

Development of Augmented Learning Media Reality for Students Learning Difficulties in Elementary School

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Abstract: This study aims to produce interactive augmented reality media in science learning for students with special needs that are valid and practical. To achieve the goal, the method used is the research and development method, adopting the ADDIE model, namely 1) Analysis, 2) Design, 3) Development, 4) Implementation, 5) Evaluation. The instrument used is the validity observation sheet and the practicality observation sheet. Based on data analysis, it was found that the validity of the Augmented Reality-based learning media for fifth grade elementary school students that was developed was declared valid with an average score of 3.32. Therefore, this learning media can be used as a supporting tool in the learning process in class V elementary school. Practicality The learning media based on Augmented Reality for grade V Elementary School students that was developed was stated to be very practical with a percentage of 91.8% consisting of 90.6% of teacher response questionnaires and 93.2% of student response questionnaires, so that augmented reality-based learning media developed belongs to the very practical category, so this media can be used as one of the learning materials, especially in science subjects on the water cycle material for fourth grade elementary school students.

Keywords: Inclusive Education; learning process; children disabilities.

INTRODUCTION

Basically, every child has different characteristics from one another, who follow different rhythms of development and different needs (Palupi, 2003). Likewise with children with special needs, who have specificities in their growth and development, including their educational needs. In relation to the education of children with special needs, the government has stipulated Permendiknas Number 70 of 2009 concerning the provision of education for children with special needs. The realization of this law was carried out in 2015 through inclusive education (Angreni & Sari, 2020). However, the realization of inclusive education has not met expectations. In practice, students with special needs have not received educational services according to their potential and obstacles. Various problem phenomena are found in the implementation of education for students with special needs. This is because their characteristics and barriers are very diverse, so they require different services. Broadly speaking, students with special needs are divided into 2 categories, namely students with intelligence barriers and students without intelligence barriers. Students with intelligence barriers one of them has learning difficulties. (Palupi, 2003) Students who experience learning difficulties will find it difficult to accept abstract material and they find it difficult to focus on certain objects and their memory is weak. The term children with learning disabilities according to the National Joint Committee for Learning Disabilities (NJCLD) is intended for children who experience difficulties in the academic field caused by central nervous system dysfunction and not due to sensory disturbances, mental retardation, social and emotional barriers or environmental influences other (Katz et al., 2012; Dragoo, 2020). added that learning for students with learning difficulties cannot be equated with learning for normal students, special adjustments are needed including in terms of curriculum, methods, strategies, media, and even learning time so that learning material can be accepted by students with learning difficulties with nice. Teachers must be equipped with various

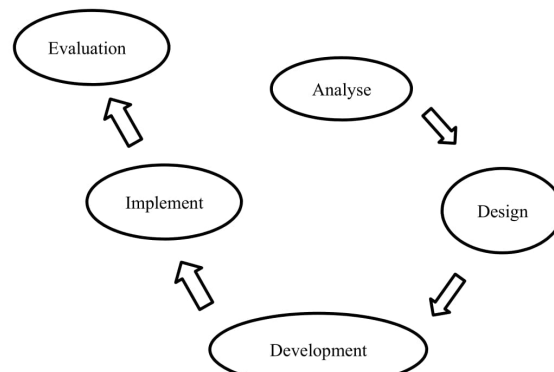
skills prior to conducting assessment activities to identify children with special needs (ABK), including children with specific learning disabilities (Nahdiyah et al, 2022).

In this regard, to improve their memory of the material being studied must be balanced with supporting infrastructure as well as the learning process in the classroom. Facilitators were suggested to be identified. It is in order to improve accessibility and promote full participation (Amka, 2019). In the learning process the alignment of strategies, materials and learning media is a determining factor for the success of students with special needs. expert opinion. Leading to this alignment, learning media is also an important factor. According to (Sunanto & Hidayat, 2016; Zulaikhah et al., 2021) in general, the learning media used today have not adapted to the barriers of students with special needs. Media is still dominant in the form of images, personality approaches to students in certain materials using video media. (Angreni, 2022) shows that there is no difference in learning media for students with special needs with regular students. Based on research results (Widodo et al, 2019) implementation of education for children with special needs have not been able to accommodate or adapt to their needs. Even though not all students with special needs can receive material delivered using the same media.

