

INTEGRATION OF AUGMENTED REALITY IN DANCE EDUCATION: DEVELOPMENT OF INTERACTIVE MEDIA FOR ELEMENTARY SCHOOL STUDENTS

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Abstract

The limited availability of instructional media and teachers' limited competence in teaching dance remain challenges in elementary school dance education. This study aimed to develop and evaluate the feasibility of an augmented reality (AR)-based interactive learning medium for introducing Indonesian traditional dances to fifth-grade elementary school students. The study employed a research and development approach using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model. Data were collected through needs analysis, expert validation, observation, and user-response questionnaires. The developed medium was validated by three media experts and three material experts and was subsequently implemented in two elementary schools in Semarang City involving two teachers and 47 fifth-grade students. The validation results indicated that the developed medium achieved a very high level of feasibility based on both media and material assessments. The classroom trial also showed positive user responses, with students and teachers perceiving the medium as attractive, easy to use, and supportive of understanding traditional dance content. The AR medium integrates three-dimensional visualization, audio narration, and interactive features to provide multimodal access to Indonesian traditional dance content. The findings indicate that AR can serve as a complementary pedagogical medium for supporting culturally responsive and interactive dance learning in elementary schools, particularly in contexts where teachers have limited access to dance instructional resources. However, the study did not examine the medium's causal effects on students' learning outcomes. Future research should employ experimental or longitudinal designs to examine its effects on cognitive, affective, psychomotor, and cultural literacy outcomes.

Keywords: Augmented Reality, Dance Education, Elementary School, Learning Media, Traditional Dance.



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INTRODUCTION

The integration of digital technologies in learning environments has been shown to improve students' digital competencies and learning readiness (Amril, 2026). Teachers today must be aware of the fact that students in this era are already familiar with digital technology; therefore, teachers should also respond by designing learning activities that are aligned with and take advantage of digital technologies (Yunika, 2023). The use of technology in learning is believed to improve both learning quality and outcomes (Zainuddin et al., 2020; Wulandari et al., 2023; Fariha et al., 2024; Ruswan et al., 2024; Baitasheva et al., 2025). Dance education in elementary schools today also needs to utilize technology in its implementation. However, one of the main problems is teachers' interest in teaching dance. The preliminary questionnaire results showed that among 27 elementary school teacher respondents, only 40% had experience in dancing and showed interest in teaching dance in the classroom. Anggraini and Hasnawati (2023) also reported that more than 50% of elementary school teachers do not have sufficient mastery of dance teaching (Anggraini & Hasnawati, 2023).

Another issue identified is the limited availability of learning media that teachers can use to teach dance knowledge. Dilla (2023) stated that learning media can influence both the process and outcomes of learning, but also noted that there are very few media focusing on local cultural content (Dilla, 2023). The lack of teachers' interest in teaching dance and the scarcity of dance learning media indicate that dance education is less favored in elementary schools. Therefore, it is necessary to develop innovative learning media that can effectively support dance learning in schools. Several previous studies are relevant to this research. Jefferson (2024) explored the use of storybooks in elementary school dance education to develop students' creativity and literacy skills. However, this approach relied heavily on teachers' imagination, which means that teachers must possess sufficient knowledge and basic dance skills (Jefferson, 2024). Dwidarti et al. (2025) explained that various types of media, such as social media, films, and computer programs, have been used in dance learning. They also recommended exploring multimedia-based dance learning in elementary schools in accordance with students' needs and the demands of the current era (Dwidarti et al., 2025).

