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Development of Modified Augmented Reality Media Based on Local Wisdom in Elementary Schools

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ABSTRACT

The development of technology in the educational process creates various possibilities that can enhance learners' experiences. This is related to the education system which refers to technology. The development of technology has made the world of education increasingly advanced, creating innovations in the form of digital teaching media, learning applications, and digital teaching materials that play a role in the learning process in schools. In elementary schools, learning still minimally uses teaching media to enhance students' critical thinking skills. Furthermore, the teacher only provides learning media in the form of videos or PowerPoint presentations, making the media seem boring and less stimulating for the students. The research method used is RnD with the ADDIE model and data collection method in the form of a questionnaire. Based on expert validation assessments, Augmented Reality media falls into the very feasible category with a percentage of 86.7%. The evaluation results on the media aspect scored 90%, the display aspect 85%, the usage aspect 92%, and the usefulness aspect 75%. This research implies that using modified Augmented Reality media can make learning more interactive and engaging, and can support students' learning activities.

Keywords: Augmented Reality, Local Wisdom, Elementary School

INTRODUCTION

The 21st century, more commonly known as the knowledge age, where this era became an alternative in the effort to fulfill knowledge-based education. (Alpisah, 2022). This is accompanied by new challenges to face the new paradigm, which aligns with the saying of philosopher Kuhn that new challenges must be faced with a new paradigm because if still based on the old paradigm, it will lead to failure. (Dedy et al., 2021). Therefore, in this century, concepts and actions are needed to support human resources to become more professional, thereby creating superior individuals.

The development of technology in the educational process creates various possibilities that can enhance learners' experiences. This is due to innovations that can serve as references in developing effective and efficient learning methods. (Mayasari, 2023).

Technology plays a significant role as an intermediary or medium connecting educators with learners. Therefore, it is able to open people's eyes to the importance of technology in the field of education. Utilizing technology in the field of education positively impacts learning activities as a means to add information, enhance learning abilities, facilitate access to learning, and obtain more engaging materials, thereby increasing interest in learning.

Through the inheritance of culture and traditions rooted in various regions, local wisdom plays an important role in shaping the character and identity of a nation. The values of local wisdom are very important in the field of education. Education, as the main pillar of individual formation, becomes a means to embody and reflect these local wisdom values, which ultimately shape independent, critical, innovative, polite, and creative attitudes. One form of innovation in learning can be achieved through the use of Augmented Reality. Augmented Reality is a term that refers to the integration of the real world and the virtual world, created to minimize existing barriers (Indahsari & Sumirat, 2023). The use of Augmented Reality in the field of education can serve as an effective means of interaction between teachers and students. Augmented Reality technology in the field of education can simplify scientific concepts, making it easier for students to understand. (Aditama et al., 2019). Thus, it can be understood that the purpose of using Augmented Reality media is to facilitate students' understanding of various concepts by using virtual technology and adding contextual data so that they can more easily understand various concepts clearly.

The potential of Augmented Reality makes learning more inspiring, engaging, and motivating for students, allowing them to explore and control from different perspectives, which previously was not a benchmark in the field of education. The development of Augmented Reality in learning media is designed to be more effective and to enhance students' motivation to illustrate abstract material so that they can think critically. (Ramadhan et al., 2023). Critical thinking in students enables them to form mindsets from various perspectives, which can become a skill for finding solutions to real-world problems.

LITERATURE REVIEW

Augmented Reality

Augmented Reality (AR) technology is a technology that combines virtual information with the real world (Chen et al., 2019). In Augmented Reality technology, users can visualize objects or items in three-dimensional form. AR has the advantages of being interactive and real-time, making it widely implemented in various fields (Haryani & Triyono, 2017). Augmented Reality (AR) is a technology capable of combining two or three-dimensional virtual objects within a real environment and then displaying or projecting them in real time. (Mustaqim, 2016). With the help of technology, Augmented Reality can create a real environment that can interact in digital form.

This Augmented Reality media is a form of innovation that can assist students in conducting independent learning (Fitriani Eka et al., 2018). Augmented Reality media can also generate interest among students in the learning topics, which will be even more effective when AR media is combined with various technological features to make students more interactive. (Almubarak et al., 2021).

