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Development of locomotor movement learning media based on games in physical education learning at elementary schools

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ABSTRACT

This study addresses the low motivation of elementary students in Physical Education, Sports, and Health (PJOK) caused by conventional teaching methods. It aims to develop a game-based locomotor movement learning media for Public Elementary School 07 Tiumang, Dharmasraya Regency. A Research and Development (R&D) design was applied using the ADDIE model, with needs analysis, media design, expert validation, classroom implementation, and evaluation. Expert validation covered media, material, and language aspects, while student responses assessed practicality. Results showed high validity: media 96.25%, material 95.42%, and language 84.44%, and high practicality with 99% positive student responses, indicating the media is feasible and engaging. This game-based media supports student-centered learning, increases motivation and participation, and provides PJOK teachers with a practical tool to enhance learning quality in elementary school contexts.



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Introduction

Physical Education, Sports, and Health (PJOK) plays a crucial role in elementary education by developing students' fundamental movement skills, physical fitness, and positive attitudes toward physical activity (Bangun et al., 2023; Palmizal et al., 2020). Mastery of basic locomotor movements such as walking, running, jumping, and hopping forms the foundation for more complex motor skills, which are essential for holistic child development (Irawan & Sutaryono, 2021; Jannah et al., 2024). Effective PJOK instruction requires teaching approaches that align with children's developmental characteristics, particularly their natural preference for play and active engagement.

Despite the importance of PJOK, many elementary schools continue to rely on conventional, teacher-centered instructional models. These methods often emphasize repetitive drills and direct instruction, which may reduce student interest, limit movement exploration, and result in suboptimal learning outcomes (Erizal & Ihsan, 2020; Sudirman & Arini, 2022). Such challenges highlight the need for innovative learning media that can stimulate motivation and active participation.

Game-based learning (GBL) has emerged as an effective instructional strategy in physical education. Integrating games into movement learning can enhance students' motivation, enjoyment, and engagement while supporting motor skill development (Sahudi et al., 2021; Siregar et al., 2023). Games provide meaningful contexts for practicing movements naturally, promoting both cognitive and physical involvement. This approach aligns with contemporary educational paradigms emphasizing student-centered, experiential learning (Nasrullah et al., 2025; Verawati et al., 2022).

Previous studies on learning media in physical education have largely focused on digital tools, sports-specific skills, or general physical activities (Lanos et al., 2025; Wijaya et al., 2024). There remains limited attention to non-digital, game-based media specifically designed to teach locomotor movements for elementary students, particularly in under-resourced or rural schools. This gap is critical, as younger learners benefit most from hands-on, play-oriented activities that promote motor development.

Furthermore, prior research often evaluates learning media based solely on outcomes, with insufficient attention to systematic development and validation processes involving multiple expert perspectives. As a result, validated and practical game-based locomotor learning media that are pedagogically sound and suitable for teachers with limited instructional resources remain scarce (Bikalawan et al., 2024; Ramadhani et al., 2024).

To address these gaps, this study develops a non-digital game-based locomotor movement learning media using the ADDIE model, a structured R&D framework consisting of Analysis, Design, Development, Implementation, and Evaluation. This method ensures systematic planning, production, expert validation, and practical testing in real classroom settings (Arfi et al., 2024; Ockta et al., 2024).

The novelty of this research lies in integrating multi-dimensional expert validation (media, material, and language) and assessing student responses to ensure both theoretical soundness and practical feasibility. Unlike previous studies, this research emphasizes fundamental locomotor skills, student engagement, and teacher usability, providing a practical solution to the limitations of conventional PJOK instruction (Fadlan et al., 2023; Syaflin et al., 2021).

Therefore, this study aims to contribute to innovative PJOK teaching strategies by developing a game-based locomotor learning media that enhances students' motivation, facilitates active participation, and supports teachers in delivering effective, developmentally appropriate instruction in elementary schools. This research ultimately addresses the need for pedagogically sound, engaging, and practical learning tools for elementary physical education.