Yetti et al., (2023), explained that local traditional dance can serve as a potential medium for teaching multicultural values in a fun and contextual way. Therefore, she recommended developing products that can foster tolerance and appreciation of diversity among children. Arisyanto developed Macapat song learning media in the form of an Android application that is both innovative and practical. This study responded to the lack of Macapat learning media and represented an adaptation of arts education through digital technology utilization (Arisyanto et al., 2021). The purpose of this study is to develop augmented reality (AR)-based learning media for dance education for elementary school students. Augmented reality is a concept that integrates the virtual world with the real world to create interactions that appear interactive and realistic (Praseptya et al., 2024). AR technology can bring objects such as photos or videos into the real world in three-dimensional form (Alfitriani et al., 2021). The type of augmented reality used in this study is marker-based AR (Fikriadi et al., 2022), which utilizes visual codes in the form of barcodes to display AR models.

Several studies on the use of augmented reality in dance learning have been conducted. Five traditional dances in elementary school learning. Aliefiudin and Asriningtias (Aliefiudin & Asriningtias, 2023), focused on introducing Papuan traditional dances. Taufiq (Taufiq, 2022), introduced the *Someah* dance from Sunda, while Hilipito focused on the *Kabela* dance from North Sulawesi (Moh Aswar K Hilipito et al., 2019). However, the studies by Aliefiudin, Taufiq, and Hilipito did not proceed to the classroom trial stage and mainly focused on the technological aspects. Listiani (Listiani et al., 2019), introduced traditional dances from Papua, Sunda, and Aceh to university students. The novelty of the current study lies in presenting a broader selection of Indonesian dances (*tari nusantara*). The long-term outcome of this media is expected to enhance students' learning interest, knowledge of dance, and creativity, as well as to serve as an effective teaching aid for teachers.

Rakhimzhanova et al., (2025), demonstrated the positive impact of AR in creating interactive and inclusive learning environments, providing relevant empirical foundations for this study. In the context of sustainability and the Sustainable Development Goals (SDGs), Anasta et al., (2025), conceptually emphasized the importance of integrating arts and environmental education into the curriculum. Dwidarti et al., (2025), showed that multimedia can increase students' interest and understanding of arts-related subjects, though they also highlighted the need for further exploration of multimedia implementation in classroom-based dance learning. Ji & Zhang, (2024), expanded the understanding of AR's role in dance

education, finding that it creates immersive and engaging learning experiences in dance performance. However, their research was not specific to primary education. Azmi & Ha, (2024), explored dance learning through play-based approaches in music and movement classes. This game-based approach proved effective in increasing student participation, although it did not explicitly discuss the use of learning media.

Previous studies have demonstrated the potential of augmented reality for introducing cultural content, visualizing objects, and supporting art and dance learning. However, much of the existing research has focused either on the technological development of AR applications or on the introduction of specific cultural objects and dances, with relatively limited attention to the integration of AR as an interactive instructional medium within the context of elementary school dance education. In addition, previous studies have not sufficiently addressed the practical challenges faced by elementary school teachers who have limited dance teaching competence and limited access to instructional media. Therefore, there is a need for an AR-based learning medium that is not only technologically functional but also pedagogically aligned with elementary dance learning and accessible for classroom use. The present study addresses this gap by developing an interactive AR medium that combines three-dimensional visualization, audio narration, and contextual information about Indonesian traditional dances for fifth-grade elementary school students.

The novelty of this study lies in the integration of augmented reality as a culturally responsive instructional medium specifically designed for elementary dance education. Rather than presenting AR merely as a technological visualization tool, the developed medium combines three-dimensional representations, audio narration, and interactive exploration of Indonesian traditional dances to support students' multimodal engagement with dance knowledge. The product is also designed to address teachers' practical need for accessible instructional resources in contexts where dance teaching expertise and learning media are limited.

