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## A content-validated interactive medium for basketball skill learning: development using Lectora Inspire

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### ABSTRACT

**Background:** The rapid digital transformation in education necessitates the development of interactive learning media, particularly in physical education domains such as basketball, which require the integration of motor skills, tactical understanding, and active engagement. However, conventional instructional media often fail to adequately support the visual and practical demands of sports learning.

**Objectives:** This study aimed to develop Lectora Inspire-based interactive media for learning basic basketball techniques and to evaluate its content validity using the Content Validity Index (CVI).

**Methods:** A quantitative descriptive validation design was employed involving four expert validators. Data were collected using a structured questionnaire assessing format, content, and language aspects. Content validity was analysed using item-level (I-CVI) and scale-level (S-CVI) indices.

**Results:** The results indicated a high level of agreement among experts, with an overall mean validity score of 88.24%. The S-CVI/Ave reached 0.95, exceeding the recommended threshold of 0.80. Fifteen out of nineteen items achieved an I-CVI of 1.00, while four items (interactive features, visual display quality, audio-video clarity, and sequential organisation) showed I-CVI values of 0.75, indicating the need for revision.

**Conclusion:** The developed interactive media demonstrates strong content validity and provides a structured approach for integrating digital technology into basketball learning. This study contributes by applying a CVI-based validation framework in motor-skill-based instructional media. Future research should examine its effectiveness through experimental designs.

**Keywords:** Interactive learning media; lectora inspire; basketball learning; content validity; physical education

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**Authors' Contribution:** a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection



## INTRODUCTION

The rapid development of information technology has created new opportunities to enhance learning through interactive media. In contemporary physical education, particularly in basketball learning, instructional processes require the integration of

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28 motor skills, tactical awareness, and cognitive understanding, making the use of interactive and multimodal media increasingly essential (Petway et al., 2020). A growing body of research indicates that dynamic visualisations, such as video modelling and interactive simulations, can enhance skill acquisition, reduce cognitive load, and improve learners' engagement and motivation (Rekik et al., 2021; Rekik et al., 2018). Furthermore, multimedia-based learning environments have been widely recognised for their capacity to facilitate meaningful learning experiences by combining visual, auditory, and interactive elements (Li & Xu, 2021).

Basketball learning demands an approach that not only develops physical skills but also supports strategy and conceptual understanding (Fahmi et al., 2021). Recent pedagogical approaches, including digital game-based learning and interactive multimedia, have demonstrated significant potential in enhancing student motivation and technical skill development, particularly in fundamental skills such as shooting and passing (Fatoni et al., 2022; Permatasari et al., 2020). However, the effectiveness of these digital innovations is highly dependent on the instructional quality and validity of the media employed. Poorly designed or unvalidated media may lead to misconceptions, cognitive overload, and suboptimal learning outcomes (Jeong et al., 2012; Vandenbosch & van Oosten, 2017; Hikmi et al., 2020; Li, 2018).

Despite these advancements, learning media in schools are still often conventional and limited in presenting interactive and dynamic visual content, which reduces student engagement and limits the development of visual motor coordination (Candra et al., 2024; Ristiani et al., 2020). This gap highlights a mismatch between technological potential and actual classroom practice, particularly in physical education settings where visualisation of movement is critical. Interactive media integrating video and user interaction have been shown to address this limitation by improving students' understanding of movement patterns and increasing learning motivation (Candra et al., 2024).

Lectora Inspire has been widely applied in various disciplines and has demonstrated effectiveness in enhancing digital learning experiences (Marindra et al., 2023; Wibawa, 2017). In the context of sports education, its use has also been associated with improved feasibility, usability, and learning outcomes, particularly in skill-based instruction such as basketball (Candra et al., 2024; Vai et al., 2021). However, existing studies predominantly focus on practicality and effectiveness, with limited attention given to rigorous validation processes that ensure the accuracy and pedagogical appropriateness of instructional content. In particular, there is a lack of studies employing standardised validation frameworks, such as the Content Validity Index (CVI), to evaluate interactive media designed for motor skill learning. This limitation raises concerns regarding the instructional reliability of such media before implementation in real learning contexts.

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22 Therefore, this study addresses this gap by developing and systematically validating a Lectora Inspire-based interactive video learning medium grounded in a visual-motor approach for basketball technical skills. Unlike previous studies, this research emphasises rigorous content validation using a structured CVI framework to ensure instructional accuracy and quality. This study aims to examine the content validity of Lectora Inspire-based interactive media in video-based basketball learning for high school students.

