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RESEARCH ARTICLE

Development and validation of an iSpring-Based interactive learning application for football education

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ABSTRACT

Background: Digital learning media can enhance the accessibility, interactivity, and flexibility of physical education instruction; however, evidence regarding interactive digital media specifically designed for football skill learning remains limited. **Objectives:** This study aimed to develop and validate an iSpring-based interactive learning application for football instruction in secondary physical education. **Methods:** A research and development design based on the ADDIE model was employed. The product was evaluated by three experts representing football content, instructional design, and educational media. Following expert validation and revision, the application was evaluated through small-group (n = 30) and large-group (n = 60) trials. Data was collected using structured evaluation questionnaires and analysed descriptively using percentage scores. **Results:** Expert validation indicated high feasibility across football content (93.00%), instructional design (91.64%), and media quality (94.16%), with an overall validation score of 93.00%. The small-group trial yielded an overall score of 86.77%, whereas the large-group trial yielded 86.24%. All scores were classified as highly feasible according to the predefined criteria. **Conclusion:** The developed iSpring-based application demonstrated strong content, instructional, and media feasibility for football learning. The application provides a validated prototype for technology-enhanced football instruction; however, its effects on students' learning achievement, skill acquisition, engagement, and retention require evaluation through controlled empirical studies.

Keywords: Technology-based teaching; physical education; football; iSpring

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INTRODUCTION

Digital technologies are increasingly reshaping physical education by providing new opportunities for multimedia instruction, interactive learning, and flexible access to learning resources (Chai et al., 2025; Youness et al., 2026; Zhang et al., 2025; Zhong et al., 2025). Recent evidence indicates that technology-enhanced pedagogy can support student engagement and broaden the ways in which physical education content is presented and practiced (Martín-Rodríguez & Madrigal-Cerezo, 2025; Saiz-González et al., 2025; Tohānean et al., 2025). However, the pedagogical value of digital technology depends not simply on its presence but on how effectively technological features are aligned with learning objectives, content characteristics, and students' learning needs (Wallace et al., 2023; Zhao et al., 2025; Zhong et al., 2025).

Football instruction in physical education presents particular pedagogical challenges because students are expected to master fundamental motor skills, such as passing, dribbling, ball control, and shooting, while also developing tactical understanding, perceptual skills, and decision-making abilities (García-Ceberino et al., 2020; Machado et al., 2026). These learning demands require students not only to reproduce movement patterns but also to understand when, why, and how particular skills should be applied in changing game situations (Zhao et al., 2025). Conventional teacher-centered demonstrations and predominantly text-based learning materials may provide limited opportunities for repeated observation, self-paced learning, and multimodal representation of movement techniques, particularly when students need to review technical movements outside scheduled face-to-face instruction (Duda et al., 2026). Interactive multimedia can provide an alternative by integrating textual explanations, visual demonstrations, animation, assessment activities, and opportunities for repeated or self-paced learning within a single instructional environment. Evidence from football and physical education research also indicates that audiovisual and interactive digital media can support the learning of fundamental football skills, including passing, dribbling, and shooting (Iuliano et al., 2023; Song et al., 2019).

Previous studies have demonstrated the potential of multimedia-based and technology-supported learning materials to enhance the delivery of physical education content. Interactive multimedia, for example, has been developed to support tennis instruction by integrating visual, textual, and interactive learning components (Basiri et al., 2020; Novak et al., 2023). Similarly, Articulate Storyline-based instructional materials have been developed to facilitate physical education learning through interactive and multimedia-oriented content. Technology-supported learning has also been examined through blended and digital learning approaches, indicating the growing role of technology in expanding instructional flexibility and student access to learning resources (Martín-Rodríguez & Madrigal-Cerezo, 2025).

Despite these developments, the existing literature remains relatively fragmented in terms of platform specificity, sport-specific content, and learning objectives. Previous studies have largely examined multimedia development for particular sports or have focused on general physical education learning rather than developing an integrated digital learning environment specifically structured around fundamental football skills (Zhao et al., 2025; Yu & Song, 2025). Moreover, relatively limited attention has been given to the use of iSpring as an integrated authoring environment for presenting football skills through multiple instructional modalities, including explanations, demonstrations, interactive activities, and assessment components. Therefore, there remains a need for a sport-specific digital learning application that integrates multimedia content and interactive assessment within a coherent instructional framework for fundamental

football skills.