Learning media play an important role in the teaching and learning process (Rahayuningsih et al., 2022). Developing AR-based dance learning media is crucial because AR technology has the potential to increase students' engagement, learning experiences, and outcomes (Sudarmilah et al., 2018); (Handayani et al., 2024; Jannah et al., 2024). Furthermore, as an effort and strategy for preserving traditional arts in the 21st century (Daryanti et al., 2019), learning media development addresses one of the main challenges faced by teachers in teaching dance (Hakim, 2012). Accordingly, this study aimed to (1) develop an augmented reality-based interactive learning medium for introducing Indonesian traditional dances to fifth-grade elementary school students; (2) examine the feasibility of the developed medium through media and material expert validation; and (3) investigate teachers' and students' responses to the developed medium during a limited classroom implementation

RESEARCH METHOD

This study employed a research and development (R&D) method using the ADDIE model (Slamet, 2022). The analysis stage was conducted to identify the need for learning media. The design stage involved creating a storyboard containing the conceptual design of the augmented reality-based learning media. The development stage focused on creating a media prototype, which was then validated by media and content experts. Three media experts participated in the validation process, consisting of an elementary school teacher, a dance teacher, and a lecturer in elementary education. The three content experts consisted of two teachers and one art education practitioner. Validation was conducted to assess the readiness of the prototype product for field testing. Once the prototype was deemed valid, the process continued to the implementation stage.

Table 1. ADDIE Stage

ADDIE Stage	Activity	Data/Output
Analysis	Needs analysis of dance teaching and media availability; curriculum document analysis	Teachers' needs and curriculum requirements
Design	Storyboard and conceptual design	Initial media design
Development	Prototype development and expert validation	Revised AR prototype
Implementation	Trial in two elementary schools	Teacher/student responses and observations

ADDIE Stage	Activity	Data/Output
Evaluation	Analysis of validation, observation, and response data	Feasibility evaluation

The development of the augmented reality-based dance learning media followed the ADDIE model, consisting of five stages: Analysis, Design, Development, Implementation, and Evaluation. The Analysis stage identified teachers' needs for dance learning media and examined relevant curriculum requirements. The Design stage involved developing the conceptual design and storyboard of the AR-based learning media. In the Development stage, the prototype was produced and validated by media and content experts to assess its readiness for field testing. The Implementation stage involved testing the validated media with fifth-grade students in two elementary schools and collecting teacher and student responses. Finally, the Evaluation stage analyzed expert validation, observation results, and user responses to determine the feasibility of the developed media.

At the implementation stage, trials were conducted in Semarang City with fifth-grade elementary school students as subjects. The inclusion criteria were public elementary schools that implemented dance education in fifth grade specifically, Elementary School Rejosari 01 and Elementary School Pakintelan 02 and fifth grade students in the 2024–2025 academic year. The exclusion criteria were schools that did not teach dance in fifth grade and students with physical or cognitive limitations that made it difficult to interact with augmented reality technology. After the trials, teachers and students were asked to complete user response questionnaires about the product. At the evaluation stage, the feasibility of the prototype was analyzed based on expert validation, trial observations, and user response data.

Data were collected through questionnaires, observations, and document analysis. Four instruments were employed in this study that are needs analysis questionnaire, media expert validation questionnaire, content expert validation questionnaire, user response questionnaire. The needs analysis questionnaire consisted of ten items designed to identify teachers' experiences in teaching dance, the availability of instructional media, and the necessity of developing technology-based dance learning media. The questionnaire used a combination of closed-ended and open-ended questions. The participants consisted of 54 elementary school teachers from 11 provinces in Indonesia selected through purposive sampling. Prior to implementation, all instruments underwent content validation by three experts in elementary education and arts education. The content validity index of all instruments exceeded 0.80, indicating excellent validity. Reliability testing using Cronbach's Alpha showed coefficients ranging from 0.86 to 0.93, indicating high internal consistency.