Thomas P. Caudell (Harini & Pujiriyanto, 2022) introduced the discovery of Augmented Reality in "The Term: Augmented Reality". There are 3 criteria in the concept of Augmented Reality:

1. Combining the virtual and real worlds
2. The information provided is interactive and real-time
3. It is in three-dimensional form.

Local Wisdom

Local wisdom in the discipline of anthropology is also known by the term local genius. This term was initially introduced by Quatrich Wales. (Ayatrohaedi,1986). Wisdom in the broad sense not only consists of cultural norms and values but also encompasses all elements of ideas, including those with implications for technology, health, and aesthetics. With that understanding, the depiction of local wisdom encompasses various patterns of action and the results of its material culture. (Sedyawati, 2006).

Local wisdom is knowledge developed by ancestors in response to their surrounding environment, making this knowledge a part of culture and introducing and passing it down from generation to generation. This traditional knowledge partly emerges from stories, legends, songs, and rituals, as well as local rules and laws. (Anamofa, 2018).

Intangible local wisdom includes oral teachings passed down through generations, such as in the form of songs and hymns that contain the values of customary teachings. Through this intangible local wisdom, social values are passed down from generation to generation.

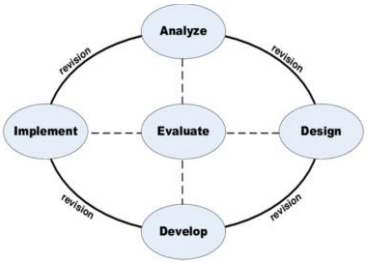
The diversity of religion, ethnicity, and language gives rise to cultural diversity. That diversity is a heritage from ancestors and forefathers since ancient times. The values of local wisdom are included in this cultural heritage.

Local wisdom can also be reflected in physical culture, such as the presence of historical sites/buildings, historical documents, and so on. The presence of historical sites/buildings in Indonesia is very diverse and spread throughout the entire region. The existence of this site is generally closely related to history of the kingdom in the past. The remnants of noble values in physical forms, such as temple carvings and historical documents, historical buildings, tombstones, and bridges, can also provide knowledge about life, culture, and technology.

Through care and the willingness to preserve cultural heritage, we can maintain local wisdom values. This can be reflected in how we teach local wisdom to students in various ways, one of which is through visits to historical/cultural sites such as temples, museums, forts, historical caves, traditional houses, and others, or by providing an understanding of their cultural values, traditions, and ancestral history so that they comprehend and feel proud of the uniqueness possessed by local culture.Literature review should be written here with proper citation.

MATERIALS & METHODS

The type of research used in this study is Research and Development (R&D) or development research. Research and development methods can be defined as scientific methods for investigating, designing, creating, and testing the validity of the produced products. (Sugiyono, 2019). The research process refers to the research and development process that uses the term ADDIE (Analysis, Design, Development, Implementation, Evaluation). The ADDIE model was chosen because the purpose of this development research is to test the feasibility and effectiveness of modified Augmented Reality learning media.



Source (Branch, 2009)

The subjects of the trial in this study are the researcher as the media designer, media experts, and content experts. The object used in this research is a learning media created in the form of modified Augmented Reality. The source of data is obtained from assessments conducted by expert validators.

Data collection techniques are methods used to gather information or facts available in the field (Ramdhan, 2021). According to (Sudaryono, 2016), data collection techniques are strategies or methods employed by researchers to gather data. In this study, the data collection technique used is through questionnaires.

The questionnaire consists of a product validation questionnaire in the form of a material validation sheet and a media validation sheet conducted by expert validators. Media and material experts evaluate the modified Augmented Reality learning media using a Likert scale with a rating score from 1 to 4.

Table 1. Score Assessment

Score Assessment	Category
1	not good
2	fairly good
3	good
4	very good

$$\text{Average score} = \frac{\text{evaluation score}}{\text{total score of the statement}} \times 100$$

The criteria used in making media validation decisions can be seen in the table. The media can be used if the average validator rating falls within the eligible and highly eligible categories.