Method

This study employed a Research and Development (R&D) approach aimed at developing a game-based locomotor movement learning media for Physical Education, Sports, and Health (PJOK) at Public Elementary School 07 Tiumang, Dharmasraya Regency. The development process followed the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. During the analysis stage, needs analysis was conducted to identify problems in the existing PJOK learning process. The design stage focused on planning learning objectives, game scenarios, and media structure. The development stage involved producing the learning media and conducting expert validations, while the implementation stage tested the media in real classroom settings. Finally, the evaluation stage was carried out to assess the overall effectiveness and feasibility of the developed product.

Data were collected through expert validation sheets and student response questionnaires. The validation process involved media experts, material experts, and language experts who evaluated the product using a Likert-scale assessment. Data analysis techniques included validity analysis and practicality analysis, calculated using percentage scores. Validity criteria were determined based on expert judgment, while practicality was assessed through students' responses after using the learning media. The results of these analyses were used to revise and finalize the product to ensure that the developed learning media met the required standards for PJOK instruction.

Results and Discussions

This study produced a game-based locomotor movement learning media for Physical Education, Sports, and Health (PJOK) subjects at the elementary school level. The development process followed the ADDIE model, which consists of Analysis, Design, Development, Implementation, and Evaluation stages. This section presents the results of the validity test and practicality test of the developed product.

Validity Test Results of the Learning Media

The validity test aimed to determine the feasibility and appropriateness of the developed learning media. Validation was conducted by media experts, material experts, and language experts using a Likert-scale-based assessment instrument.

Media Expert Validation

The media expert evaluation focused on visual appearance, media design, interactivity, readability, and suitability for elementary school students.

Table 1. Media Expert Validation Results

No	Assessment Aspect	Maximum Score	Obtained Score	Percentage (%)	Category
1	Visual Appearance	40	39	97.50	Very Good
2	Media Design	40	38	95.00	Very Good
3	Interactivity	40	39	97.50	Very Good
4	Student Suitability	40	38	95.00	Very Good
	Average			96.25	Highly Valid

The results in Table 1 show that the learning media achieved an average validity score of 96.25%, indicating that it is highly valid and suitable for use in PJOK learning activities.

Material Expert Validation

Material validation assessed curriculum alignment, accuracy of locomotor movement concepts, clarity of material presentation, and alignment with PJOK learning objectives.

Table 2. Material Expert Validation Results

No	Assessment Aspect	Maximum Score	Obtained Score	Percentage (%)	Category
1	Curriculum Alignment	40	38	95.00	Very Good
2	Concept Accuracy	40	39	97.50	Very Good
3	Presentation Clarity	40	38	95.00	Very Good
4	Learning Objective Relevance	40	37	92.50	Very Good
	Average			95.42	Highly Valid

As shown in Table 2, the average material validation score was 95.42%, indicating that the content is highly valid and appropriate for elementary PJOK instruction.

Language Expert Validation

Language validation focused on sentence clarity, readability, appropriateness for students' cognitive levels, and correct use of terminology.

Table 3. Language Expert Validation Results

No	Assessment Aspect	Maximum Score	Obtained Score	Percentage (%)	Category
1	Language Clarity	30	25	83.33	Good
2	Student Appropriateness	30	26	86.67	Very Good
3	Readability	30	25	83.33	Good
	Average			84.44	Valid

The language expert evaluation yielded an average score of 84.44%, which falls into the valid category, indicating that the media is linguistically appropriate with minor revisions.

Practicality Test Results

The practicality test aimed to determine students' responses and the ease of use of the learning media during the learning process. Data were collected using a student response questionnaire.

Table 4. Student Response Results

No	Assessment Aspect	Percentage (%)	Category
1	Media Attractiveness	100	Very Good
2	Ease of Use	98	Very Good
3	Learning Motivation	99	Very Good
4	Learning Activeness	99	Very Good
	Average	99	Very Good

The results show an average student response score of 99%, indicating that the developed learning media is highly practical and well-received by students.