Table 2. Research Instruments and Measurement Dimensions

Instrument	Dimensions	Number of Items	Scale
Needs Analysis Questionnaire	Dance teaching experience, learning media needs	10	Open and closed questions
Media Validation Questionnaire	Visual design, usability, technical quality, interactivity, educational effectiveness	15	Likert 1–5
Material Validation Questionnaire	Curriculum alignment, conceptual accuracy, content depth, language, illustrations	13	Likert 1–5
Teacher Response Questionnaire	Eight evaluation dimensions	16	Likert 1–5
Student Response Questionnaire	Enjoyment, usability, usefulness, satisfaction	10	Likert 1–5

The media expert validation questionnaire consisted of 15 items covering five dimensions: (1) visual design, (2) usability, (3) technical quality, (4) interactivity, and (5) educational effectiveness. The material expert questionnaire consisted of 13 items assessing (1) curriculum alignment, (2) conceptual accuracy, (3) content depth, (4) language appropriateness, and (5) illustration quality. The user response questionnaire for teachers consisted of eight indicators, namely visual quality, usability, content appropriateness, educational effectiveness, engagement and interactivity, comfort and safety, technical

performance, and overall satisfaction. The student questionnaire consisted of ten indicators assessing enjoyment, ease of use, engagement, usefulness, visual and audio quality, and overall satisfaction. All questionnaire items used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The questionnaire data were analyzed using descriptive quantitative analysis by converting the obtained scores into percentages. This percentage calculation aims to determine the level of respondents' needs, perceptions, or responses toward the media being developed. The percentage score was obtained by comparing the total score achieved by all respondents with the maximum possible score and then multiplying the result by 100%. Percentage analysis can be used to describe respondents' tendencies in a simple manner and facilitate the interpretation of data in educational research. The formula used to calculate the percentage score is presented as follows.

$$P = \frac{\sum X}{N \times S_{max}} \times 100\%$$

Where

P = Percentage score

$\sum X$ = total score obtained

N = number of respondents

S_{max} = maximum possible score

Instrument validation is essential to ensure the accuracy and credibility of educational research instruments (Hasyim et al., 2026). To ensure the quality of the research instruments, validity and reliability analyses were conducted prior to data interpretation. The student response questionnaire was evaluated using corrected item-total correlation coefficients and Cronbach's Alpha. The analysis revealed that six items met the minimum validity criterion ($r > 0.288$), whereas four items showed low correlations and should be revised in future studies. The instrument obtained a Cronbach's Alpha coefficient of 0.582, indicating moderate reliability and acceptable internal consistency for exploratory and developmental research.

Table 3. Summary of Instrument Validity and Reliability Results

Instrument	Number of Respondents	Number of Items	Validity Method	Reliability	Category
Material Validation Questionnaire	3	13	I-CVI = 1.00; S-CVI = 1.00	N/A	Excellent validity
Media Validation Questionnaire	3	15	I-CVI = 1.00; S-CVI = 1.00	$\alpha = 0.804$	Good reliability
Teacher Response Questionnaire	2	16	Descriptive review	$\alpha = 0.952$	Excellent reliability
Student Response Questionnaire	47	10	Item-total correlation	$\alpha = 0.582$	Moderate reliability

Table 4. Item Validity Results of the Student Response Questionnaire

Item	r-value	Decision
1	0.308	Valid
2	0.159	Invalid
3	-0.009	Invalid
4	0.289	Valid
5	0.352	Valid
6	0.280	Invalid
7	0.384	Valid
8	0.416	Valid
9	0.349	Valid
10	0.136	Invalid

The teacher response questionnaire demonstrated excellent internal consistency with a Cronbach's Alpha coefficient of 0.952. However, because only two teachers participated in the trial, the

reliability coefficient should be interpreted cautiously and considered preliminary evidence of instrument consistency. The content validity of the material and media validation instruments was assessed using the Content Validity Index (CVI). Both instruments achieved an Item-Level Content Validity Index (I-CVI) and Scale-Level Content Validity Index (S-CVI) of 1.00, indicating excellent content validity. The media validation instrument additionally demonstrated good reliability with a Cronbach's Alpha coefficient of 0.804. Following recent methodological recommendations, expert validation instruments with a very limited number of validators are more appropriately evaluated using content validity indices rather than item correlation analysis.

