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Development of FARSIA Learning Media of Learning Outcomes of Grade V Elementary School Students

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Abstract: This study aimed to examine the feasibility, practicality, and effectiveness of FARSIA learning media for fifth-grade elementary school students in learning IPAS (Science and Social Studies), particularly on the water cycle. The study employed a research and development approach involving ten stages: problem identification, data collection, product design, design validation, design revision, product testing, product revision, product validation, evaluation and final revision, and dissemination. Data were collected through observations, interviews, questionnaires, documentation, and learning achievement tests. The feasibility analysis indicated that FARSIA learning media was highly feasible for use in learning activities, with validation scores of 94% from media experts and 85% from material experts. The practicality analysis also demonstrated positive results. Responses from 20 students yielded a total score of 744, corresponding to a practicality percentage of 93%, indicating that the media was practical and engaging for students. In terms of effectiveness, the experimental class achieved a mean posttest score of 88.75 (SD = 9.926), compared with 70.25 (SD = 10.818) for the control class. The N-gain score was 0.79 for the experimental class, categorized as high, and 0.49 for the control class, categorized as moderate. These findings indicate that FARSIA learning media is feasible, practical, and effective for supporting the teaching and learning of the water cycle among fifth-grade elementary school students. The study recommends optimizing the use of FARSIA media in classroom instruction, providing adequate technological facilities and Wi-Fi access in schools, and further developing the media to enable broader accessibility and application.

Keywords: FARSIA learning media; learning outcomes; elementary school students; research and development; water cycle

1. Introduction

Learning is a fundamental process through which students acquire knowledge, skills, attitudes, and values through meaningful educational experiences. Effective learning at the elementary school level requires appropriate instructional strategies and learning resources that can facilitate students' understanding of concepts, particularly those that are abstract or difficult to observe directly. Learning media play an important role in communicating information and instructional messages in ways that can support the achievement of learning objectives (Arsyad, 2014). Appropriate learning media can therefore enhance students' engagement, facilitate conceptual understanding, and create more meaningful learning experiences.

The implementation of the Merdeka Curriculum in Indonesia emphasizes meaningful, student-centered learning and encourages the integration of technology to improve the quality of education (Kemendikbudristek, 2024). Nevertheless, the implementation of these principles at the elementary school level remains challenging. Many teachers continue to rely predominantly on conventional instructional approaches, including lectures and textbook-based learning, which may provide limited opportunities for students to actively engage with learning content. This situation is particularly relevant

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to IPAS (Ilmu Pengetahuan Alam dan Sosial) learning, in which students are required to understand scientific and social phenomena through observation, interpretation, and conceptual reasoning. One topic that may present difficulties for fifth-grade students is the water cycle because its processes, including evaporation, condensation, precipitation, and collection, involve phenomena that occur continuously and cannot always be directly observed in their entirety. Consequently, learning resources that can provide clear visual representations and interactive learning experiences are needed to facilitate students' understanding of the water cycle.

The use of interactive and technology-based learning media has increasingly been recognized as an approach for improving students' engagement and learning outcomes. Previous research has indicated that interactive multimedia can be valid, practical, and effective in supporting students' understanding of learning content (Baharuddin et al., 2020). Similarly, digital flipbooks provide opportunities to integrate various forms of content, including text, images, audio, and video, thereby creating more engaging learning experiences (MZ & Syafi'i, 2021). Augmented Reality (AR) technology offers an additional opportunity to represent learning content through interactive three-dimensional visualizations, allowing students to explore concepts that may otherwise be difficult to visualize through conventional instructional materials (Cawood & Fiala, 2008). The integration of these technologies may therefore provide a more interactive and visually supported learning environment for elementary school students.

Despite the potential of digital and interactive learning technologies, there remains a need for learning media specifically designed to support the teaching of the water cycle in IPAS at the elementary school level. The integration of flipbook technology with Augmented Reality may provide a distinctive learning experience by combining accessible digital content with interactive visual representations. Such an approach has the potential to address the limitations of conventional learning media while supporting students in understanding the sequence and relationships among the processes involved in the water cycle. Therefore, the development of FARSIA (Flipbook based on Augmented Reality) learning media is considered relevant to the current needs of technology-integrated elementary education.

