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Analysis of the Needs of Local Wisdom-Based Augmented Reality Flipbooks for Popular Scientific Article Reading Skills

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ABSTRACT
Reading skills in popular scientific articles is an essential ability in strengthening students' literacy in the digital era because it requires the ability to understand information critically, analytically, and contextually. However, in the practice of learning Indonesian at the junior high school level, students still experience various difficulties in understanding the content of popular scientific articles, both in terms of the main idea, text structure, and their relationship to the context of daily life. One of the factors that causes this problem is the limited use of learning media that is innovative, interactive, and relevant to local technological and cultural developments. Responding to these problems, this study aims to analyze the needs of teachers, students, and curriculum as the basis for the development of learning media in the form of Augmented Reality (AR)-based Flipbooks that are integrated with local wisdom in Indonesian learning. This study uses a mixed methods approach with data collection techniques in the form of interviews, observations, and questionnaires involving teachers and 31 students at SMP Negeri 7 Padang. The results of the study show that teachers are still dominant in using conventional learning media and need technology-based media that is able to increase student involvement in learning. Meanwhile, students showed a high level of need, which was 78.8%, for digital media that was interesting, easily accessible, and contextual with local culture. The curriculum analysis also shows that learning to read popular scientific articles in the Merdeka Curriculum has been relevant to learning outcomes, but has not fully integrated the value of local wisdom and AR technology. Therefore, the development of Flipbook AR based on local wisdom is a strategic step in realizing meaningful, interactive, and culture-based learning, as well as being an important foundation for the design and development stages in the ADDIE development model.

Keywords: *local wisdom, augmented reality flipbook, popular scientific articles, reading skills*

Analisis Kebutuhan *Flipbook Augmented Reality* berbasis Kearifan Lokal untuk Keterampilan Membaca Artikel Ilmiah Populer

ABSTRAK
Keterampilan membaca artikel ilmiah populer merupakan kemampuan esensial dalam penguatan literasi siswa di era digital karena menuntut kemampuan memahami informasi secara kritis, analitis, dan kontekstual. Namun, dalam praktik pembelajaran Bahasa Indonesia di tingkat sekolah menengah pertama, siswa masih mengalami berbagai kesulitan dalam memahami isi artikel ilmiah populer, baik dari segi gagasan utama, struktur teks, maupun keterkaitannya dengan konteks kehidupan sehari-hari. Salah satu faktor yang menyebabkan permasalahan tersebut adalah keterbatasan penggunaan media pembelajaran yang inovatif, interaktif, serta relevan dengan perkembangan teknologi dan budaya lokal. Menanggapi permasalahan tersebut, penelitian ini bertujuan untuk menganalisis kebutuhan guru, siswa, dan kurikulum sebagai dasar pengembangan media pembelajaran berupa Flipbook berbasis Augmented Reality (AR) yang terintegrasi dengan kearifan lokal pada pembelajaran Bahasa Indonesia. Penelitian ini menggunakan pendekatan mixed methods dengan teknik pengumpulan data berupa wawancara, observasi, dan angket yang melibatkan guru serta 31 siswa di SMP Negeri 7 Padang. Hasil penelitian menunjukkan bahwa guru masih dominan menggunakan media pembelajaran konvensional dan membutuhkan media berbasis teknologi yang mampu meningkatkan keterlibatan siswa dalam pembelajaran. Sementara itu, siswa menunjukkan tingkat kebutuhan yang tinggi, yaitu sebesar 78,8%, terhadap media digital yang menarik, mudah diakses, dan kontekstual dengan budaya lokal. Analisis kurikulum juga menunjukkan bahwa pembelajaran membaca artikel ilmiah populer dalam Kurikulum Merdeka telah relevan dengan capaian pembelajaran, namun belum sepenuhnya mengintegrasikan nilai kearifan lokal dan teknologi AR. Oleh karena itu, pengembangan Flipbook AR berbasis kearifan lokal menjadi langkah strategis dalam mewujudkan pembelajaran yang bermakna, interaktif, dan berbasis budaya, serta menjadi landasan penting bagi tahap design dan development dalam model pengembangan ADDIE.

