



Developing Augmented Reality to Improve Movement Literacy among Elementary School Students

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Abstract

This study was motivated by students' low movement literacy in understanding physical education content presented through conventional videos, with 83% of students experiencing difficulties interpreting movements. Therefore, this study aimed to develop interactive media based on Augmented Reality (AR) for floor gymnastics to improve elementary school students' movement literacy. The study employed the System Development Life Cycle (SDLC) method using the Waterfall model, encompassing planning, analysis, design, implementation, and testing. Product trials involved application experts, floor gymnastics content experts, and a small-group trial with 15 students at SD 3 Banjar Jawa. Expert evaluations and field trials indicated that the developed AR application was rated appropriate and functionally valid. These findings confirm that AR media for floor gymnastics are suitable as a structured interactive learning alternative. The novelty of this study lies in providing AR media that specifically validate the correct execution of the basic airplane balance pose, thereby effectively addressing students' movement literacy difficulties before they engage in practical activities in the field.

Keywords: Augmented Reality, Movement Literacy, Physical Education, Elementary School, Floor Gymnastics

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A. Introduction

Low interest in reading among elementary school students indicates that learning activities have not yet been implemented optimally, given that reading literacy provides the essential foundation for understanding learning materials. A preliminary study in Buleleng Regency found that students' interest in reading stood at 68%. In physical education, sports, and health (PJOK) instruction, most teachers (61%) in the region had used interactive media, and 90% of these teachers used videos from YouTube. Although these videos were confirmed to provide sound information about movement content, field findings showed that 83% of students still experienced literacy difficulties in understanding information about movement skills when teachers used these interactive media.

This phenomenon indicates an urgent need for interactive media validated in terms of both the clarity of instructional information and the accuracy of the movements presented. Teachers need validated media to bridge students' literacy difficulties in translating digital information into practical activities in the field. Previous literature has established that virtual environments integrated with real objects are more engaging for students

and effective in improving learning outcomes (Ummah, 2019). Augmented Reality (AR) technology is claimed to stimulate cognitive activity and learning motivation while interactively presenting visual objects in the real world, encouraging students to explore physical movements (Ridwan, 2023; Zaid et al., 2022). Technology use in PJOK has generally had a positive impact; however, its implementation must still be examined critically to ensure that pedagogical objectives are achieved effectively.

B. Methods

This study employed the System Development Life Cycle (SDLC) approach using the Waterfall model to develop Augmented Reality (AR) technology. Each systematic stage was completed sequentially, encompassing planning, data requirements analysis, initial and application design, implementation, testing, and revision.

The research procedure began with an analysis of the need for AR technology and an examination of physical education content, specifically the airplane balance pose in floor gymnastics. Data for assessing product feasibility were collected through expert judgment. This validation process involved technology application experts, instructional media experts, and subject

matter experts, with observations by sports practitioners or coaches. Data collection instruments consisted of questionnaire-based evaluation sheets using a five-point Likert scale to assess the quality of the draft design and collect qualitative suggestions for improvement.

After the initial product was revised based on expert evaluations, the AR application design was tested with a small group to identify fundamental problems before broader implementation. Field data were obtained from 15 students at SD 3 Banjar Jawa, who represented the intended users of this technology.

Data were analyzed using a mixed-method approach. Qualitative analysis drew on experts' suggestions and feedback to

revise the media and content instruments. Quantitative evaluation of the model used the Gregory test, while application instrument validity was assessed using the Statistical Package for the Social Sciences (SPSS) to determine significance values (r_{xy}) and compare them with the critical r -value.

C. Results and Discussion

Development of the Augmented Reality Application Product. This study developed an Augmented Reality model by creating a smart, smartphone-based AR application. The content specifically addressed floor gymnastics, focusing on mastery of movement literacy for the basic airplane balance pose.

Table 1. Expert Validation and Revision Results

No.	Name	Suggestions	Comments
1.	Gede Surya Mahendra, M.Pd	Make the application images as clear as possible and, if feasible, realistic.	Further improve the visual presentation; the images will be more engaging after revision.
2.	Nyoman Indhi Wiradika, M.Pd	The application interface is still basic, but the movement concept is clear.	Further refine the images.
3.	Dr. Doddy Tisna, M.Pd	Present the movement concept clearly so that students can understand it simply by viewing the application.	It is already clear for elementary school students.

Source: Data Processing Results (2026)

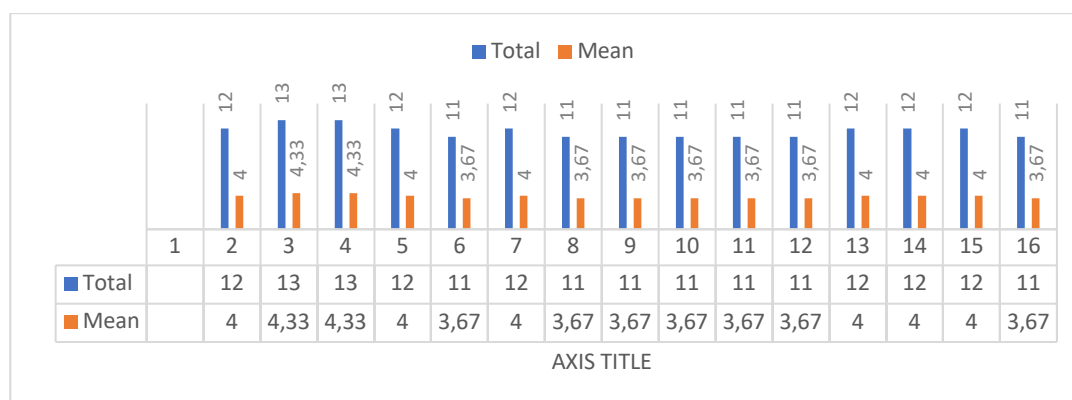


Figure 1. Observer Evaluation Results

Following revision, a small-group trial was conducted with 15 students from SD 3 Banjar Jawa whose characteristics matched those of the intended users, with direct observation by sports practitioners. Evaluations by three observers yielded an overall mean score of 3.89. When converted to a five-point scale, the application model was rated “appropriate.”