The data obtained from the needs analysis, expert validation, and user response questionnaires were analyzed using descriptive quantitative analysis. The analysis involved calculating the total score and percentage score for each instrument. The percentage score was calculated by dividing the total score obtained by the maximum possible score and multiplying it by 100%. The resulting percentages were then interpreted using predetermined criteria, namely 81–100% as Excellent, 61–80% as Good, 41–60% as Fair, 21–40% as Poor, and $\leq 20\%$ as Very Poor. The expert validation data were used to determine the feasibility of the developed augmented reality-based learning media before implementation. The teacher and student response data were used to describe users' perceptions of the attractiveness, usability, usefulness, and implementation of the media. Observation and document analysis data were used as supporting information in interpreting the implementation and evaluation stages. Because this study focused on product development and feasibility evaluation, no inferential statistical test was conducted to determine the causal effect of the media on students' learning outcomes.

RESULTS AND DISCUSSION

Analysis

The needs analysis data were obtained through questionnaires and document studies. The questionnaire focused on dance learning in elementary schools and the need to develop AR-based dance learning media. The curriculum document study focused on learning outcomes related to dance education in elementary school. The participants consisted of 54 elementary school teachers from 11 provinces in Indonesia. The survey results show that teachers consider the availability of innovative teaching materials to be a high priority. As many as 74% of teachers stated that digital resources are essential. As many as 67% of teachers believe that teaching materials for dance are essential, yet suitable materials are currently hard to come by, and schools do not yet have adequate teaching resources. In addition, the limited learning media available to support dance education made teaching dance in elementary schools particularly challenging (Darmayanti et al., 2022; Maulana & Nurharini, 2024). Therefore, innovation in learning media is needed to support teachers in teaching dance.

Video recordings of dances are commonly used as practice media in dance learning. However, according to the learning objectives in the experiencing element of dance for Phase C (fifth and sixth grade), students are expected to observe various forms of traditional dances that can be used to express themselves through the supporting elements of dance. Therefore, the product development in this study was directed toward fifth-grade learning with the theme of observing various traditional dances. The choice of fifth-grade students was also based on their developmental stage—at this age, they have entered the concrete operational phase, possess greater independence in learning, and can be guided to search for, select, and summarize data (Rahmaniar et al., 2022; Azizah & Irianto, 2024). Based on the needs analysis, it was determined that AR-based learning media would focus on the topic of Introduction to Indonesian Traditional Dances for fifth-grade students.

Design

The design stage aimed to determine the structure, content, and layout of the media. The learning media developed took the form of a book and application, where the book displayed child characters that came to life through the application. The design process began by creating a storyboard containing notes about structure, layout, and learning content. The prototype consisted of 26 pages, including the cover, usage instructions, main material (introduction, AR markers), and developer profiles. The learning material featured 10 traditional Indonesian dances: *Babangsai*, *Gantar*, *Jaranan*, *Kipas*, *Lenso*, *Merak*, *Pendet*, *Piring*, *Sajojo*, and *Tor-Tor*. These dances were chosen to represent different islands across Indonesia.

Each dance was presented through a child character wearing traditional attire from the corresponding region. The inclusion of these child characters was a strategy to make the media more

appealing and age-appropriate for students. Each character provided an introduction to their regional dance, followed by a barcode marker. To use the media, teachers and students needed to install a specific AR application. When the device’s camera was directed at the marker, the application displayed three-dimensional visuals and audio explanations of the traditional dances.

Development

The development process involved several steps. First, the AR application was created using Unity software, incorporating images, sounds, text, and markers. After completing the app, the book design was developed using canva, featuring the cover, characters, text, and AR markers.



Figure 1 product draft

Each core page displayed a regional child character introducing a specific traditional dance. To view the augmented reality features, students had to open the application and scan the marker using their device’s camera. After the draft was completed, it underwent validation by media and content experts. Media experts included elementary school teachers and lecturers in elementary education, while content experts included elementary school teachers and dance practitioners. The validation results are shown Table 4.