Table 2. Average Score Rating Interval

Percentage	Criteria
76% - 100%	Very Worthy
51% - 75%	Worthy
26% - 50%	Fairly Worthy
0 - 25%	Less Worthy

RESULT AND DISCUSSION

During the Natural and Social Sciences (IPAS) learning activities, various obstacles were encountered, especially with some materials that require students to think critically and materials that necessitate students to visually observe the taught content. In this situation, visualization and field visit activities become very important to help students understand the material in depth. This condition requires teachers to innovate in selecting appropriate learning media so that the process of delivering material can run effectively and efficiently, allowing all students to grasp and understand the lesson content well. Nevertheless, teachers often face obstacles due to the limited availability of electronic learning media, especially in certain topics of IPAS material that require a more complex visual approach. As a temporary solution, teachers can only rely on the use of PowerPoint, videos, and photos as the main learning media, even though these media are considered inadequate for illustrating more in-depth concepts in the IPAS material.

Another challenge faced by teachers in the learning process is that some students show less enthusiasm during Natural and Social Sciences (IPAS) lessons. This is evident from their behavior, which often shows a lack of focus when the lesson begins, preferring to play alone, or even appearing sleepy during the learning activities. As a result, students become less active in participating in the learning activities that take place in the classroom.

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Augmented Reality has advantages as an interactive, direct, and real learning medium for students, which can encourage them to use their imagination. Augmented Reality learning media can increase students' interest in learning. Augmented Reality Learning Media in training 21st-century thinking skills depends on ongoing learning activities. Research by Iqliya & Kustijono (2019) found that one way to train critical thinking skills is by using Augmented Reality media. Augmented Reality is very useful for enhancing the teaching and learning process because it has a visualization aspect that can stimulate students' motivation to concretely understand the material presented through three-dimensional visual representations. The use of Augmented Reality requires learning activities that can engage students to think scientifically and gain experience in finding answers to existing questions on their own. Such learning activities will help Augmented Reality as a medium in training 21st-century thinking skills. Augmented Reality as a learning medium requires learning activities that align with the characteristics of 21st-century learning to develop 21st-century skills.

Here are the results of the development of modified Augmented Reality learning media based on local wisdom:

1. Opening Page
   The opening page/image shows the name of the ARKASIA application (Augmented Reality Kearifan Indonesia), and a play button to proceed to the next menu page.

Figure 1. Cover Page

2. Main Menu Page
   The main menu page contains the menus available in the ARKASIA application, including the AR camera, materials, games, quizzes, and profiles. In the top left corner, there is a cross button that, when pressed, will present the option to exit the ARKASIA application. Observations/Results of your study should be written in this section along with tables/charts/figures etc.

Figure 2. Main Page of ARKASIA Media

3. AR Camera Page
   When pressing the AR camera menu, there are two submenu displays: instructions and AR camera. The instructions submenu contains usage guidelines for the available Augmented Reality camera submenu, making it easier for users to use the Augmented Reality camera submenu.

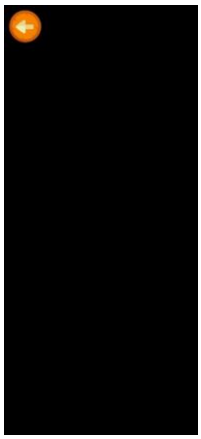


Figure 3. Augmented Reality Camera Page

4. Material Page
   The display on the material page consists of a scrollable page containing local wisdom material and supporting images. There is an audio button that, when activated, plays audio containing the material.

Figure 4. Pages of Material

5. Game Page
   Students can play the game page after learning a number of media-related materials. After finishing the earlier learning tasks, the game page serves as an icebreaker before moving on to the subsequent ones.
   On the game page, there is a simple game in the form of a piano game. The piano game is a game where users must

press each tile at the right time as the tiles slide from the bottom of the screen to the top. If you fail, the user will have five chances, and if all five chances are used up, the game will be lost. Letting the tiles reach the top of the screen will also cause the game to end. This game has 3 levels and each level has a different speed. There is a score that is calculated directly when the game is played.