Keywords: Flipbook augmented reality, *kearifan lokal, keterampilan membaca, artikel ilmiah populer*

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INTRODUCTION

The ability to read popular scientific articles is a crucial competency in strengthening student literacy in the information age (Afnita et al., 2021; Amir et al., 2024; Caffrey et al., 2022; Park et al., 2021). This skill helps students understand, analyze, and critically evaluate scientific information, thereby improving their thinking and decision-making (Afnita et al., 2023; Amir, 2019, 2023; Plummer et al., 2022). However, preliminary observations indicate that junior high school students' reading skills for popular scientific articles remain low. Students tend to read texts only literally, are less able to identify main ideas, and are not yet accustomed to drawing critical conclusions from reading content (Afnita, 2022; Aukerman & Chambers Schuldt, 2021; Deane, 2020). This situation is exacerbated by the limited availability of innovative learning media and the lack of contextual and engaging reading resources for students. This situation drives the need to explore innovative learning media that can increase engagement, motivation, and reading skills in popular scientific articles. Augmented Reality (AR)-based flipbooks are one relevant alternative solution. The choice of AR is supported by recent findings showing that AR can increase learning engagement, motivation, and conceptual understanding in K–12 students (Ghinaya et al., 2024; Nabila et al., 2025). AR enables the visualization of abstract concepts, multimodal presentation, and an immersive learning experience. Furthermore, the incorporation of local wisdom into learning media has been shown to strengthen the relevance of learning, increase the connection between material and students' life experiences, and foster cultural identity (Amir et al., 2019; Nugraha et al., 2025).

Previous research has shown that the use of AR in learning has demonstrated positive results, such as improved conceptual understanding, learning engagement, and critical thinking skills (Alkhabra et al., 2023; Dutta et al., 2023). Research conducted by Alzahrani (2020); Fayzullina et al. (2023), recommends the need for local context-based research to increase the relevance and sustainability of AR implementation in schools. Research by Fadhilah et al. (2025); Smith et al. (2022), shows that digital media containing local wisdom can increase students' reading interest by up to 30%, but most research still focuses on learning STEM concepts or narrative material, not on reading skills for popular scientific articles. Several AR flipbook developments have been carried out by Rahmawati & Purwati (2025); Totti & Nuryanto (2024), but research integrating AR, flipbooks, and local wisdom to improve reading skills for popular scientific articles at the junior high school level is rare. This research gap is the basis for conducting this study.

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Mardiantiningsih et al., 2024; Syar et al., 2023; Yulia & Suttrisno, 2024). Yet, integrating local wisdom can make material more contextual, relevant, and meaningful for students, thus increasing learning motivation.

This research positions itself as an effort to address this gap by developing innovative learning media in the form of local wisdom-based AR flipbooks. The contribution of this research lies in providing a comprehensive empirical basis for media development, which is expected to significantly improve students' reading skills in popular scientific articles while fostering an appreciation for local culture.

Based on this description, this study seeks to address the questions of teacher and student needs for digital technology-based popular scientific article learning media, as well as the relevant curriculum requirements for the development of AR flipbooks based on local wisdom. The purpose of this study is to describe the results of this needs analysis as a basis for developing AR flipbooks that are appropriate to the curriculum and student characteristics. Therefore, the research hypothesizes that the results of this needs analysis will demonstrate the need for innovative AR-based learning media that is curriculum-appropriate, contextual, and engaging for students, thereby helping to improve their reading skills in popular scientific articles.

The selection of SMP Negeri 7 Padang as the research location was based on initial observations indicating low reading skills in popular scientific articles and a lack of technology-based learning media. Furthermore, this school has students with diverse characteristics, making it representative of the media development needs in Padang City. This research is also relevant to the national context, given that Indonesia's reading literacy achievement remains low according to the PISA 2022 report. Therefore, innovative efforts based on local wisdom are needed to improve students' literacy skills (Aini et al., 2024; Rasyid et al., 2023; Setyorini et al., 2022).

METHOD

This research uses a mixed methods approach. According to Creswell (2009), this approach systematically combines qualitative and quantitative methods to gain a more comprehensive understanding. This approach was chosen because the research aimed to provide an in-depth overview of the needs of teachers, students, the curriculum, and student characteristics, while also quantitatively verifying this data (Popa et al., 2020; Schiepe-Tiska et al., 2021; Tondeur et al., 2020).

