students.

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