The findings of this study indicate that the developed game-based locomotor movement learning media demonstrates a high level of validity and practicality. Validation from media, material, and language experts shows that the product meets pedagogical, technical, and linguistic standards for elementary school PJOK learning, although language aspects received slightly lower scores, suggesting minor improvements may be needed (Cao et al., 2025; M. Wang et al., 2025).

The integration of game-based elements effectively increased students' motivation, participation, and engagement during physical education lessons. This aligns with the developmental characteristics of elementary students, who naturally prefer active, play-oriented learning activities (Cromley & Chen, 2025; Long et al., 2025). The positive response reflects the value of embedding learning objectives within enjoyable, structured games to maintain student attention and foster active movement exploration.

High validity scores for media and material indicate alignment with instructional design principles and motor learning theory. The systematic integration of locomotor movements within games supports the development of fundamental movement skills, essential for elementary students' motor competence (Fuentes et al., 2025; Hashizume et al., 2025). However, the study does not assess the long-term retention of these skills, which remains a potential area for further research.

Student responses demonstrated that the media is highly practical, enhancing motivation and engagement. Competitive and cooperative elements in the games encouraged active participation and reduced boredom, consistent with previous findings on game-based physical education (Al Kobaisi et al., 2025; Nguyen et al., 2025). Nonetheless, variations in responses among students of different ability levels or learning preferences were not analyzed, which may affect generalizability.

From a pedagogical perspective, the media promotes a student-centered learning approach. Students can explore movements independently within structured games, fostering autonomy, collaboration, and experiential learning (Baskota et al., 2025; Shen et al., 2025). While this approach appears effective, observations on classroom management challenges or teacher facilitation strategies were not systematically recorded.

The media provides practical benefits for PJOK teachers, offering a ready-to-use instructional tool that reduces preparation time and supports varied learning activities (Hashizume & Ying, 2025; Vidiyanti et al., 2025). However, the study did not quantitatively measure teacher workload reduction, and implementation in larger or multi-grade classes may present additional challenges.

The study also suggests potential long-term benefits for students' attitudes toward physical activity. Positive early experiences in PJOK may foster lifelong interest in movement and healthy lifestyles (Cherem-Kibrit et al., 2025; Silva et al., 2025). Still, claims regarding sustained behavioral changes extend beyond the data collected, and longitudinal studies are needed to confirm these outcomes.

Despite the overall positive findings, the study has limitations, including a relatively small sample, focus on a single school, and limited observation of students' performance variability. Future research

should investigate adaptation of the media for diverse school settings, measure long-term skill retention, and compare effectiveness with conventional or other game-based instructional methods (Smith et al., 2025; B. Wang et al., 2025).

In conclusion, the developed game-based locomotor learning media is a valid, practical, and engaging tool for elementary PJOK instruction. It supports student-centered learning, enhances motivation, and provides teachers with a structured, adaptable teaching resource. By addressing both pedagogical and practical challenges in physical education, the media contributes to the development of fundamental movement skills while offering a feasible solution for under-resourced classrooms (Fuentes et al., 2025; Hashizume et al., 2025; Soomro et al., 2025; Ylinen & Ranta, 2025).

Conclusions

This study concludes that the development of game-based locomotor movement learning media for elementary school PJOK using the ADDIE model was successfully achieved and met the intended research objectives. The developed media demonstrated a very high level of validity based on evaluations by media, material, and language experts, as well as excellent practicality based on students' responses. These findings indicate that the media is feasible, effective, and appropriate for supporting PJOK learning, particularly in enhancing students' motivation and active participation in locomotor movement activities. Therefore, the developed game-based learning media can be used as an innovative alternative to improve the quality of physical education instruction at the elementary school level.

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