The data collection method used was a survey. Sugiyono (2013) explains that a survey is a method for obtaining data on beliefs, opinions, characteristics, behaviors, and relationships between variables within a specific population. Through this method, information was collected directly from teachers and students regarding the need for digital technology-based popular scientific article learning media and their expectations for the development of AR flipbooks based on local wisdom (Wiyanarti et al., 2024; Yusmar et al., 2024).

The research model used refers to the ADDIE development model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation (Martatiyana et al., 2023; Stracke, 2019; Razak, 2017). However, this research only conducted the Analysis stage because the focus was on exploring needs as a basis for developing learning media.

The Analysis stage encompasses three main aspects: needs analysis and curriculum analysis. The needs analysis was conducted through observation, interviews, and questionnaires with eighth-grade Indonesian language teachers at SMP Negeri 7 Padang. The goal was to identify the limitations of the media used in teaching reading skills, particularly in popular scientific articles, so that more innovative and relevant media development solutions could be formulated.

Student needs analysis was conducted using questionnaires and interviews to determine preferred and needed media, ensuring that the developed media could improve their reading interest

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and learning outcomes. Curriculum analysis was conducted by identifying Learning Outcomes (CP), elements, and learning objectives according to the Independent Curriculum to ensure the designed media was relevant and practical for teachers.

RESULT

In this development research, the initial step taken by the researcher was to define a product, a local wisdom-based Augmented Reality Flipbook, that would be developed to improve reading skills for popular scientific articles. A needs analysis was conducted on several indicators to determine a product that was appropriate and relevant to learning conditions in the field. In the initial stage, a needs analysis was conducted for teachers, students, and the curriculum. The following is an explanation.

Teacher Needs Analysis

The needs analysis in this study was used to research local wisdom-based Augmented Reality Flipbooks in Indonesian language subjects for popular scientific articles at SMP Negeri 7 Padang. This needs analysis was used to determine teachers' needs for the development of this learning media. Interviews were conducted with Indonesian language teachers at SMP Negeri 7 Padang. The interviews consisted of 14 questions. Based on these interviews, several findings were found in Table 1.

Table 1
Results of Teacher Needs Analysis Interviews

No.	Indicator	Interview Results
1	Use of learning media	The learning media currently used by teachers in eighth-grade Indonesian is still limited to presentation slides. Innovative learning media such as local wisdom-based augmented reality flipbooks have never been used. When teaching, teachers often use textbooks and presentation slides to convey learning materials.
2	Application of digital teaching media in learning	Augmented Reality flipbooks based on local wisdom can be applied to Indonesian language subjects, particularly in popular scientific articles. This significantly enhances learning, especially in a world that demands innovative interactive digital media, increasing student engagement, motivation, and adaptability to technological advancements in the learning process.r.
3	Teacher Characteristics	Teachers have welcomed the creation of this local wisdom-based Augmented Reality Flipbook. They haven't yet mastered its use, but they will strive to learn it to improve Indonesian language learning in the future. They hope the developers will conduct outreach regarding the development of this media to improve its use.

Interview results indicate that teachers still rely on conventional media such as textbooks and slides, while innovative digital media such as AR Flipbooks have never been used due to limited equipment and technical knowledge. Nevertheless, teachers believe that AR Flipbooks have great potential for application to popular scientific articles because they can enhance visualization, interactivity, and student learning motivation. Teachers also demonstrate good pedagogical preparedness and a high level of

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openness to digital innovation, although technical training is still needed for optimal AR implementation in Indonesian language learning.

Student Needs Analysis

To determine student needs regarding the development of the learning media to be developed, a questionnaire was distributed to 31 students. The questionnaire consisted of 15 items designed using a Likert scale: strongly disagree (STS), disagree (TS), agree (S), and strongly agree (SS). Data from the student needs questionnaire can be seen in Table 2 below.