Choosing the right media for children with special needs is very important for their success in learning. When viewed from the current technological developments, bringing fresh air to the world of education. New breakthroughs were found, especially learning media in the form of interactive multimedia that presents material through a three-dimensional combination of audiovisual and animation. Media with a combination of 2D and 3D-based animation which presents real material. Media like this can be a solution for children with special needs who have difficulty understanding material. The media with 2D and 3D based animation models is Augmented Reality (AR). AR (Augmented Reality) is a combination of 2D, 3D and the real world that is displayed in virtual form on a smartphone screen. (Bahroni & Zakaria, 2020). Learning media with AR technology itself can be a bridge between concrete and digital learning media (Zünd et al., 2015). Using Augmented Reality which is able to realize the virtual world into the real world, can turn these objects into 3D objects, so that the learning method is not monotonous and the user becomes motivated to find out more (Andriyani et al., 2022; Nazaruddin & Efendi, 2018; Saputro & Saputra, 2015). The use of AR technology as a learning medium has many advantages as stated by (Afifah et al., 2019) among others: (1) more interactive, (2) effective in use, (3) can be implemented widely in various media, (4) simple object modeling, because it only displays a few objects, (5) creation that doesn't take too much cost, and (6) easy to operate (Arifin et al., 2020). Thus, it is very possible to use Augmented Reality (AR) media to help students with special needs to understand the lessons they are learning.

METHOD

In accordance with the problems studied, this research is research development or Research and Development (R&D). The development model used is the ADDIE model which consists of 1) Analysis, 2) Design, 3) Development, 4) Implementation, 5) Evaluation (Sani, Abdullah, & Manurung, 2018).



Gambar 2. Model ADDIE

The description of each phase is as follows:

The first stage is the analysis (Analysis). There are three, namely needs analysis, curriculum analysis, and student analysis. a) Curriculum analysis was carried out to find out the curriculum used in inclusive elementary schools. At this stage an analysis of core competencies, basic competencies and analysis of the derivatives of basic competencies into indicators is carried out. The basic competencies analyzed are Natural Sciences (IPA) subjects. b) Needs analysis is carried out first to analyze the state of learning media for students with special needs and at this stage learning media will be developed to help students with special needs in learning. c) Analysis of the characteristics of students with special needs with intelligence barriers. Of the 16 students, 20% understood the material below average. Although this research focuses on students with special needs, the implementation of learning media is carried out for all students in the class.

The second stage is Design (Design) which is divided into two stages, namely the design of research instruments and the design of learning media. The design of the instrument was divided into several sections, interview guidelines, expert validity questionnaires (media, material and language), as well as teacher and student response questionnaires. Meanwhile for the design stage of learning media that is carried out is to make a flow chart (flowchart) of the learning media that will be developed.

The third stage is development (develop). The design of learning media that has been made in the second stage will be realized at this stage. The result of this stage is the initial version of the learning media product. The validity of the learning media, which is still the initial version, will be examined by three experts, namely media experts, material experts and linguists to find out whether the initial version of the learning media is valid or not. If this learning media is declared valid by the experts, then it will proceed to implementation with the initial version. But if the initial version of the learning media is not valid, it will be repaired first until all the improvements are complete and become an advanced version of the learning media that will be used for the next stage.

The fourth stage is implementation (implementation). At this stage the learning media that has been declared valid by the validator will be tested on trial subjects, namely students in class. At this stage students use learning media based on augmented reality in the learning process. After using learning media based on augmented reality students were given a questionnaire regarding students' responses regarding the learning media they had used. Practicality data was also obtained from the results of a practical questionnaire given to the teacher after the learning activities were completed.

The fifth stage in this research is evaluation (evaluation). At this stage an evaluation is carried out regarding the validity and practicality of the learning media developed. Not

only evaluation but suggestions regarding the development of this learning media for the future will also be given at this stage.

Data analysis carried out included analysis of feasibility data (media experts, material experts, and language experts) using formulas (Sari & Angreni, 2018) as follows:

$$R = \frac{\sum_{j=1}^n Vij}{nm}$$

Information:

R = average research results from experts/practitioners

Vij = sum of the results of the expert judgment

n = the number of experts who judge

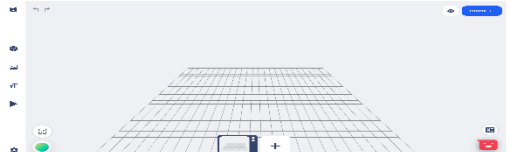



m = the number of statements.