Accordingly, this study focused on the development of FARSIA learning media for fifth-grade elementary school students learning the water cycle in IPAS. Specifically, the study examined the feasibility, practicality, and effectiveness of the developed media. The feasibility assessment was conducted to determine whether the content and media components met the required standards for instructional use, while the practicality assessment examined the usability and students' responses to the developed media. The effectiveness assessment was conducted to determine whether the use of FARSIA learning media could improve students' learning outcomes. The findings are expected to contribute to the development of innovative technology-based learning media for elementary education and provide teachers with an alternative instructional resource for teaching abstract scientific concepts.

2. Methodology

This study employed a research and development (R&D) method aimed at developing and evaluating FARSIA learning media (Flipbook based on Augmented Reality) for fifth-grade elementary school students. The development procedure followed Sugiyono's R&D model, which consists of ten stages: problem identification, data collection, product design, design validation, design revision, product testing, product revision, product validation, final revision and evaluation, and dissemination.

The participants of this study were fifth-grade elementary school students. Data were collected using observation, interviews, questionnaires, documentation, and learning outcome tests. Expert validation sheets were used to assess the feasibility of the learning media, while student response questionnaires were used to evaluate its practicality. To measure effectiveness, pre-test and post-test were administered to both experimental and control classes.

Data analysis was conducted using descriptive quantitative and qualitative techniques. The feasibility and practicality of the media were analyzed using percentage scores, while effectiveness was determined by comparing post-test results and N-gain values between the experimental and control groups. The results of the analysis were used to determine the feasibility, practicality, and effectiveness of the FARSIA learning media.

3. Results

The Table 1 shows the results of the Shapiro-Wilk normality test. In this test, data is declared normally distributed if the significance value is greater than 0.05. The results of the Shapiro-Wilk 27 data normality test show that the significance values are 0.50; 0.51; 0.195 and 0.132, respectively. These values are greater than 0.05. From these two tests, the results have met the requirements, meaning that the data obtained are normally distributed. It can be concluded that the test results for the experimental class and the control class are normally distributed.

Table 1: Normality Test of Pretest and Posttest of Control Class and Experimental Class

	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Hasil	Control Class Pretest	.173	20	.120	.929	20	.150
	Control Class Posttest	.159	20	.198	.929	20	.151

Experimental Class Pretest	.158	20	.200*	.935	20	.195
Experimental Class Posttest	.137	20	.200*	.926	20	.132

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

The basis for decision making for this homogeneity test is that if the sig value > 0.05 then the data distribution is homogeneous, but conversely if the sig value < 0.05 then the data distribution is not homogeneous as presented in Table 2. The learning outcomes of fifth grade students of SDN 1 Genjahan as the experimental class and SDN 1 Jiken as the control class show a sig value > 0.0005. So it can be concluded that the school variant data used for the research sample is homogeneously distributed.

Table 2: Homogeneity Test

	Levene Statistic	df1	df2	Sig.
Based on Mean	.579	1	38	.451
Based on Median	.583	1	38	.450
Based on Median and with adjusted df	.583	1	32.866	.451
Based on trimmed mean	.568	1	38	.456

The results of the independent sample t-test were conducted by looking at the Equal variances assumed value. This was done because the data was homogeneous as illustrated in Table 3. The significance value obtained or Sig (2-tailed) was 0.000 < 0.05. This means that H1 is accepted, there is a significant difference in the average between the posttest of the experimental class and the posttest of the control class. The description of the results of the independent sample t-test is in the following table.

