



Android-Based Cikeruhan Dance Multimedia to Improve Students' Self-Directed Learning

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Abstract: This research aims to develop an Android-based digital module for Cikeruhan Dance that can enhance students' self-directed learning (SDL) abilities. Cikeruhan Dance, as part of the Sundanese folk dance tradition, has the potential to be used as an interesting and relevant learning material for university students and school pupils, especially in the context of dance education. The research method employed is Research and Development (R&D), utilizing the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The module development process involves analyzing students' needs for interactive and easily accessible dance learning materials, followed by designing a module that includes History, Movement Structure, Makeup and Costume, as well as video tutorials and quizzes for evaluation. Data collection techniques include observation, interviews, and literature studies to analyze needs and identify novelties, ensuring that the development aligns with student requirements. Triangulation analysis is then applied to ensure the collection of relevant and balanced data. A limited trial was conducted with dance education students. The results of the small group trial showed an effectiveness of 85.07%, while the large group trial showed an effectiveness of 87.91%. The difference occurred because the large group already had prior knowledge of the material. This module is considered highly valid with an attractive design, communicative language, and visual elements that support learning. The use of the Android-based module facilitates access and increases motivation and independence among students in learning Cikeruhan Dance.

Keywords: multimedia; application; digital module; dance noise; android-based; self-directed learning

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INTRODUCTION

The development of digital technology in education has significantly impacted learning methods, particularly in facilitating flexible and independent learning (Badaruddin et al., 2023). One innovation is the creation of mobile application-based learning modules, which allow students to access materials independently without spatial or temporal limitations (Badaruddin, 2023). A notable example is the development of a digital module for learning traditional Cikeruhan Dance, accessible via Android (Lemmetty, 2021; Ali et al., 2023). This aims to enhance students' self-directed learning (SDL), enabling them to plan, implement, and evaluate their learning process independently (Ummah, 2019; Esiyok et al., 2025). SDL emphasizes individual initiative and responsibility in managing one's learning process (Komalasari et al., 2021; Li et al., 2023). SDL increases students' engagement and motivation, and has a positive impact on learning outcomes (Beckers et al., 2022; Brockett & Hiemstra, 2018). The Android-based digital module for Cikeruhan Dance offers an interactive platform that enables students to access dance materials, promoting independent learning tailored to their abilities. This is particularly relevant, as conventional dance learning often faces limitations in terms of time and accessibility. Previous studies demonstrate that mobile applications in art education can improve motor skills and cultural understanding (Kustandi et al., 2020; Darajat et al., 2025; Rusk et al., 2024; Sari & Putra, 2020). Technology-based learning is increasingly accepted in higher education, and various studies demonstrate that it can support more effective learning by providing access to materials anytime and anywhere (Anderson, 2021; Kumar & Rose, 2022).

The development of the Android-based Cikeruhan Dance digital module aims to provide a personalized and flexible learning experience, enhancing dance skills through the use of SDL. The application is designed with a user-centered approach, featuring interactive tutorials, repeatable exercises, and an evaluation system. SDL is a process where individuals take the initiative in identifying their learning needs, planning, and evaluating their learning outcomes independently (Zhu, 2021). It promotes active learning, responsibility, and deep cognitive skills (Koong Lin et al., 2024; Knowles, 1975; Brockett & Hiemstra, 2018; Alemayehu & Chen, 2023).

From the statement above, Self Direct Learning is an important basis in the development of digital modules, because it provides space for students to learn at their own pace and style (Golightly, 2025).

