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Development of Android-Based Interactive Multimedia in IPAS Subject for Grade V Elementary School

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Abstract: Learning Science and Social Studies (IPAS) in elementary schools still faces problems due to the dominance of conventional teaching methods, which result in low student engagement and difficulties in understanding abstract concepts. This condition highlights the need for more interactive learning media that align with students' characteristics. This study aimed to develop Android-based interactive multimedia for the IPAS subject in Grade V elementary school and to examine its validity, practicality, and effectiveness. The study employed a research and development approach using the ADDIE model. Data were collected through expert validation sheets, teacher and student practicality questionnaires, and learning outcome tests. The validation results showed that the developed multimedia was highly valid, with content validity of 92% and media validity of 88%. Practicality testing indicated that the product was very practical, obtaining scores of 83% from teachers and 80.2% from students. Effectiveness was measured by comparing pre-test and post-test scores, which increased from an average of 58.50 to 81.00, with an N-Gain value of 0.55 (moderate category). The findings indicate that the Android-based interactive multimedia is valid, practical, and effective in improving students' learning outcomes in elementary school IPAS learning.

Keywords: Android; Interactive multimedia; IPAS; Learning

Introduction

Education plays a fundamental role in developing human resources and improving a nation's quality. In Indonesia, primary education serves as a crucial foundation for shaping students' basic knowledge, skills, and learning attitudes. However, learning implementation at the elementary school level, particularly in the Science and Social Science (IPAS) subject, still encounters significant challenges. One of the main issues is students' difficulty in understanding abstract concepts, which often results from the dominance of conventional learning approaches such as textbooks and teacher-centered lectures. These approaches tend to limit students' active involvement and reduce their learning motivation (Listiana et al., 2024; Rosiyani et al., 2024). Previous studies have also confirmed that traditional teaching methods are frequently insufficient for facilitating students' conceptual understanding, especially when dealing with complex and abstract material (Meylovia & Julianto, 2023).

Empirical conditions at SD Negeri 14 Sungai Guntung further illustrate this problem. Observations and interviews with the IPAS teacher revealed that learning activities still rely heavily on printed materials and verbal explanations, with minimal use of innovative learning media. As a result, students easily experience boredom and disengagement during lessons. This situation is reflected in students' learning outcomes during the first semester of the 2023/2024 academic year, where the average IPAS score was only 55.3. This score indicates that students' achievement is still below the expected learning standards, suggesting that their conceptual understanding has not yet reached the minimum level required for optimal learning

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outcomes (Istiqomah et al., 2024; Maielfi & Ardiana, 2023; Rusidi, 2018).

In contrast to these learning conditions, most students are already familiar with Android devices in their daily lives. Unfortunately, this technological familiarity has not been optimally utilized in classroom learning. Educational technology, particularly Android-based interactive multimedia, has been widely recognized as having the potential to enhance student engagement and conceptual understanding. Interactive multimedia that integrates visual elements, animations, audio, and user interaction can help transform abstract concepts into more concrete and comprehensible forms (Diyana et al., 2019; Amiroh, 2019; Junpahira & Pahlevi, 2023; Hidayah et al., 2023). In addition, technology-supported learning media can increase students' motivation, learning interest, and independence in learning (Miasari et al., 2022; Purba & Saragih, 2023).

Several studies have highlighted the effectiveness of interactive multimedia in improving learning quality; however, many of these studies focus on general multimedia use or learning contexts that are not specifically designed for Android-based platforms at the elementary school level, particularly for IPAS subjects. Moreover, limited research has addressed the development of Android-based interactive multimedia that can be accessed offline, aligned with the elementary school curriculum, and equipped with interactive features such as animations and quizzes to support active learning. This condition indicates a clear research gap that needs to be addressed. According to Zatnika & Rochintaniawati (2023), multimedia learning tools that are systematically designed and contextually relevant can significantly deepen students' understanding and enhance classroom interaction.

Therefore, this study is important and necessary as it aims to fill this gap by developing Android-based interactive multimedia specifically designed for IPAS learning in grade V elementary school. The novelty of this research lies in the development of curriculum-aligned, offline-accessible interactive multimedia that integrates animations and formative quizzes to support students' understanding of abstract IPAS concepts. Previous studies have shown that technology-based learning media can improve students' learning outcomes (Hafiedz & Nurhamidah, 2023; Oktaviani et al., 2024); however, this research emphasizes contextual needs analysis and practical implementation in real classroom settings. Thus, this study aims to develop Android-based interactive multimedia for IPAS learning in grade V elementary school to enhance student engagement, improve conceptual understanding, and ultimately improve learning outcomes by utilizing technology that is already familiar to students.

Method

This study employed a Research and Development (R&D) method using the ADDIE model, which consists of Analyze, Design, Develop, Implement, and Evaluate stages (Sugiyono, 2017; Pribadi, 2017; Angko & Mustaji, 2017).

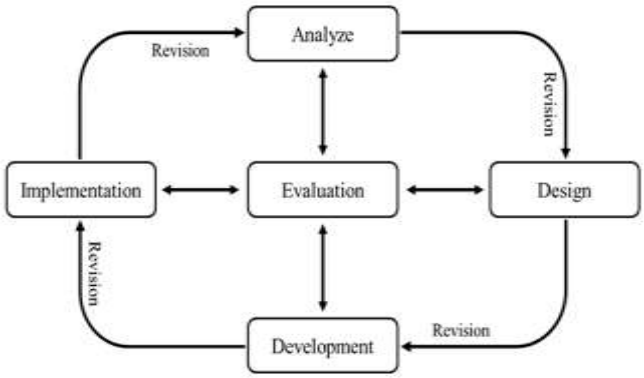

Figure 1. ADDIE model development procedure chart

Based on Figure 1, this study employed the ADDIE development model, consisting of Analyze, Design, Development, Implementation, and Evaluation stages, with ongoing evaluation and revision at each stage. The Analyze stage was conducted through classroom observations, teacher interviews, and analysis of Grade V student characteristics to identify learning problems and needs. The results showed that IPAS learning on the topic of human senses still relied on conventional media, while students were familiar with Android devices that had not been optimally utilized.