Table 2
Distribution of Student Needs Questionnaire Responses

No.	Statement	STS (%)	TS (%)	S (%)	SS (%)	Mean (%)	Category
1	Statement-1	00.00	00.00	41.09.00	58.01.00	86.03.00	high
2	Statement-2	06.05	09.07	58.01.00	25.08.00	75.00.00	middle
3	Statement-3	12.09	22.06	54.08.00	09.07	63.07.00	middle
4	Statement-4	00.00	06.05	48.04.00	45.02.00	77.04.00	high
5	Statement-5	00.00	03.02	29.00.00	67.07.00	85.05.00	high
6	Statement-6	00.00	03.02	29.00.00	67.07.00	84.07.00	high
7	Statement-7	12.09	22.06	54.08.00	09.07	63.07.00	middle
8	Statement-8	00.00	00.00	32.03.00	67.07.00	87.09.00	high
9	Statement-9	06.05	19.04	51.06.00	22.06	69.04.00	middle
10	Statement-10	00.00	03.02	35.05.00	61.03.00	83.01.00	high
11	Statement-11	03.02	03.02	45.02.00	48.04.00	78.02.00	high
12	Statement-12	00.00	00.00	41.09.00	58.01.00	86.03.00	high
13	Statement-13	03.02	03.02	58.01.00	35.05.00	79.08.00	high
14	Statement-14	00.00	03.02	29.00.00	67.07.00	83.09.00	high
15	Statement-15	03.02	06.05	54.08.00	35.05.00	76.06.00	high
Mean		02.04	08.06	43.09.00	45.01.00	78.08.00	high

Based on a questionnaire administered to 31 students, the majority of responses were in the "high" category (78.8%), indicating digital readiness and strong interest in interactive learning media. The statement with the highest score (87.9%) confirmed students' need for visual media that is easily accessible on digital devices. However, several indicators fell into the "moderate" category, indicating that some students still require assistance in using technology. Overall, students demonstrated an adaptive attitude toward learning innovations, thus assessing the suitability of the local wisdom-based AR Flipbook for more engaging, contextual, and interactive learning.

Curriculum Analysis

The curriculum analysis was conducted to re-examine the suitability of the existing curriculum with the development of the local wisdom-based Augmented Reality (AR) Flipbook as a learning me-

dium for reading popular scientific articles. The goal was to identify the strengths and weaknesses of the curriculum's demands related to the concept of learning to read popular scientific articles and to examine the curriculum's suitability for the interactive AR Flipbook, which will be designed in accordance with the Independent Curriculum. The currently implemented curriculum is the Independent Curriculum, which emphasizes flexible Learning Outcomes (CP) and Learning Objectives (TP), tailored to local needs. The results of the curriculum analysis are presented in Table 3 below.

Table 3
Results of the Learning Media Curriculum Analysis

No.	Observed Aspects	Scale				Description
		1	2	3	4	
1	Curriculum relevance to CP/TP learning to read popular scientific articles				✓	The curriculum's demands are already relevant to CP, emphasizing the ability to identify information, explore implicit/explicit messages, and present current topics in popular science articles. However, adjustments are needed to integrate local wisdom to make it more contextualized to students' lives.
2	Accuracy of curriculum requirements and alignment with language skills			✓		The curriculum demands strong language skills, from reading to producing texts. This requirement is accurate based on the principles of the Independent Curriculum, but lacks in-depth examples based on local wisdom.
3	Curriculum presentation in interactive formats and use of AR technology		✓			The Independent Curriculum is flexible in its presentation but does not explicitly facilitate AR technology or interactive media. The development of AR flipbooks is needed to improve the readability and visualization of popular science articles.
4	Potential for developing critical and creative thinking through the integration of local wisdom			✓		The curriculum does not facilitate critical thinking through local examples, resulting in students' passive learning. Integrating local wisdom into AR flipbooks could encourage further exploration.

Curriculum analysis shows that AR Flipbooks based on local wisdom align with the CP and TP of the Merdeka Curriculum, particularly in the competencies of identifying information, understanding text structure, and critically processing ideas. However, the curriculum does not explicitly include the integration of local wisdom in popular scientific articles, so this medium serves to fill this gap by presenting contextual content. The curriculum also provides flexibility in the use of technology, including AR, enabling innovative project-based learning and digital literacy. Thus, AR Flipbooks are relevant and have the potential to enrich Indonesian language learning through the integration of technology,

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local culture, and the development of critical and creative reasoning skills.

DISCUSSION

Teachers' Needs for Digital Learning Media

Based on the analyzed questionnaire results, the majority of students demonstrated a high level of readiness for all learning needs indicators, with an overall average of 78.8%. This indicates that students have a high level of readiness and interest in using innovative learning media that can support independent learning. The data shows that 45.1% of respondents strongly agree and 43.9% agree, emphasizing the importance of developing engaging, user-friendly learning media that facilitate independent learning.