Table 4 expert validation of media and subject matter

Media Expert	Assessment	Material Expert	Assessment
Validator 1	95%	Validator 1	98%
Validator 2	96%	Validator 2	98%
Validator 3	93%	Validator 3	99%
Average	94,6%	Average	98,3%

Media experts evaluated aspects such as the appropriateness of the media for fifth graders, its potential effectiveness, ease of use, visual design, and feature appeal. Content experts assessed the material’s alignment with learning objectives for Phase C, conceptual accuracy, content depth, language use, illustration quality, and potential misconceptions. All items were rated on a 1–5 scale. The developed media underwent expert validation to determine its feasibility before classroom implementation. The material validation results demonstrated excellent content validity, indicating that the learning content, language, curriculum alignment, and illustrations were appropriate for elementary school students. Similarly, media experts evaluated the product positively in terms of visual design, usability, interactivity, and technical quality. The media validation instrument demonstrated good reliability with a Cronbach's Alpha coefficient of 0.804, while the material validation instrument achieved an excellent content validity index. These findings suggest that the developed media fulfilled both pedagogical and technological requirements and was therefore appropriate for implementation in elementary classrooms.

Implementation

The prototype trial was conducted in two elementary schools in Semarang City, with one session (60 minutes) per school. During the trial, teachers first introduced the topic of Traditional Indonesian Dances, then divided students into seven groups, each receiving one copy of the media. Teachers explained how to use the media and then allowed students to explore and record observations about the dances. Students were later asked to share their findings in a discussion guided by the teacher. During

classroom implementation, students actively interacted with the application by scanning AR markers, observing three-dimensional dance visualizations, and discussing the displayed cultural information collaboratively. Observation results indicated that students demonstrated enthusiasm, curiosity, and active participation throughout the learning activities.



Figure 2 Product draft trial

During the trial, students were visibly enthusiastic because the media was new and engaging. They discussed the characters and AR visuals together. Afterward, both teachers and students completed user response questionnaires via Google Forms. Teachers rated the media on eight aspects: Visual Quality, Usability, Content Appropriateness, Educational Effectiveness, Engagement & Interactivity, Comfort & Safety, Technical Performance, and Overall User Satisfaction. Students evaluated the media on seven aspects: Enjoyment, Ease of Use, Understanding the Material, Engagement & Interactivity, Visual and Audio Quality, Perceived Usefulness, and Overall User Satisfaction. Both groups gave highly positive evaluations regarding the appearance, usability, safety, and relevance of the media. Some technical issues were noted such as non-functional markers, mismatched AR models, and unresponsive buttons but these were minor and easily resolved by refreshing the devices. Users considered such issues normal and device-specific, not significantly affecting the trial outcomes.

Evaluation

The overall mean scores from teachers and students indicated a very high satisfaction level with the AR-based media. The aspect that could be improved further was the stability and compatibility of the application to optimize user experience. These issues were minor technical limitations and did not affect the media's overall feasibility. Teachers suggested adding more dance materials for future versions.