Multimedia in an educational context refers to the use of various media such as text, images, video, and audio to enrich the learning process and help students understand the material more effectively (Dhivya et al., 2023). According to Mayer's Cognitive Theory of Multimedia Learning (2005), learning is more effective when information is presented using a combination of text and images. The use of multimedia can enhance understanding by engaging cognitive, visual, and auditory processing, which facilitates faster information processing (López, 2023). Furthermore, Mayer (2009) suggests that multimedia learning can improve comprehension and retention of information by combining multiple forms of media. He emphasizes that effective learning design combines text and images to prevent cognitive overload and foster a deeper understanding. In the context of the Cikeruhan Dance digital module, multimedia theory guides the development of learning materials that incorporate multiple forms of media, such as video tutorials, explanatory texts, and images or graphics to explain the philosophy of dance. This multimedia approach can enhance students' understanding of dance techniques and the cultural context. Learning media refers to various tools or technologies used to convey messages or learning information to help students understand the material better (Wang & Hung, 2022; An & Shan, 2023). Arsyad (2011) states that learning media can stimulate students' attention and interest in the learning process. Good learning media should create a fun and effective learning experience (Sudjana, 2005). This media can also help students understand abstract material and clarify concepts that are difficult to accept verbally (Abuzaid et al., 2024).

In the context of the Android-based Cikeruhan Dance digital module, learning media can include applications that provide dance tutorials, text explanations, and interactive exercises, allowing students to interact directly with the material and improve their understanding of traditional dance and Indonesian culture. Digital modules are learning materials presented in digital format, accessible via computer or mobile devices (Sankaran et al., 2022). These modules typically include text, images, videos, and interactive elements that help students understand the material. According to Dick and Carey (2009), digital modules are an effective tool for building multimedia-based learning. They enable students to access materials at any time and from anywhere, providing immediate feedback on their progress. Hassan and Aziz (2017) argue that digital modules support student-centered learning, allowing students to learn independently at their own pace and convenience. This module also provides students with opportunities to explore the material more engagingly. The concept of digital modules is crucial in developing Android-based learning applications for Cikeruhan Dance. This module can include dance tutorials, explanations of dance philosophy, and quizzes or evaluations that enable students to measure their progress. These four theories provide a clear framework for how the development of Android-based digital modules for learning Cikeruhan Dance can enhance the student learning process. Understanding Self-Directed Learning (SDL) Theory underlies the importance of student initiative in independent learning.

Furthermore, we examine several previous studies regarding the concept of digital modules in dance learning. Sari and Putra (2020) investigate the application of mobile applications in traditional dance learning in Indonesia. Their study finds that mobile applications not only facilitate students' access to dance learning materials but also improve their motor skills. Through interactive tutorials and repeatable exercises, students can learn dance movements independently and flexibly. This study is relevant to the development of a digital module for Cikeruhan Dance, aiming to facilitate independent learning. Anderson (2021) reveals that technology-based learning can enhance students' self-directed learning (SDL) skills. His study explains how mobile applications provide flexible access for students to learn independently, allowing them to explore material at their own pace and learning style. This study supports the idea of developing an Android-based digital module for learning Cikeruhan Dance, as it can improve students' skills and motivation to learn independently.

Hooper and Berkman (2011) and Saputra and Kania (2022) examined the impact of user experience design on the effectiveness of mobile applications in learning. They found that well-designed applications can increase user engagement and facilitate quick access to information. Although their study focused on the "Duet" application in childcare, the design principles can also be applied to developing Android-based digital dance modules. A good user experience can help students access and understand Cikeruhan dance materials more easily. Wijaya et al. (2021), Li et al. (2018), and Indriati et al. (2024) investigated the application of technology in arts education, particularly dance. Their study demonstrated that mobile applications can enhance students' understanding of dance culture and techniques, as well as improve their motor skills. This highlights the importance of integrating technology in dance teaching, enabling students to learn in a more personalized and flexible manner through mobile applications. This is relevant to developing digital modules for learning Cikeruhan Dance, enabling students to learn independently. Brockett and Hiemstra (2018) discussed the concept and theory of self-directed learning (SDL) in higher education, stating that SDL encourages students to take responsibility for their learning process, potentially increasing motivation and engagement. Mobile-based applications can be an effective tool to support SDL, providing learning resources accessible anytime and anywhere. This study provides a strong theoretical basis for using Android-based digital modules to improve

students' SDL in learning Cikeruhan Dance. The five previous studies highlighted the important role of technology, particularly mobile applications, in enhancing art learning, especially in dance. [Sari and Putra \(2020\)](#) emphasized that mobile applications enable students to learn dance independently with interactive tutorials, improving their motor skills. [Anderson \(2021\)](#) supported this, showing that mobile applications provide flexibility for students to manage their learning process according to their learning style and pace. [Hoover and Berkman \(2011\)](#) stated that effective user experience design in mobile applications can enhance user engagement, facilitate access to learning materials, and promote a deeper understanding.