The Design stage involved formulating learning objectives, developing a storyboard, selecting multimedia elements, designing application navigation, and preparing research instruments, including pre-test, post-test, and practicality questionnaires. The Development stage focused on producing Android-based interactive multimedia using Articulate Storyline. The product was validated by content, media, and language experts, and revisions were made based on validation results.

The Implementation stage was conducted through a limited trial involving 10 Grade V students at SD Negeri 14 Sungai Guntung to examine the practicality of the media based on teacher and student responses. The Evaluation stage aimed to determine the effectiveness of the product by comparing pre-test and post-test scores using N-gain analysis (Hake, 1999). The evaluation results were used to finalize the developed interactive multimedia.

Result and Discussion

Result

This research produces Android-based interactive multimedia for the subject of science for fifth grade elementary school students which is developed using the ADDIE model (Analyze, Design, Develop, Implement, Evaluate), and the results of the research prove that the Android-based interactive multimedia developed is valid, practical, and effective in improving the science learning outcomes of fifth grade elementary school students.

Table 1. The Results of the material validation

Variable Criteria	Variable average
Content Suitability	4.5
Presentation Suitability	4.8
Total	9.3
Percentage	92%
Criteria	Highly valid

Table 1 presents the results of material validation for the developed interactive multimedia. The Content Suitability scored 4.5 and Presentation Suitability scored 4.8, with a total of 9.3 or 92%. This percentage is categorized as highly valid, indicating that the learning content is well-aligned with the objectives and presented in a clear, engaging manner.

Table 2. The Results of the media validation

Variable Criteria	Variable average
Ease of Use	4.7
Visual Appearance	4.2
Media Presentation	4.2
Benefits of Media	5
Total	18.0
Percentage	88%
Criteria	Highly valid

Table 2 shows the media validation results. Ease of Use scored 4.7, Visual Appearance 4.2, Media Presentation 4.2, and Benefits of Media 5. The total score of 18.0 equals 88%, categorized as highly valid. This demonstrates that the media is user-friendly, visually appealing, well-presented, and highly beneficial for learning.

Table 3. Results of teacher practicality trials

Variable Criteria	Variable average
Ease	4.2
Material Presentation	4.7
Appearance	4.4
Effects on Learning Strategies	4.3
Total	17.6
Percentage	83%
Criteria	Very Practical

Table 4. Results of student practicality trials

Variable Criteria	Variable average
Ease	4.03
Material Presentation	3.8
Appearance	3.9
Effects on Learning Strategies	4.2
Total	16.03
Percentage	80.2%
Criteria	Very Practical

Based on the results of the teacher practicality test in Tables 3 and 4, the scores were 17.6 (88%) for teachers and 16.03 (80.2%) for students, both categorized as very practical. The highest aspect for teachers was material presentation (4.7), while for students it was ease of use (4.03). These results confirm that the Android-based interactive multimedia is easy to use, engaging, and supports the learning process.

Table 5. N-Gain test results

Information	Pre-test	Post-test
Amount	585	810
average	58.50	81.00
N-gain		0.55
N-gain percentage		54.53%
Category		Currently

Based on the N-Gain test results, the average score increased from 58.50 (pre-test) to 81.00 (post-test) with an N-Gain of 0.55 (54.53%), categorized as moderate, indicating an improvement in students' understanding.

Discussion

The results of the study show that the developed Android-based interactive multimedia meets the criteria for content and presentation feasibility. The learning content is aligned with the objectives, presented clearly, and packaged attractively, thereby facilitating students' conceptual understanding. This finding aligns with Sugiyono (2017), who states that expert validation ensures that the product matches learning needs and enhances its potential for successful use in the classroom.

In terms of practicality, both teachers and students found the media easy to use, engaging, and supportive of the learning process. It's simple yet interactive design keeps students focused, while features such as animations, quizzes, and evaluations encourage active participation throughout learning activities. According to Sukardi (2012), ease of use and perceived usefulness by users are key indicators of a learning media's success.

The product's effectiveness is reflected in the improvement of students' learning outcomes after using the interactive multimedia. Concepts that were

previously difficult to understand could be explained visually and interactively, helping students develop a deeper understanding. This result is consistent with (Gusrianto & Rahmi, 2022; Iswara & Cahdriyana, 2022; Maielfi & Ardiana, 2023; Marta et.al, 2025), who state that technology-based media can enhance the quality of learning and academic achievement.

Overall, the combination of high validity, ease of use, and the ability to improve learning outcomes indicates that this Android-based interactive multimedia is suitable as an alternative learning medium for the IPAS subject. The integration of text, images, animations, audio, and interactive quizzes in a single application provides an engaging and flexible learning experience that promotes student independence, as emphasized by Muharani & Kunci (2024), Oktaviani et al. (2024), and Veza & Nurlinda (2021).

Conclusion

This study concludes that the developed Android-based interactive multimedia for Grade V IPAS learning is valid, practical, and effective, as indicated by high expert validation results, positive user responses, and improved student learning outcomes based on N-gain analysis. The multimedia effectively supports students' understanding of abstract concepts through interactive and visual features. Therefore, this product contributes to enhancing the quality of elementary science learning by optimizing the use of Android-based technology.

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Conceptualization, methodology, R. and F.Y.J.; validation, Z.Z. and Z. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest
The authors declare no conflict of interest.

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