Despite the growing integration of digital technologies into physical education, an important research gap remains in the systematic development and validation of sport-specific interactive learning applications that integrate instructional content, multimedia presentation, interactive learning activities, and assessment within a coherent learning environment (Saiz-González et al., 2025). Existing studies have demonstrated the potential of digital and multimedia-based resources to support physical education learning (Wallace et al., 2023; Youness et al., 2026; Zhong et al., 2025), however, relatively limited attention has been given to the development of an iSpring-based application specifically designed to support fundamental football skills through an integrated and learner-oriented instructional framework. More importantly, the quality of such an application should not be determined solely by its technical functionality or visual presentation, but also by whether its content accuracy, instructional clarity, usability, attractiveness, and practical applicability meet the requirements of the intended learners and learning context (Rahayu et al., 2025). Therefore, empirical validation is necessary to establish whether an iSpring-based football learning application is both technically appropriate and pedagogically suitable for secondary physical education.

The present study addresses this gap by developing and validating an iSpring-based interactive learning application specifically designed for fundamental football skills in secondary physical education. However, this is different from previous research which focused on developing multimedia or applications about physical fitness for students in physical education classes (Guo et al., 2026), this study integrates football-specific technical content, interactive multimedia elements, structured learning activities, and assessment components within a single digital learning environment. The resulting product is evaluated from three complementary expert perspectives—football content, instructional design, and educational media—to examine its content accuracy, pedagogical appropriateness, and technical quality. Where applicable, small- and large-group trials are subsequently conducted to obtain preliminary evidence of the product's usability and practical feasibility among intended users. Through this integrated development and validation process, the study contributes to a sport-specific digital learning resource that is designed not merely as a multimedia presentation, but as an interactive instructional application aligned with the learning requirements of football in secondary physical education.

Accordingly, this study aims to develop and validate an iSpring-based interactive learning application for fundamental football skills in secondary physical education using the ADDIE development framework. Specifically, the study sought to: (i) develop an interactive digital learning application integrating fundamental football skill content, multimedia presentations, learning activities, and assessment components; (ii) evaluate the content, instructional design, and educational media validity of the application through expert assessment; and (iii) examine the preliminary feasibility and usability of the application through small- and large-group student trials.

METHODS

Design

This study employed a research and development (R&D) design using the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation (Figure 1). The model was used to systematically develop an iSpring-based interactive learning application for fundamental football skills. The Analysis stage identified students' learning needs and instructional problems; the Design stage determined the learning objectives, content, and multimedia components; the

Development stage involved product development and expert assessment; the Implementation stage involved small- and large-group trials; and the Evaluation stage was conducted to assess product feasibility and guide further refinement.

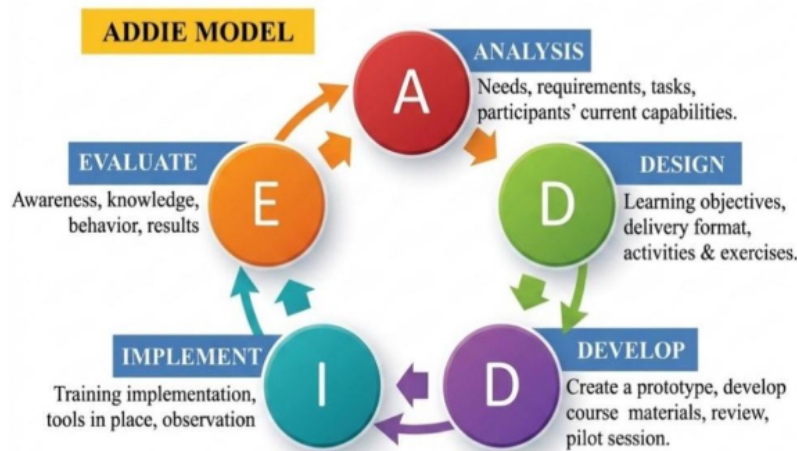


Figure 1. ADDIE-based Research and Development Procedure for the iSpring Football Learning Application

Needs Analysis

A preliminary needs analysis was conducted with 120 senior high school students to identify instructional problems, learning preferences, and the need for technology-based football learning materials. Data was collected using a structured questionnaire and analysed descriptively using percentages. The findings showed that 73.7% of students had a strong interest in football learning, 70.8% perceived limited variety in the presentation of fundamental football skills, and 83.0% reported a need for more diverse materials addressing affective, cognitive, and psychomotor competencies. In addition, 74.5% identified limited availability of technology-based learning media.