## METHOD

### Design

This study employed a quantitative descriptive validation design to evaluate the content validity of video-based interactive learning media developed using Lectora Inspire. The study focused on assessing the extent to which the developed media met established validity criteria across three dimensions: content, format, and language. Content validity was examined using the Content Validity Index (CVI), including both item-level CVI (I-CVI) and scale-level CVI (S-CVI), to quantify the level of agreement among expert validators regarding the relevance and appropriateness of the media components.

### Participants

The content validation process involved four expert validators selected through purposive sampling based on their expertise in physical education, instructional media, and sports learning. The panel consisted of two high school physical education teachers, one information technology lecturer, and one lecturer in physical education, health, and recreation. This composition ensured a balanced evaluation encompassing pedagogical, technical, and content-specific perspectives. The use of four experts is considered adequate for content validation studies, as previous research suggests that a panel of three to five experts is sufficient to achieve reliable judgement and consensus (Aksah et al., 2023).

### Instrument

Data were collected using a content validation questionnaire adapted from the multimedia learning evaluation framework proposed by (Smaldino et al., 2019). The instrument was modified to align with the characteristics of interactive video-based learning media in sports education, particularly basketball instruction. The questionnaire consisted of 19 items distributed across three dimensions: (i) format (layout, navigation, and visual design); (ii) content (accuracy, relevance, and completeness); and (iii) language (clarity, readability, and consistency of terminology). A four-point Likert scale (1 = not relevant, 2 = somewhat relevant, 3 = relevant, and 4 = highly relevant) was used to assess the relevance of each item and to encourage definitive expert judgements. Content validity was evaluated using the Content Validity Index (CVI) to determine the level of agreement among expert validators regarding the relevance and appropriateness of each item.

### Procedure

The validation process was conducted in three main stages. First, the developed Lectora Inspire-based interactive media were distributed to expert validators along with the content validation questionnaire. Second, each validator independently assessed the media by rating each item based on its relevance and appropriateness. In addition to quantitative ratings, validators were invited to provide qualitative feedback and suggestions for improvement. Third, all evaluation results were collected and analysed. The qualitative feedback was used to refine and improve the media content prior to final validation. Standardised instructions were provided to all validators to ensure consistency in the evaluation process.

### Data Analysis

Data were analysed using the Content Validity Index (CVI) to evaluate the level of agreement among expert validators regarding the relevance and appropriateness of each

item in the developed media. The item-level CVI (I-CVI) was calculated as the proportion of experts who rated each item as relevant (scores of 3 or 4 on a four-point Likert scale), using the formula:  $I-CVI = (\text{number of experts rating the item as 3 or 4}) / (\text{total number of experts})$ . I-CVI values of 0.78 or higher were considered acceptable, indicating adequate content validity.

The scale-level CVI (S-CVI/Ave) was computed as the average of all I-CVI values to assess the overall content validity of the media. An S-CVI/Ave value of 0.80 or higher was interpreted as demonstrating strong agreement among experts. The analysis was conducted for each item and across all dimensions (format, content, and language) to provide a comprehensive evaluation of the strengths and areas for improvement of the developed interactive media.

## RESULTS AND DISCUSSION

### Results

#### Content Validity Results

The content validity of the developed Lectora Inspire-based interactive media was evaluated using the Content Validity Index (CVI). The detailed results of the item-level CVI (I-CVI) and scale-level CVI (S-CVI/Ave) are presented in **Table 1**.

**Table 1. Content Validity Index (CVI) Results per Item (I-CVI) and Scale-Level (S-CVI)**

No	Item Description	I-CVI	Decision
1	Clarity of learning objectives	1.00	Accepted
2	Relevance to basketball techniques	1.00	Accepted
3	Appropriateness of interactive features	0.75	Revised
4	Ease of navigation	1.00	Accepted
5	Visual display quality	0.75	Revised
6	Readability of text and fonts	1.00	Accepted
7	Audio-video clarity	0.75	Revised
8	Accuracy of technique illustrations	1.00	Accepted
9	Sequential organization of material	0.75	Revised
10	Sufficiency of practice simulations	1.00	Accepted
11	Alignment with learning outcomes	1.00	Accepted
12	Language clarity	1.00	Accepted
13	Use of standard terminology	1.00	Accepted
14	Feedback quality	1.00	Accepted
15	Motivation and engagement	1.00	Accepted
16	Suitability for diverse abilities	1.00	Accepted
17	Assessment relevance	1.00	Accepted
18	User control and flexibility	1.00	Accepted
19	Overall usability	1.00	Accepted
S-CVI/Ave		0.95	High validity

As shown in **Table 1**, the I-CVI values ranged from 0.75 to 1.00, indicating generally strong agreement among expert validators. A total of 15 out of 19 items (78.9%) achieved an I-CVI value of 1.00, reflecting complete agreement regarding the relevance and appropriateness of these components.