Table 3: Comparison Table of Control and Experimental Classes

Class	N	Mean	Std. Deviation	Std. Error Mean
Posttest Control Class	20	70.25	10.818	2.419
Posttest Experimental Class	20	88.75	7.926	1.772

The Table 4 shows the control class's posttest average of 70.25 with a standard deviation of 10.818. Meanwhile, the experimental class's posttest average was 88.75 with a standard deviation of 9.926. This means that learning using the developed FARSIA learning media was significantly better.

Table 4: Independent Sample T-test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
								95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Hasil	Equal variances assumed	.579	.451	-6.169	38	.000	-18.500	2.999	-24.571	-12.429
	Equal variances not assumed			-6.169	34.836	.000	-18.500	2.999	-24.589	-12.411

The criteria for the effectiveness of the FARSIA learning media are if the t-test result for the pretest score has a Sig. (2-tailed) value > α = 0.05; and the posttest score is a Sig. (2-tailed) value < α = 0.05. There was a difference in posttest learning outcomes between the control and experimental classes, with the experimental class's posttest results being higher than the control class's. Therefore, the FARSIA learning media for the water cycle in science is effective in improving the learning outcomes of fifth-grade elementary school students.

Based on the n-gain, the experimental class's n-gain was 0.79, categorized as high, while the control class's n-gain was 0.49, categorized as medium. The results obtained show that the n-gain of the experimental class is greater than the n-gain of the control class. Therefore, it can be stated that the FARSIA learning media is more effective than the conventional (one-way) learning method.

4. Discussion and Implications

The findings demonstrate that FARSIA, an Augmented Reality-based flipbook learning medium, is feasible, practical, and effective for supporting fifth-grade students' learning of the water cycle in IPAS. The feasibility assessment produced high ratings from both media and material experts, with an overall mean of 94% for media validation and 85% for material validation. These findings indicate that the developed medium satisfies the essential requirements related to design, usability, content presentation, and instructional suitability. The high feasibility ratings are consistent with previous studies reporting that flipbook and Augmented Reality-based learning media can provide suitable digital learning resources for elementary education. The findings further suggest that integrating visual, interactive, and digital elements into learning media can enhance the presentation of scientific concepts that may be difficult for students to understand through conventional instructional materials alone.

The expert validation process also provided important information for improving the quality of FARSIA. Media experts recommended enlarging selected images to improve the visualization of activities and phenomena associated with the water cycle, particularly those related to environmental conditions. Material experts recommended strengthening the integration of Problem-Based Learning, improving the organization and sequencing of the learning content, using appropriate scientific language, and adding evaluation activities. The researchers subsequently revised the media by reorganizing the content according to learning sessions, improving the presentation of the material, and incorporating additional evaluation questions. These revisions demonstrate that expert validation should not be viewed solely as a procedure for determining whether a product meets feasibility criteria but also as an important mechanism for improving the pedagogical and technical quality of instructional media.

The practicality findings provide further evidence of the potential of FARSIA for classroom implementation. The teacher questionnaire produced a score of 98%, while the responses from 20 students resulted in a score of 93%. These findings indicate that both teachers and students perceived FARSIA as easy to use, engaging, and appropriate for classroom learning. From the teachers' perspective, the high score suggests that the media can be integrated into instructional activities without substantial technical or administrative difficulties. From the students' perspective, the high response score indicates positive acceptance of the learning medium and suggests that its interactive features can contribute to a more engaging learning experience.

The practicality of FARSIA can be associated with its combination of flipbook and Augmented Reality features. The flipbook format enables learning content to be presented in an organized digital form, while the AR component provides additional visual representations of the water cycle. Such visualization is particularly relevant to elementary science learning because students may have difficulty constructing an accurate mental representation of processes that occur sequentially and cannot be observed directly in their entirety. The opportunity to interact with visual representations may therefore help students connect textual explanations with observable representations of the learning content. Nevertheless, the high practicality scores should be interpreted primarily as evidence of usability and user acceptance rather than as direct evidence that the media caused improvements in learning outcomes. The relationship between the use of FARSIA and learning achievement is more appropriately considered through the effectiveness findings.