The students also demonstrated strong preferences for digital and interactive learning resources. Specifically, 78.8% expressed a demand for more engaging materials, 80.5% preferred easy-to-use application-based materials, 85.0% supported practical technology-based materials, and 93.0% preferred non-print learning materials in application format. Furthermore, 92.0% considered technology-based materials useful for addressing challenges in football instruction. Overall, these findings provided an empirical basis for developing an iSpring-based interactive learning application that offers more varied, accessible, and technology-supported fundamental football learning resources.

Participants and Experts

The study involved three experts and 90 senior high school students from Senior High School 1 Batu City, Indonesia. The experts comprised one football content expert, one instructional expert, and one educational media expert, who assessed the developed iSpring application according to their respective areas of expertise. The student participants were Grade X and XI students, with 30 students participating in the small-group trial and 60 students participating in the large-group trial. Expert assessments and student evaluations were conducted using structured questionnaires to examine the feasibility, usability, and quality of the developed learning application.

Ethical Considerations

Ethical approval was obtained from the Ethics Committee of Universitas Negeri Malang (Approval No. 986/320/UM/2025). Before participation, students and/or their legal guardians, where applicable, received information regarding the purpose and procedures of the study, the voluntary nature of participation, confidentiality of responses, and their right to withdraw without consequences. Informed consent was obtained before data collection. Participant information was anonymised and used solely for research purposes.

Product Development Process (ADDIE)

The product was developed using the ADDIE framework, comprising Analysis, Design, Development, Implementation, and Evaluation stages. Following the needs analysis, the Design stage involved determining the learning objectives, football content, instructional structure, and multimedia components of the iSpring-based application. During the Development stage, the initial product was assessed by three experts representing football content, instructional design, and educational media. Their feedback was used to revise and refine the application before user testing.

In the Implementation stage, the revised application was tested with 30 students in a small-group trial. Based on the findings and user feedback, further revisions were made before conducting a large-group trial involving 60 students. The Evaluation stage involved analysing expert assessments and student responses to determine the product's feasibility and usability and to identify aspects requiring further improvement.

Instrument Validation

The study employed structured questionnaires to evaluate the developed iSpring-based learning application. The questionnaires were administered to the football content expert, instructional expert, educational media expert, and student participants. The expert assessment questionnaire was designed to evaluate the quality and feasibility of the product in terms of content accuracy, instructional quality, and media presentation, whereas the student questionnaire assessed the usability and attractiveness of the application.

All questionnaire items were rated using a four-point Likert scale, ranging from 1 (very poor) to 4 (very good). Higher scores indicated more favorable evaluations of the developed application. The scoring criteria are presented in Table 1.

Table 1. Four-Point Likert Scale for Product Evaluation

No	Category	Score
1	Very good	4
2	Good	3
3	Poor	2
4	Very poor	1

Small-Group Trial

A small-group trial was conducted with 30 Grade X-XI students to examine the preliminary usability and feasibility of the iSpring-based learning application. The students used the application during football learning activities and subsequently completed a questionnaire assessing the clarity, usability, attractiveness, and practicality of the developed product. Feedback obtained from this stage was used to identify technical and instructional aspects requiring revision before the large-group trial.

Large-Group Trial

Following the small-group trial and subsequent product revision, a large-group trial involving 60 Grade X-XI students was conducted during football learning activities. The students used the revised iSpring application and evaluated its usability, attractiveness, clarity, and practical suitability for learning basic football skills. The results of the large-group trial were used to determine the final feasibility of the developed learning application and to identify any remaining aspects requiring improvement.

Data Analysis

Data obtained from the expert validation and student trials were analysed using descriptive quantitative analysis. Responses to the questionnaire were scored using a four-point Likert scale, ranging from 1 to 4, with higher scores indicating more favorable evaluations of the developed iSpring-based learning application. The obtained scores were converted into percentage scores by comparing the empirical scores with the maximum possible scores.

The resulting percentage scores were interpreted using the feasibility criteria presented in **Table 2**. For expert validation, the analysis was conducted separately for the football content, instructional design, and educational media aspects. For the student trials, the percentage scores were used to evaluate the preliminary usability and practical feasibility of the application. The findings from each stage were used to determine the need for subsequent product revisions.

Table 2. Criteria for Interpreting Product Feasibility

Percentage	Category	Interpretation
81-100%	Very feasible	Suitable for use without major revision
61-80%	Feasible	Suitable for use with minor revision
41-60%	Moderately feasible	Requires substantial revision
21-40%	Not feasible	Requires major revision before use
0-20%	Very infeasible	Not suitable for use

RESULTS

Expert Validation

The developed iSpring-based football learning application was evaluated by three expert validators representing three complementary domains: football content, instructional design, and educational media. The assessment focused on six dimensions of product quality: clarity, practicality, attractiveness, suitability, accuracy, and usefulness. The results are presented in **Table 3**.