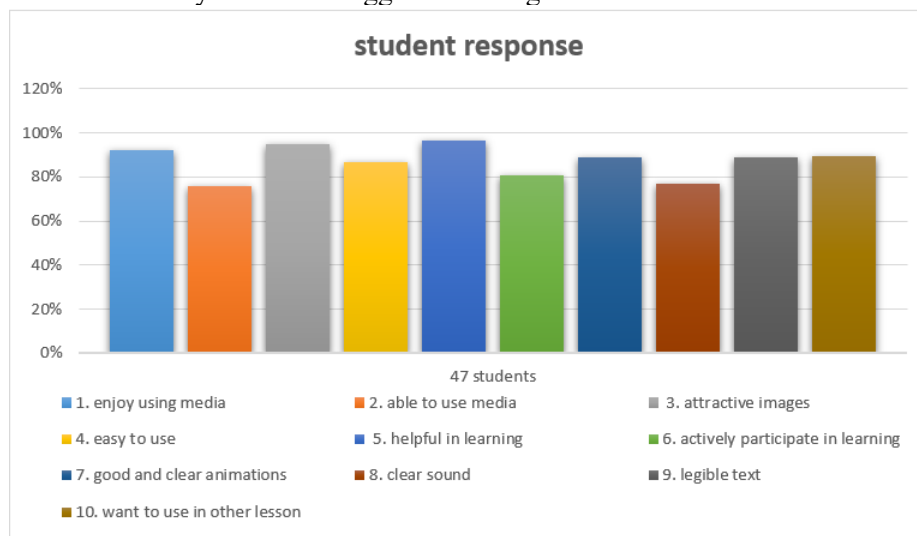


Figure 3 Results of the student response questionnaire

The trial involving 47 students showed an average response rate of 87.1% (Excellent). However, some items scored lower. For example, 23.9% of students reported difficulties using the media because their device storage was full or because they used IOS devices, which were incompatible with the Android-based application. Additionally, 19.1% of students reported being less active in learning because they did not have personal devices and had to share one gadget among four students. Regarding the audio component, 22.9% of students reported unclear sound quality, mainly due to damaged speakers or noisy classroom environments. These were considered individual technical issues rather than systemic problems. The student response questionnaire revealed positive perceptions regarding the attractiveness, usability, and educational value of the developed media. Likewise, teachers reported that the application was easy to use and could support dance instruction by providing visual representations and contextual information about Indonesian traditional dances. The positive responses from both teachers and students indicate that the developed media is not only feasible but also practically useful for supporting more engaging and interactive dance learning experiences in elementary schools.

This study focused on the integration of technology into dance learning in elementary schools, aiming to develop AR-based dance learning media suitable for classroom use. The research was limited to the application of technology and the analysis of user responses; it did not measure the media's impact on learning outcomes. Integrating technology into dance learning should not merely serve as a visual aid but also encourage student engagement, empathy, and self-expression (Song, 2021; Zou, 2025). AR media can act as a catalyst that enriches learning experiences without replacing the importance of direct dance practice (Vijay et al., 2019). Previous research has shown that AR has a moderate effect on learning effectiveness (Garzón et al., 2019). Therefore, the developed media should be viewed as a supporting tool, not a substitute for artistic exploration. Dance learning should continue to promote creativity and expressive development (Larsson et al., 2025). The integration of technology offers new insights, experiences, and innovation in the learning process (Pancirol et al., 2018).