[Wijaya et al. \(2021\)](#) noted that mobile applications can enhance the understanding of dance culture and techniques, offering a more personal and flexible experience. [Brockett and Hiemstra \(2018\)](#) provided a theoretical basis for self-directed learning (SDL), suggesting that technology can facilitate students' responsibility for their learning, encouraging higher engagement and motivation. Research on developing an Android-based Cikeruhan Dance digital module offers significant innovation by replacing traditional manual book methods or direct learning, which typically lack guidance for students. With this application, learning becomes more structured and interactive ([Nagar et al., 2024](#)). The uniqueness of this research lies in its integration of interactive multimedia and digitalization, bringing innovation to traditional dance education ([Li et al., 2025](#)). This module represents a development in dance education, adapting to technological advancements and offering a more modern and efficient learning experience ([Seraj et al., 2024](#)). The contribution of this research to scientific knowledge is clear, as it advances the arts field by utilizing multimedia and digital technology as teaching materials that are increasingly relevant over time ([Ramsay-Seaner et al., 2024](#)). The use of this module facilitates students to learn more flexibly, not limited to the classroom, but anywhere. This makes the learning process more effective, as students can study independently without having to wait for the lecturer's presence. Therefore, face-to-face meetings in class will be more focused on refining dance techniques, making them more effective and targeted.

METHODS

The development of this Android-based digital module employs the Research and Development (R&D) method, a research approach that involves producing new products and testing their effectiveness through a practical and applicable product design and development process ([Huang, 2024](#); [Jia et al., 2025](#); [Sugiyono, 2022](#)). This study aims to develop an Android-based digital module for Cikeruhan Dance, which will enhance students' self-directed learning (SDL). The Research and Development (R&D) method is a systematic approach to designing, developing, and testing products, specifically an Android-based digital module. This method allows for the creation of innovative solutions that address specific needs and problems. By adopting an R&D approach, this study aims to develop a high-quality digital module that effectively enhances students' self-directed learning.

The selection of participants for the trial employed a purposive random sampling approach, designed to select a sample that aligns with the study's objectives ([Sulistiawati et al., 2017](#)). The participants involved were fourth-semester students currently enrolled in the Traditional Dance course, as they possess a foundational understanding of both the theory and practice of traditional dance. This criterion was chosen to ensure that participants could provide meaningful feedback on the effectiveness of the module, thereby enhancing the reliability and validity of the research findings. The development process employs the ADDIE instructional design model, comprising five primary stages: Analysis, Design, Development, Implementation, and Evaluation ([Wang et al., 2025](#)). In response to the reviewer's comment regarding the need for a more detailed description of the needs analysis steps, we would like to elaborate on the Analysis stage. During the Analysis stage, a comprehensive needs analysis was conducted to identify the learning needs and goals of the students. This involved interviews with students and instructors to gather information about the current challenges and limitations in learning Cikeruhan Dance, observations of traditional dance classes to understand the teaching methods and student engagement, surveys and questionnaires to collect data on students' prior knowledge, skills, and attitudes towards Cikeruhan Dance, and analysis of existing learning materials and resources to identify gaps and areas for improvement.