Table 3. Expert Validation Results of the iSpring-Based Football Learning Application

Validator	Percentage	Interpretation
Football expert	93.00%	Very feasible
Learning expert	91.64%	Very feasible
Media expert	94.16%	Very feasible
Overall	93.00%	Very feasible

The football expert assigned an overall score of 93.00%, indicating a high level of agreement regarding the accuracy and suitability of the football-related content. The learning expert provided a score of 91.64%, indicating that the instructional components were considered appropriate for the intended learning context. The media expert recorded the highest score at 94.16%, suggesting that the application's multimedia presentation and media-related features were highly acceptable. Overall, the expert

validation yielded a score of 93.00%, supporting the feasibility of the developed application for subsequent user testing.

Small-Group Trial

Following expert validation and product revision, a small-group trial was conducted with 30 students. The trial evaluated six user-oriented dimensions: clarity, practicality, attractiveness, suitability, accuracy, and usefulness. The results are presented in **Table 4**.

Table 4. Small-Group Trial Results (n = 30)

Indicator	Percentage	Interpretation
Clarity	92.86%	Very high
Practicality	89.29%	Very high
Attractiveness	83.33%	Very high
Suitability	91.52%	Very high
Accuracy	82.50%	Very high
Usefulness	81.11%	Very high
Overall	86.77%	Very high

The overall score of the small-group trial was 86.77%, indicating a high level of perceived feasibility among the participating students. Clarity received the highest score (92.86%), followed by suitability (91.52%) and practicality (89.29%). The comparatively lower scores were observed for usefulness (81.11%) and accuracy (82.50%), although both remained within the high-feasibility category. These findings supported the continuation of the product development process to the large-group trial, while the qualitative feedback obtained from students was considered in the subsequent revision.

Large-Group Trial

Following the small-group trial and subsequent product refinement, the revised application was evaluated by 60 students in the large-group trial. The assessment covered the same six dimensions used in the small-group trial.

Table 5. Large-Group Trial Results (n = 60)

Indicator	Percentage	Interpretation
Clarity	93.45%	Very high
Practicality	89.29%	Very high
Attractiveness	81.94%	Very high
Accuracy	81.44%	Very high
Suitability	90.28%	Very high
Usefulness	81.04%	Very high
Overall	86.24%	Very high

The large-group trial produced an overall score of 86.24%, indicating a consistently high level of perceived feasibility among the 60 participating students. Clarity received the highest rating (93.45%), followed by suitability (90.28%) and practicality (89.29%). Attractiveness (81.94%), accuracy (81.44%), and usefulness (81.04%) received comparatively lower ratings but remained within the predefined high-feasibility category.

Interestingly, the overall score decreased slightly from 86.77% in the small-group trial to 86.24% in the large-group trial. This small difference suggests that the perceived feasibility of the application remained relatively stable when evaluated by a larger group of students. Rather than indicating a decline in product quality, the difference may reflect greater variability in user perceptions in the larger sample. However, because the study used descriptive analysis, this difference should not be interpreted as a statistically

significant change.

Final Product Characteristics

The final result of this research and development produced a final product called “iSpring-Based Football Learning Application” which we present in **Figure 2**.



Figure 2. Final Interface and Functional Features of the iSpring-Based Football Learning Application

DISCUSSION

Overall Product Validity and Feasibility

The present study developed an iSpring-based interactive learning application for football instruction. The product obtained an overall expert evaluation score of 93.00%, while the small- and large-group trials yielded 86.77% and 86.24%, respectively. These findings indicate that the application demonstrated high preliminary validity and feasibility for football learning.

The high expert evaluation suggests that the application successfully integrates football-specific content with interactive digital presentation. Such integration is important in physical education because students need both conceptual explanations and clear representations of movement techniques. Digital learning resources can also provide more flexible, varied, and accessible learning experiences when their technological features are aligned with instructional objectives and learner needs (Martín-Rodríguez & Madrigal-Cerezo, 2025; Saiz-González et al., 2025; Tohănean et al., 2025). These findings are consistent with previous research demonstrating the potential of multimedia-based resources to support physical education learning (Feng et al., 2025; Zhang et al., 2025). However, the high validity and feasibility scores should not be interpreted as evidence of instructional effectiveness. The present study demonstrates that the product is appropriate for further use and testing, whereas its effectiveness in improving football learning outcomes requires evaluation through comparative or experimental research.