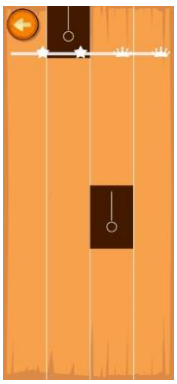


Figure 5. Game Page

6. Question Page
   The question page contains questions that serve as practice for students after studying the material on the learning media. The question page consists of 10 multiple-choice questions that, if answered correctly, will yield a score. If a question is answered incorrectly, a cross mark will appear, and if answered correctly, a checkmark will appear to help students identify correct and incorrect answers. At the end of the question page, the total score obtained by the students will appear. The questions can be repeated so that the students can learn from the incorrect answers.

Figure 6. Pages of Questions

7. Profile Page
   The profile page is a menu for information on the profile of the developer of the Augmented Reality-Based Learning Media Modification ARKASIA/Application Developer Profile.

The results of the assessment by subject matter experts regarding the feasibility of the material in the modified Augmented Reality learning media are presented in Table 3.

Table 3. Recapitulation of Expert Material Assessment Results

Number	Assessment Aspect	Score
	Content Suitability	20
	Presentation Suitability	23
	Linguistic Suitability	20
Total (R)		63
Maximum Total (SR)		72
Suitability Percentage (NP)		87,5%

Based on the Table 3, it is known that the learning media developed by the researchers

shows that the material in the modified Augmented Reality learning media is suitable for use in education. Subject matter experts provided a positive response with a score of 63 and a percentage of 87.5%, placing it in the very feasible category. Based on the assessment obtained, the modified Augmented Reality learning media is suitable for testing with well-prepared and ready-to-use materials and questions. The assessment results from media experts regarding the feasibility of the modified Augmented Reality learning media as presented in Table 4.

Number	Assessment Aspect	Score
	Media Aspect	18
	Display Aspect	17
	Usage Aspect	11
	Utility Aspect	6
Total (R)		52
Maximum Total (SR)		60
Feasibility Percentage (NP)		86,7%

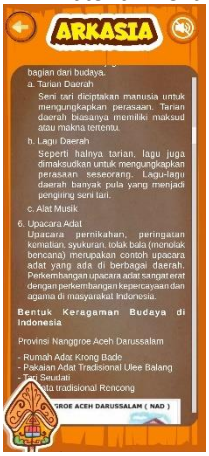
Based on the Table 4, it is known that the learning media developed by the researcher shows that the modified Augmented Reality learning media is suitable for use in education. Media experts gave a positive response with a score of 52 and a percentage of 86.7%, placing it in the very feasible category. The feedback and suggestions received are as follows:

1. The audio in the material is separated so that students can choose which audio to play.
2. The background on the material page is adjusted to be more contrasting and appealing. Write

Revision of Learning Media

After evaluation by subject matter experts and media experts, the researcher revised the product according to the suggestions and feedback from the subject matter experts and media experts. After the improvements were made, the media was declared ready for testing. The results of the modified revision of the Augmented Reality learning media are presented in Table 5.

Number	Suggestions and Feedback	Improvement
1.	Changing the audio from having all materials combined into one audio to being separated into several parts	• Before Revision 1. The audio was combined, so if you wanted to play the previous material, you had to start from the beginning 2. You could not choose which material you wanted listen to  • After Revision 1. The audio has been separated so that the material can be played as desired

		
2.	Improving the background on the material page to make it more contrasting and attractive	• Before Revision 1. There is only one background theme in the material menu  • After revision 1. There are several themes in the background of the material menu so it is not monotonous 

Based on the results, it shows that the modified Augmented Reality learning media product developed is suitable for implementation in the IPAS learning process, especially for local wisdom material.

CONCLUSION

Based on the product assessment results by the validators, the modified Augmented Reality learning media developed received a percentage of 90% for the media aspect; 85% for the display aspect; 92% for the usability aspect; and 75% for the usefulness

aspect. The total score from the average of each aspect was 52, resulting in an ideal percentage of 86.7%, categorizing the product as very suitable for use in learning. The feasibility of the modified Augmented Reality learning media with local wisdom content, based on expert assessment, has been deemed suitable for use in IPAS learning, and can thus be utilized in educational activities.

Declaration by Authors
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