However, four items, namely interactive features, visual display quality, audio-video clarity, and sequential organisation of material obtained, I-CVI values of 0.75, which are slightly below the recommended threshold of 0.78 for four experts. These findings suggest that while the majority of the media components were considered appropriate, certain aspects required refinement.

At the scale level, the S-CVI/Ave value reached 0.95, as presented in **Table 1**, exceeding the recommended threshold of 0.80. This result indicates a high level of overall content

validity and strong agreement among validators regarding the quality of the developed media.

Based on these results, items with lower I-CVI values were revised according to expert feedback, particularly focusing on improving interactivity, visual presentation, audio–video quality, and content organisation. Following these revisions, the media was considered to meet the required standards for instructional use in basketball learning.

*Dimensional Analysis of Content Validity*

To provide a more detailed evaluation, the CVI results were further analysed across three dimensions: format, content, and language. The analysis revealed that items within the content and language dimensions consistently achieved I-CVI values of 1.00, indicating strong agreement regarding instructional accuracy, clarity, and relevance. In contrast, items within the format dimension, particularly those related to interactivity and visual presentation, showed relatively lower I-CVI values (0.75). This suggests that while the instructional substance of the media is strong, aspects related to user interface design and media presentation require further refinement to optimise learning engagement and usability.

*Revision Outcomes Based on Expert Feedback*

Based on expert feedback, several revisions were implemented to improve the quality of the developed media. These revisions primarily focused on enhancing interactive features, improving visual design and layout, optimising audio–video clarity, and restructuring the sequence of learning content. As summarised in **Table 2**, each identified issue was systematically addressed through targeted revisions to ensure both pedagogical accuracy and technical quality of the media.

**Table 2. Summary of Revisions Based on Expert Feedback**

Aspect	Issue Identified	Revision Implemented
Interactive features	The level of interactivity was considered insufficient to actively engage users	Interactive components were strengthened by improving navigation flexibility and providing greater user control during learning activities
Visual design and layout	Visual presentation lacked clarity and the layout structure appeared inconsistent	The visual hierarchy was refined, layout organization was standardised, and graphical elements were enhanced to improve readability and aesthetic quality
Audio–video quality	Audio and video elements were not consistently clear and occasionally lacked synchronisation	Audio–video synchronisation was optimised and overall media quality was improved to ensure a smoother and more coherent learning experience
Content organisation	The sequencing of instructional materials was not yet systematic and tended to disrupt learning flow	The content structure was reorganised into a more logical and progressive sequence to support step-by-step understanding

**Discussion**

The developed media achieved a high level of content validity, with an S-CVI/Ave of 0.95, exceeding the recommended threshold of 0.80, as suggested by (Othman et al., 2024). In addition, 15 out of 19 items achieved an I-CVI value of 1.00, indicating complete agreement among expert validators. However, four items, namely interactive features, visual quality, audio–video clarity, and sequential organisation, obtained I-CVI values of 0.75, suggesting the need for refinement. This pattern indicates that while content-

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related aspects were consistently rated as highly appropriate, elements related to user interaction and presentation remain more sensitive to expert evaluation.

This finding is consistent with previous validation studies in physical education. [So et al., \(2021\)](#) applied CVR and CVI to evaluate physical education test instruments, while [Yusfi et al. \(2021\)](#) developed a basketball learning model and reported high I-CVI values. Similarly, [Shahril et al. \(2024\)](#) implemented structured validation procedures using the DONE model, and [Shortt et al. \(2019\)](#) employed a Delphi approach to establish content validity in physical literacy research. However, unlike these studies, the present research highlights specific weaknesses at the item level, providing more precise diagnostic information for improving instructional media.

From a theoretical perspective, the effectiveness of the developed media can be explained by the cognitive theory of multimedia learning. [Mayer \(2024\)](#) argues that learning is enhanced when information is processed through both visual and verbal channels within the limits of cognitive capacity. In the context of motor skill learning, this process must be complemented by observational learning mechanisms, as proposed by [Han et al. \(2022\)](#) and motor control processes such as error detection and feedback, as described by [Akizuki et al., 2025](#). Furthermore, [Thompson et al. \(2017\)](#) demonstrated that interactive visual feedback enhances complex motor skill acquisition, while [Heemsoth et al. \(2022\)](#) showed that video-based instruction improves pedagogical understanding in sports contexts.