Expert Evaluation and Pedagogical Quality

The expert assessment showed consistently high ratings for the three domains: football content (93.00%), learning design (91.64%), and media quality (94.16%). These results indicate that the application achieved a reasonable balance between content accuracy, pedagogical organisation, and digital-media quality.

This integration is consistent with the TPACK framework, which emphasises that effective technology integration requires the alignment of content, pedagogy, and technology, rather than simply adding digital tools to instruction (Park et al., 2025; Sullivan et al., 2024). The high football-expert rating suggests that the technical content was appropriate for the intended learning context, while the learning-expert rating indicates that the instructional organisation supported the presentation of football skills in a structured manner.

The media-expert score was the highest (94.16%), indicating that the application's presentation and interactive features were well received. This finding is consistent with evidence that multimedia technologies can provide more varied, accessible, and engaging learning experiences when appropriately aligned with instructional objectives (Saiz-González et al., 2025; Tohănean et al., 2025). However, technological quality alone does not establish learning effectiveness; the value of digital media depends on the integration of technological features with pedagogical strategies and subject-specific learning objectives (Zhao et al., 2025). Thus, the contribution of the present study lies not merely in the use of iSpring, but in its integration of football-specific content, instructional design, multimedia presentation, and interactive learning features within a single learning environment.

Student Evaluation and Practical Implications

Student trials provided additional evidence of the application's preliminary feasibility, with overall scores of 86.77% in the small-group trial and 86.24% in the large-group trial. The similar results across both groups suggest that the application's favorable evaluation remained relatively consistent as the number of participants increased.

In the small-group trial, clarity (92.86%) and suitability (91.52%) received the highest ratings, whereas usefulness (81.11%) and accuracy (82.50%) received comparatively lower scores. A similar pattern was observed in the large-group trial, with high ratings for clarity (93.45%) and suitability (90.28%), but lower ratings for attractiveness (81.94%), accuracy (81.44%), and usefulness (81.04%). Although all indicators remained within the study's very valid category, these differences suggest that future refinement should focus particularly on the application's engagement, functional usefulness, and precision of selected learning components.

The findings are consistent with previous research indicating that interactive multimedia can increase the variety and accessibility of learning experiences by combining visual, textual, and interactive elements (Martín-Rodríguez & Madrigal-Cerezo, 2025). However, multimedia features should remain closely aligned with learning objectives rather than being incorporated solely for technological appeal (Hebibi et al., 2026). From a practical perspective, the iSpring application can serve as a supplementary learning medium for presenting and reinforcing fundamental football skills. Students can revisit instructional materials independently, while teachers can use the application to complement demonstrations and classroom activities (Tohănean et al., 2025). Nevertheless, the application should not be considered a substitute for direct motor practice, teacher feedback, and authentic physical activity, which remain essential components of physical education learning (Rahayu et al., 2025; Gil-Espinosa et al., 2022; Vega-Ramírez et al., 2020). Future development should therefore prioritise interactive quizzes, immediate feedback, animation or movement demonstrations, and differentiated learning activities to strengthen the application's perceived usefulness and attractiveness. Importantly, these recommendations represent directions for product refinement rather than evidence of effectiveness, as the present study primarily established validity and preliminary feasibility, not causal improvements in football

learning outcomes.

Limitations and Future Research

3 Several limitations should be considered. First, the study involved only one school, limiting the generalisability of the findings. Second, the evaluation relied on expert judgments and student questionnaires, which provide evidence of validity and feasibility but not direct evidence of learning effectiveness. Third, the absence of a control group prevents causal conclusions about the superiority of the iSpring application over conventional instruction. Finally, long-term outcomes such as learning retention, technical skill transfer, and sustained use were not examined.

Future research should use quasi-experimental or randomised controlled designs to examine the application's effects on football knowledge and technical performance. Studies should also involve multiple schools and more diverse samples and examine outcomes such as motivation, engagement, self-efficacy, and learning retention. Further product development could incorporate interactive assessment, immediate feedback, gamification, and learner analytics to enhance its instructional value.

CONCLUSION

This study developed an iSpring-based interactive learning application for football instruction and demonstrated high preliminary validity and feasibility. Expert evaluation yielded an overall score of 93.00%, while small- and large-group student trials yielded 86.77% and 86.24%, respectively. These findings indicate that the application is a feasible supplementary medium for supporting football learning. However, its effectiveness in improving students' football knowledge and technical performance remains to be established through controlled empirical studies.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest related to this study.

AI DISCLOSURE STATEMENT

The authors used generative AI tools for language refinement, sentence structure, and readability. All AI-assisted content was reviewed and verified by the authors, who remain responsible for the final manuscript.

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