Several indicators with the highest scores, such as statement 8 (87.9%) and statement 5 (85.5%), demonstrate that students strongly desire digital-based learning media that are flexible and accessible anytime and anywhere. This finding aligns with the findings of Calderón et al. (2020); Wong & Hughes (2023), who stated that digital media can provide a more meaningful learning experience through the integration of text, images, and interactivity, thus encouraging students to be more active and motivated in their learning. Similarly, Essa et al. (2023); Martin et al. (2020); Ramesh & Jayashree (2024) emphasized that the use of technology in education can improve the quality of learning because it adapts to students' needs and learning styles.

Meanwhile, several indicators in the moderate category, such as statement 2 (75.0%) and statement 3 (63.7%), indicate that a small proportion of students are still not fully accustomed to optimally using digital media in their learning activities. This situation indicates the need for mentoring and guided training so that students can utilize digital media effectively. According to Saadati et al. (2023), technology-based learning requires strong metacognitive skills so that students can regulate, control, and reflect on their learning process independently.

Overall, the results of this study reinforce the views of Jannah et al. (2020) and Pramesworo et al. (2023), who assert that 21st-century students are characterized as active learners who prefer digital, interactive, and contextual technology-based learning. Therefore, the results of this needs analysis provide a strong conceptual basis for designing interactive, flexible, and contextual digital learning media to increase student motivation, participation, and learning independence in the context of meaningful Indonesian language learning.

Students' Needs for Interactive Learning Media

Based on the analyzed questionnaire results, the majority of students scored high on all learning needs indicators, with an overall average of 78.8%. This indicates that students have a high level of readiness and interest in using innovative learning media that can support independent learning. The data shows that 45.1% of respondents strongly agree and 43.9% agree, emphasizing the importance of developing engaging, easy-to-use learning media that facilitate independent learning.

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Suitability of AR Flipbook Development with the Independent Curriculum

Based on Table 3, the main requirements in the curriculum for learning to read popular scientific articles are quite relevant to the formulation of the Independent Curriculum. The main requirements include recognizing popular scientific articles, identifying information and facts in the text, presenting current topics in a summary form, and examining the steps for developing a critical response to the article. Although the Independent Curriculum covers relevant key concepts, the detailed requirements for learning to read popular scientific articles are not yet fully understood. The discussion in the curriculum remains simplistic and lacks interaction, thus failing to stimulate students' critical and creative thinking. According to Setyawan et al. (2020); Sinaga et al. (2022), complex material that involves interaction with students can enhance students' critical thinking.

The Independent Curriculum requires learning resources to provide comprehensive explanations of material requirements and encourage students to actively explore the material so they can understand the text through reading activities (Fauzan et al., 2023; Latifa et al., 2023). However, in the curriculum requirements for reading popular scientific articles used by students, the presentation of learning concepts consists only of core explanations. Examples provided in the learning resources are still very general and presented without integration of local wisdom or AR technology. Furthermore, the examples presented in popular scientific articles are not closely related to students' daily lives. Examples that are familiar to students can improve understanding, critical thinking skills, and reading skills (Ardhian et al., 2020; Arifin, 2020). Therefore, although the curriculum requirements used are quite relevant, interactive activities within the curriculum, in-depth discussion, AR-based presentation strategies, and the provision of examples based on local wisdom are needed to develop AR flipbooks for teaching reading popular scientific articles.

CONCLUSION

Based on the research results, the development of Augmented Reality (AR) flipbooks based on local wisdom is highly needed in Indonesian language learning, particularly for reading popular scientific articles in junior high schools. Analysis of teacher, student, and curriculum needs showed a high level of alignment, with an average of 78.8% in the high category. Teachers assessed that existing media were still limited, while students needed interactive, contextual, and easily accessible media. The curriculum also demands critical thinking skills and an understanding of texts relevant to the socio-cultural context. Therefore, AR flipbooks are considered potential for delivering engaging and meaningful learning through the integration of text, visuals, and local cultural values. However, this research has only reached the Analysis stage in the ADDIE model, requiring further development to the Design and Development stage to produce a test-ready product with interactive features that strengthen student independence and learning effectiveness.

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