The effectiveness analysis provides evidence that FARSIA can support improvements in students' learning outcomes. The experimental class obtained a mean posttest score of 88.75 (SD = 9.926), whereas the control class obtained a mean posttest score of 70.25 (SD = 10.818). In addition, the N-gain score for the experimental class was 0.79, categorized as high, compared with 0.49 for the control class, categorized as moderate. The higher N-gain value in the experimental class indicates greater improvement in learning outcomes among students who used FARSIA than among those in the control condition. These findings suggest that the combination of interactive digital content and three-dimensional visualization may facilitate students' understanding of the water cycle.

The effectiveness findings are also broadly consistent with previous research indicating that Augmented Reality-based learning media can support students' conceptual understanding and learning outcomes. The interactive visualization provided by AR may help transform abstract scientific concepts into more concrete representations, enabling students to observe relationships among different stages of the water cycle. In the context of FARSIA, the AR component is integrated into a flipbook-based learning environment, allowing students to access the content sequentially while interacting with three-dimensional representations. This combination provides a potentially useful instructional approach because it integrates conventional visual representations with interactive digital experiences. However, claims regarding improved motivation, science process skills, or cognitive mechanisms should not be made solely on the basis of posttest and N-gain results unless these variables were directly measured in the study. Therefore, the present findings provide strongest support for improvements in learning outcomes rather than for broader claims concerning motivation or science process skills.

The findings have several implications for educational practice. For teachers, FARSIA can serve as an alternative technology-enhanced learning resource for teaching the water cycle and other scientific concepts that require visualization. Its use may be particularly appropriate when teachers seek to move beyond text- and lecture-based instruction toward more interactive and student-centered learning. Teachers should nevertheless provide appropriate guidance on the use of the AR features and integrate the media with suitable instructional activities rather than treating the technology as a substitute for pedagogical interaction. The incorporation of Problem-Based Learning elements, as

suggested during the validation process, may further strengthen the instructional value of FARSIA by encouraging students to connect the water cycle with environmental issues and everyday situations.

At the school level, successful implementation of FARSIA requires adequate technological infrastructure, including compatible digital devices and reliable internet or Wi-Fi access where these are necessary for accessing the media. The study also highlights the importance of teachers' digital competence and technical readiness. Although the practicality results were highly positive, broader implementation may encounter differences in the availability of devices, internet connectivity, and teachers' familiarity with Augmented Reality technology. These conditions should therefore be considered when adopting FARSIA in different school contexts.

The development of FARSIA also has implications for educational innovation and digital transformation under the Merdeka Curriculum. The integration of flipbook and Augmented Reality technologies supports a more interactive and student-centered learning environment and provides an example of how digital resources can be incorporated into elementary education. At the same time, technology integration should be accompanied by appropriate instructional planning, teacher support, and infrastructure provision. The findings therefore suggest that the success of technology-based learning media depends not only on the quality of the digital product but also on the readiness of the educational environment in which it is implemented.

Overall, the study indicates that FARSIA has strong potential as an innovative learning medium for teaching the water cycle to fifth-grade elementary school students. Its high feasibility and practicality ratings, together with the higher learning gains observed in the experimental class, provide empirical support for its continued use and further development. Future development could focus on expanding the range of IPAS topics, improving accessibility across different devices, strengthening interactive and problem-based learning components, and testing the media with larger and more diverse samples. Further studies could also employ more rigorous experimental designs and examine longer-term learning outcomes to establish stronger evidence regarding the effectiveness and broader applicability of FARSIA.

5. Conclusion

This study concludes that FARSIA learning media (Flipbook based on Augmented Reality) is feasible, practical, and effective for use in IPAS learning on the water cycle topic for fifth-grade elementary school students. The results of expert validation, student responses, and learning outcome tests indicate that the use of FARSIA learning media improves students' understanding and learning outcomes compared to conventional learning methods. Therefore, FARSIA learning media can be recommended as an innovative and technology-integrated learning medium to support effective learning in elementary schools.

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Conflict of Interest

The author declare there is no conflict of interest.

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