The lower I-CVI scores identified in this study are particularly meaningful, as they correspond to elements that directly influence perceptual and attentional processes in motor learning. [Trajkovik et al. \(2018\)](#), in their systematic review of basketball activity demands, emphasised the importance of visual guidance and interaction design in supporting skill acquisition. This suggests that even when content accuracy is high, insufficient attention to interaction design may limit the instructional effectiveness of digital learning media.

Unlike previous Lectora Inspire-based studies that relied primarily on percentage-based evaluation, the present study applies a more rigorous CVI-based validation framework, as recommended by [Almanasreh et al., 2019](#). This approach enables a more precise identification of item-level weaknesses, which may be overlooked when using aggregate percentage scores. In addition, [Sha and Chiu \(2025\)](#) found that guided dual-sensory video instruction significantly improves basketball shooting performance, while [Abdulhusein \(2025\)](#) demonstrated that interactive video analysis enhances dribbling skills with a large effect size. However, these studies generally assume content validity without explicitly testing it, whereas the present study establishes content validity as a prerequisite for instructional effectiveness.

This study offers several important contributions. First, it provides a systematic application of I-CVI and S-CVI/Ave in validating Lectora Inspire based basketball learning media, following established validation standards [\(Othman et al., 2024\)](#). Second, it identifies a critical imbalance between content accuracy and interaction design, where instructional content is strong, but interactive presentation requires further refinement. Third, it demonstrates that high overall validity scores may mask weaknesses at the item level, supporting the argument by [Almanasreh et al. \(2019\)](#) that item-level analysis is essential in content validation studies. Fourth, it presents a replicable validation protocol that includes instrument development, CVI calculation, and revision procedures.

From a practical perspective, the validated media has strong potential to support basketball instruction. However, the identified weaknesses in interactivity and presentation must be addressed before the media is widely implemented, particularly in

self-regulated learning contexts [Abdulhussein \(2025\)](#) emphasised that interactive video-based training significantly improves performance outcomes, while [Waffak et al. \(2022\)](#) demonstrated that game-based multimedia approaches enhance higher-order thinking skills. In addition, [Jenny et al. \(2017\)](#) concluded that motion-based and video-supported learning technologies are effective when properly designed. Therefore, content validity should be considered a foundational step rather than a final indicator of instructional effectiveness.

23 Several limitations should be acknowledged. First, the number of validators was relatively small ( $n = 4$ ), which may limit generalisability. Second, the CVI approach assumes equal weighting of all items, whereas motor skill learning contexts may require differential weighting, as discussed by [\(Almanasreh et al., 2019\)](#). Third, inter-rater reliability beyond agreement proportion was not calculated, and future studies are recommended to apply more robust measures, such as Fleiss' kappa. Fourth, the validation process did not involve student users, limiting ecological validity. Finally, the study employed the S-CVI/Ave approach; therefore, future research should consider reporting both S-CVI/UA and S-CVI/Ave, as recommended by [\(Othman et al., 2024\)](#).

26 Future research should extend this work by employing experimental designs, such as randomised controlled trials, to examine the effectiveness of the developed media on actual skill performance for example, [Sha and Chiu \(2025\)](#) and [Abdulhussein \(2025\)](#) demonstrated the effectiveness of video-based interventions in improving basketball performance. In addition, comparative studies between the original and revised versions of the media are recommended, particularly focusing on items with lower I-CVI values. Furthermore, contextual factors such as learning environment and learner characteristics should be considered. Cross-cultural validation is also needed, as expert judgements regarding interactive features may vary across educational systems.

## CONCLUSION

This study demonstrates that the developed Lectora Inspire-based interactive media exhibits a high level of content validity, as evidenced by strong agreement among expert validators across format, content, and language dimensions. These findings indicate that the media is instructionally appropriate and well-aligned with the requirements of basketball learning, particularly in supporting fundamental motor skill acquisition. Furthermore, this study contributes to the literature by providing a systematic CVI-based validation framework for the development of interactive learning media in physical education. The results also highlight that, despite high overall validity, aspects related to interactivity and visual presentation require careful refinement to ensure optimal instructional effectiveness.

32 From a practical perspective, the validated media offers a structured and visually supported instructional resource that can assist teachers in delivering more effective and engaging basketball learning experiences. However, this study is limited to content validation and does not evaluate the effectiveness of the media in improving learning outcomes or performance. Therefore, future research is recommended to employ experimental designs to examine the impact of the developed media on student learning, as well as to explore its applicability across diverse educational contexts and learner characteristics.

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14  
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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this study.

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