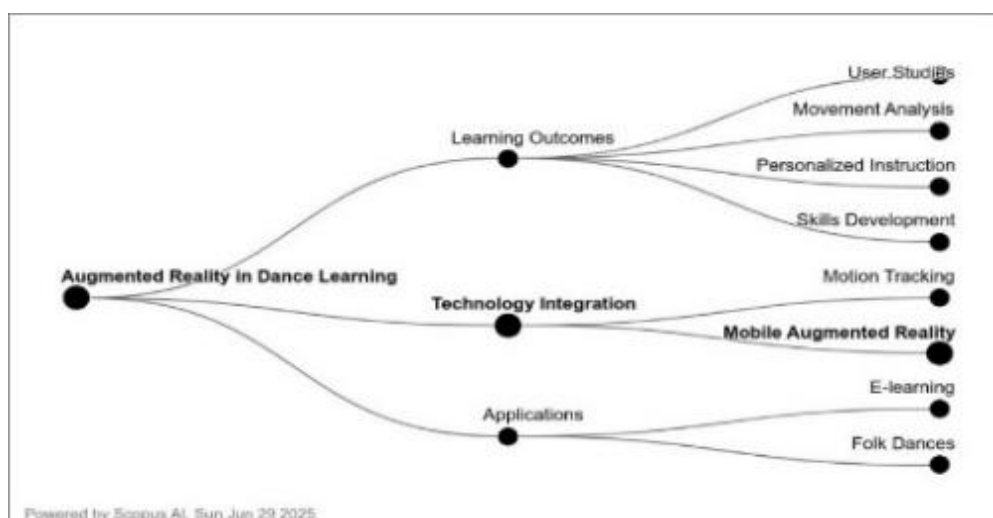


Figure 4 Research focus

However, implementing AR in education is not without challenges. Factors such as infrastructure readiness, technological literacy, and teacher–student characteristics play significant roles (Masurkar et al., 2024; Jupriyanto et al., 2025; Zekeik et al., 2025). This trial was conducted in Semarang City, where both teachers and students generally possess adequate technological readiness. The same results may not necessarily apply in other regions with limited resources. Interactive learning media that display 3D objects provide a relatively new experience for students. Augmented reality can transform passive learning into interactive experiences (Yuk et al., 2023), fostering feedback and collaboration among students (Ji & Zhang, 2024). The use of AR shows potential for increasing motivation, learning outcomes, and educational transformation (Wang, 2024; Rodriguez-Saavedra et al., 2025; Faruk et al., 2025). Nevertheless, teacher supervision remains crucial to ensure that the media aligns with learning objectives.

This study also recognizes several limitations. The AR application can only operate on Android devices and was tested with students without special educational needs. Although previous studies (Chen et al., 2016; Tunur et al., 2020; Romero et al., 2023; Rakhimzhanova et al., 2025), have shown that AR can support learning for students with special needs, further studies are required to explore such

adaptations. Additionally, this research focused only on fifth-grade students and the topic of Introduction to Indonesian Traditional Dances. Future studies should examine the effectiveness of the media in improving cognitive, affective, and psychomotor learning outcomes.

CONCLUSION

This study developed and evaluated an augmented reality (AR)-based learning medium for elementary dance education using the ADDIE development model. The findings demonstrate that the developed media is pedagogically feasible, technologically appropriate, and positively accepted by both teachers and students. The integration of three-dimensional visualization, audio narration, and interactive features enabled students to explore Indonesian traditional dances through engaging and multimodal learning experiences, while simultaneously assisting teachers in overcoming limitations related to instructional resources and dance teaching competencies. The findings contribute to the growing body of knowledge on digital transformation in arts education by demonstrating that augmented reality can function not merely as a technological innovation but also as a pedagogical tool that supports embodied learning, cultural literacy, and student engagement in elementary dance education. The study further suggests that the integration of culturally responsive digital media can provide meaningful opportunities for preserving local cultural heritage while adapting arts education to the demands of contemporary digital learning environments. From a practical perspective, the developed media offers an alternative instructional resource that can assist elementary school teachers in implementing more interactive and accessible dance learning activities. The product may also support schools in promoting the integration of educational technology and local cultural content within classroom instruction. Nevertheless, the study was limited by its implementation in a small number of schools and by the absence of experimental evidence regarding the effects of the media on students' learning outcomes. Therefore, future studies are recommended to investigate the effectiveness of AR-based dance learning media through experimental and longitudinal designs, to explore broader implementation across different educational contexts, and to examine its impact on students' cognitive, affective, psychomotor, and cultural literacy development.

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AUTHOR CONTRIBUTIONS

Conceptualization, PA, RSS, RB; Methodology, PA, RSS, MFAU; Software, PA, and AH; Validation, PA, and MFAU; Formal Analysis, PA, RSS, RB; Investigation, PA, and RSS; Resources, PA, AH; Data Curation, PA, RSS, MFAU; Writing – Original Draft Preparation, PA, RSS, MFAU; Writing – Review & Editing, PA, RSS, RB; Visualization, PA, AH; Supervision, PA, MFAU; Project Administration, PA, RSS, MFAU; Funding Acquisition, PA, RSS, RB.

CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

The authors declare that no artificial intelligence (AI) tools were used in the generation, analysis, or writing of this manuscript. All aspects of the research, including data collection, interpretation, and manuscript preparation, were carried out entirely by the authors without the assistance of AI-based technologies.

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