RESULT AND DISCUSSION

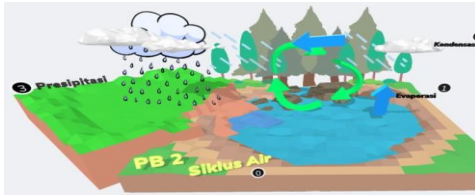
Result(s)

The results of this development research are learning media based on Augmented Reality. From the analysis stage, namely needs analysis, curriculum analysis, student analysis, information was obtained from the teacher that there were eight students who had difficulty understanding the material at different levels. three light categories, three moderate categories and two heavy categories, these eight students more often get scores under the Minimum Completeness Criteria, including natural science material. Even though learning media has been used by teachers, students need innovative learning media that can motivate them to learn. The findings from the analysis phase are then followed up by creating a media design that starts with making a storyboard in table 1. The application used to design augmented reality-based media is the Assemblr application.

Table 1. Storyboard

No	Part	information
1.		The initial display and the tools used in the process of making learning media based on Augmented Reality
2.		Display objects that will be selected to design the creation of learning media based on Augmented Reality
3.		Several tools such as islands, planes, clouds, and forest backgrounds are combined and arranged so that they become Augmented Reality-based learning media in scene 1
4.		In this scene there are several material explanations that are open if the numbering in the Augmented Reality interactive media is clicked in scene 5

5.



In this scene there are several material explanations that are open if the numbering in the Augmented Reality interactive media is clicked in scene 8

The assemblr application with 3-dimensional images for designing augmented reality media is an application that is equipped with scenes and tools. This assemblr application is simpler, the template is already available and users design according to their own creativity. The material to be made is the water cycle and its impact on events on earth. For each scene using a different view equipped with a video to attract students' learning interest.

Before the developed learning media is used in learning activities in schools, it is first validated by learning media experts and education experts using a Likert scale questionnaire instrument. The experts who carry out the validation consist of two experts in their respective fields and have at least ten years of experience in pursuing that field. The validation results from media experts, education and grammar experts can be seen in table 2.

Table 2. Learning Media Expert Validation Results.

No	Aspect	Learning Media Expert		Total score	maximum score
		1	2		
1	Appearance	50	52	102	120
2	Presentation and design	30	33	63	80
Amount				165	200

Table 3. Educational Expert Validation Results

No	Aspect	Learning Media Expert		Total score	maximum score
		1	2		
1	Contents and Materials	32	36	68	80
2	Language	32	34	66	80
Amount				134	160

Based on table 2 and table 3 it can be seen the results of the four experts, the assessment of the two learning media experts obtained a total score of 180 and a maximum score of 200, so that the results of the assessment of learning media experts were 3.3 with a valid category. Furthermore, the assessment of educational experts obtained a total score of 142 and a maximum score of 160, so that a result of 3.35% was obtained in the valid category. The results of media and education validation obtained 3.32 with a valid category.

In addition to providing an assessment of the developed learning media, media experts also provide several suggestions for improving augmented reality-based learning media. The advice given is to add animation so that the learning media is more interactive. Then the next suggestion is that the scene is added again for enrichment material, students with special needs need material that is broader and more complete. Furthermore, adjust the language with Indonesian spelling because there are still sentences that are difficult to understand. In addition, media experts suggest that food chain material is shown more clearly and all stages are visible in the media. However, the last suggestions were all corrected due to the limitations of the researcher.

Based on the assessment of media experts and education experts, it can be concluded that the developed augmented reality-based learning media is valid for use. This learning media has been revised according to the suggestions given by media experts and education

experts. That is, the learning media developed are suitable for use as learning media in the learning process. Furthermore, the augmented reality learning media that is declared feasible is applied in learning activities in the classroom. All students, both normal and with special needs, use learning media for three meetings according to the topic, namely the water cycle. The use of augmented reality learning media together aims not to distinguish normal students and students with special needs. During the learning activities the teacher also participates in teaching and learning activities in the classroom to find out the application of these learning media. So that the teacher can provide an assessment of the practicality of augmented reality learning media. The practicality assessment of the learning media that was developed involved two class teachers, namely class teachers Va and Vb. The instrument used is a practicality assessment with a Likert scale which includes aspects of efficiency, effectiveness, interaction and ease of use. The results of the practicality assessment can be seen in table 4.

Table 4. Practical results by the teacher

No	Aspect	Teacher		Total Score	Maximum Score
		1	2		
1	Efficient	17	18	35	40
2	Effective	15	15	30	32
3	Interactive	18	17	35	40
4	Ease of use	22	23	45	48
Amount				145	160

Based on the results of the practicality assessment listed in table 4, a total score of 145 is obtained with a maximum score of 160, so that the percentage of practicality assessment obtained is 90.6% in the very practical category. Thus, it can be concluded that augmented reality learning media has good practicality.