The validity of the application instrument was also tested using SPSS 22.0. Analysis of the 20 statement items yielded significance values (r_{xy}) that were all > 0.05 . When compared with the critical r -value, all r_{xy} values exceeded that value, leading to the conclusion that the questionnaire instrument and the developed AR model were valid.

Discussion

The Augmented Reality model for the airplane balance pose in floor gymnastics was designed to address students' difficulties in translating instructional information into actual movement skills. Trial evaluations indicated that the procedural stages and instructions in the AR application were easy to understand, and the level of movement difficulty was highly appropriate for the characteristics of both male and female elementary school students. Validation of the physical

instrument demonstrated that the product was suitable as a tool to encourage young athletes and students to improve their movement literacy.

These findings are consistent with previous literature. AR technology shows considerable potential to increase student participation and make PJOK learning more meaningful (Zaid et al., 2022). Furthermore, virtual elements projected into the real world help students explore new strategies and develop greater interest in and motivation for physical activity (Ridwan, 2023). Implementing such technology in physical education is crucial for facilitating motor skills learning, as three-dimensional visualization reduces students' cognitive confusion when interpreting movement instructions (Chang et al., 2020).

Accordingly, these findings offer a new synthesis: integrating AR media through a structured approach not only transforms the delivery of traditional sports content but is also specifically demonstrated to be valid and effective in bridging students' movement literacy gaps before they undertake practical activities in the field.

D. Conclusion

Based on the research and

development conducted, the Augmented Reality (AR) model for the airplane balance pose in floor gymnastics has been validated and is suitable for use. In response to the initial finding that 83% of students in Buleleng Regency experienced movement literacy difficulties when interpreting information from conventional videos, this AR technology offers an effective and interactive solution. Qualitative quality assessments by experts and quantitative validity testing using SPSS (with significance values of r_{xy} exceeding the critical r -value) confirm that the AR media product is functionally valid.

In the future, the developed AR product is expected to be applied widely in school learning activities to support teaching at the right level, making PJOK instruction more varied and meaningful while preventing student boredom. Further research may focus on expanding the range of movement content to align with specific elementary school curriculum requirements.

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F. Conflict of Interest

No conflict of interest.

References

- Ade Kurniawan, Y., Rozaq, M., & Diana, A. (2024). The use of digital technology in science and sports learning to improve students' literacy and understanding. *Jontak*, 5.
- Akramunnisa, S. (2025). Introducing augmented reality applications as media. *IPMAS*, 5(1). <https://doi.org/10.30605/ipmas.5.1.2025.549>
- Broll, W., Lindt, I., Herbst, I., Ohlenburg, J., Braun, A. K., & Wetzel, R. (n.d.). Toward Next-Gen Mobile AR Games.
- Chang, K. E., Zhang, J., Huang, Y. S., Liu, T. C., & Sung, Y. T. (2020). Applying augmented reality in physical education on motor skills learning. *Interactive Learning Environments*, 28(6), 685–697.
- Hartati, Y. (2025). The use of augmented reality technology in Islamic religious education: A literature analysis of its potential and challenges. *Variable*

- Research Journal, 2(1).
- Kependidikan, J. I., Fitriansyah, F., Bina, U., & Informatika, S. (2024). Through the school literacy movement in the program. 5, 238–246.
- Koekoek, J., van der Mars, H., van der Kamp, J., Walinga, W., & van Hilvoorde, I. (2018). Aligning Digital Video Technology with Game Pedagogy in Physical Education. *Journal of Physical Education, Recreation & Dance*, 89(1), 12–22.
- Koh, K. T., Tan, L. Q. W., Camiré, M., Paculdar, M. A. A., & Chua, W. G. A. (2022). Teachers' and students' perceptions of factors influencing the adoption of information and communications technology in physical education in Singapore schools. *European Physical Education Review*, 28(1), 100–119.
- Ridwan, M. (2023). The effect of augmented reality media on motivation to learn soccer passing. *Jurnal Mahasiswa Pendidikan Olahraga*, 3.
- Setiawan, H. (2024). The use of augmented reality-based reading resources for the literacy movement in elementary schools.
- Ummah, M. S. (2019). Covariance structure analysis of health-related indicators among community-dwelling older adults focusing on subjective health perceptions. *Sustainability (Switzerland)*, 11(1), 1–14.
- Wiartis, W. (2021). Implementing project-based learning to improve students' learning abilities through collaborative activities in English at SMP Negeri 6 Batam. *Daiwi Widya*, 7(5), 17.
- Zaid, M., Razak, F., & Alam, A. A. F. (2022). The effectiveness of STEAM-based augmented reality learning media in improving the quality of science learning in elementary schools. *Jurnal Pelita: Jurnal Pembelajaran IPA Terpadu*, 2(2), 59–68.