In addition to providing an assessment of the practicality of learning media, the teacher also provides suggestions and input for improving this learning media. The suggestions given by the teacher include video learning media about the water cycle that should be displayed according to the stages using a click button for each stage so that it will be more interesting. However, due to the limitations of the researcher, this suggestion is used as a development for the future.

Table 5. Practical results by students

No	Assessment Aspects	Score	Score Max.	%	Information
1	Ease of Use	416	450	92,4%	very practical
2	Appearance	841	900	93,4%	very practical
3	Language	139	150	92,6%	very practical
4	Practical Use of Learning Media	283	300	93,3%	very practical
5	Evaluation	139	150	92,6%	very practical
Average				93,2%	very practical

Discussion

The developed augmented reality-based learning media has a purpose, namely as one of the learning media for students with special needs with learning difficulties. Learning media is expected to be able to help students with special needs understand learning material well so that learning problems for students with special needs learning difficulties can be resolved. After being validated by experts, learning media based on augmented reality was

declared suitable for use by students with special needs with learning difficulties. This adds to technology-based learning media for students with special needs learning difficulties. So far, the development of learning media based on augmented reality technology has not been widely developed, some of which have been developed are dominant for normal students. As developed by (Saputro & Saputra, 2015) (Aripin & Suryaningsih, 2019) (Ningrum et al., 2022), shows that augmented reality learning media has a very good impact on students' motivation and understanding of the material they are learning. In addition to augmented reality learning media, there are several other media that have been developed, such as learning media using attractive videos with Microsoft PowerPoint and Windows Movie Maker version 12 on material tangent to a circle by (Putri & Dewi, 2020).

Agree with (Buliali & Andriyani, 2021) the development of technology-based learning media for students with special needs is still very limited. Even though this should be a priority for education observers to improve the quality of learning for students with special needs. The role of learning media not only increases motivation in learning but also has implications for student learning outcomes. This is in accordance with the results of the study (Irfansyah & Anifah, 2022); (Leonardo et al., 2018) (Imawati & Chamidah, 2018) that the application of augmented reality learning media in learning improves the quality of learning and students' understanding of the subject matter. Selection of the right media also motivates students to play an active role in the learning process (S. Angreni & Sari, 2020).

The developed augmented reality-based learning media obtained a practical value of 90.6% from the teacher in the very practical category, this means that the developed media provides convenience for students with special needs in the learning process. It can be seen in the results of the questionnaire where the effective indicator obtained a percentage of 93.7%, this shows that during the learning process all students take an active role in learning. Students look enthusiastic about learning using augmented reality learning media, they are able to construct the material provided by the teacher. Supported by research results (Arifin et al., 2020) which shows that learning media with augmented reality accommodates the construction of students' own knowledge and is in accordance with constructivism theory. Furthermore, the ease of use of augmented reality-based learning media obtains a percentage of 93.75%, this shows that augmented reality-based learning media is easy to apply or use. In line with research results (Buliali & Andriyani, 2021) augmented reality media in circle material makes it easy for teachers to use it.

Furthermore, the practicality of the students obtained a percentage of 93.2% in the very good category. In other words, according to students, learning media based on augmented reality is easy to use and practical, the teacher also said the same thing. Thus, teachers can use learning media based on augmented reality as an alternative medium in learning science about the water cycle and attract students' interest in learning. In addition to learning outcomes, students' interest in learning is also a factor in the success of students. Augmented reality-based learning media is one of the technological media that is able to attract students' interest in learning. according to the opinion (Imawati & Chamidah, 2018) Augmented reality can maintain student engagement, because it is interesting and challenging to interact, create, and manipulate objects in a virtual environment. The advantages of animation in this augmented reality media are that animated objects look clear as real and real, so that students can see objects without being limited by time and can be used repeatedly. Augmented reality-based learning media is said to be efficient because teachers do not need to bring media into class, but students can learn the material displayed. In line with the opinion (Buliali & Andriyani, 2021) by using AR technology, the abstractness of concepts that were previously difficult for students to imagine, becomes easier to capture through the visualization of virtual objects that are presented together with the object's explanatory text.

This research still has limitations, including the response from students as users is still lacking and practicality is only assessed by one teacher.

CONCLUSION

Based on the results of research and discussion, it can be concluded that the developed augmented reality learning media was declared valid by experts with a score of 3.32. Furthermore, the practicality of the teacher obtained a value of 90.6% and students 93.2% in the very practical category. Based on these results, it was concluded that the developed augmented reality learning media met valid and practical criteria. However, this research still has limitations, including the response from students as users is still lacking and practicality is only assessed by one teacher. It is recommended that teachers use this augmented reality learning media as an alternative medium to help learning difficulties of students with special needs in the category of learning difficulties.

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