The data collected from these methods were analyzed and used to inform the design of the Android-based digital module. Specifically, the needs analysis helped to identify the key concepts and skills that students need to master in Cikeruhan Dance, determine the most effective ways to present the content and engage students in the learning process, and develop assessments and evaluations that align with the learning objectives and outcomes. The findings from the needs analysis were then used to inform the Design stage, where a detailed design plan for the digital module was created. The design plan took into account the learning needs and goals of the students, as well as the key concepts and skills identified during the Analysis stage. The Development stage focused on building the digital module based on the design plan, while the Implementation stage involved testing and deploying the digital module. Finally, the Evaluation stage assessed the effectiveness of the digital module ([Branch, 2009](#)). The ADDIE model is chosen for its systematic and flexible nature, allowing for continuous improvement at each development stage ([Zou et al., 2024](#); [Li & Sun, 2024](#); [Branch, 2009](#)). Aligns

with [Sulistiyawati et al. \(2017\)](#), that the ADDIE approach is an effective and efficient design model for developing learning designs. Data collection for this study involves various methods to ensure a comprehensive evaluation of the digital module's effectiveness. These methods will include surveys or questionnaires to gather information from students and experts about the digital module's usability and effectiveness, observations of students using the digital module to identify areas of improvement, interviews with students and experts to gather more in-depth feedback, usability testing to ensure the digital module is user-friendly and effective, and pre-and post-tests to assess the impact of the digital module on students' self-directed learning.

To ensure the validity and effectiveness of the Android-based digital module, expert validation was conducted. The experts involved in the validation process were selected based on their qualifications and expertise in the field of education, instructional design, and Cikeruhan Dance. Specifically, the experts included experienced educators and subject matter experts with advanced degrees and extensive experience in teaching, instructional design, and traditional dance education. For instance, one expert was a Ph.D. holder in education with over 10 years of experience in teaching and instructional design, while another expert was a renowned specialist in Cikeruhan Dance with a deep understanding of the subject matter. These experts were tasked with reviewing the digital module and providing feedback on its content, design, and effectiveness. Their feedback was carefully considered and incorporated into the final version of the digital module, ensuring that it meets the highest standards of quality and effectiveness. By involving qualified and experienced experts in the validation process, we can establish the credibility and validity of the digital module, ensuring it is effective in enhancing students' self-directed learning.

The development of this Android-based digital module employs the Research and Development (R&D) method, a research approach that involves producing new products and testing their effectiveness through a practical and applicable product design and development process ([Sugiyono, 2022](#)). This study aims to develop an Android-based digital module for Cikeruhan Dance, which will improve students' self-directed learning (SDL). The development process employs the ADDIE instructional design model, comprising five primary stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE model is chosen for its systematic and flexible nature, allowing for continuous improvement at each stage of development ([Branch, 2009](#)). After analysis, the design stage involves creating the structure of the digital module, including the learning content and interactions that are provided in the mobile application. According to [Morrison et al. \(2010\)](#), instructional design must consider specific learning objectives and create effective and engaging learning experiences for students. During the design stage, a user-friendly and interactive interface and module structure are designed to facilitate easy access to learning materials for students and lecturers. Additionally, research instruments, such as questionnaires, are prepared to collect feedback from material and media experts, as well as potential module users.

The development stage follows the design phase, involving the creation of an application prototype that integrates all design elements, such as dance learning materials, application interfaces, and evaluation and feedback features. According to [Arsyad \(2011\)](#), developing technology-based learning media, including mobile applications, requires consideration of adequate technical and functional aspects to ensure effective use by students. At this stage, the designed module is transformed into a digital product ready for testing. To ensure the product's quality and feasibility, an evaluation is conducted with dance material experts and media experts. Validation from both parties is used to refine and enhance the developed module, ensuring it meets the desired quality standards. At the implementation stage, [Dellar \(2006\)](#) explains that implementation involves a field trial to assess the product's functionality in a real context and collect data on its effectiveness in improving learning outcomes. The refined product was tested on a user group consisting of students and teachers. The trial was conducted in two stages: initially, a small-group trial with 6-8 users, followed by a large-group trial with approximately 20 participants. The purpose of this trial was to evaluate the feasibility and effectiveness of the module in supporting the folk dance learning process in the Dance Arts Education study program.

The data collection instrument used in this study was a questionnaire with a Likert scale, which consisted of several types of questionnaires: a validation questionnaire developed by material experts, a validation questionnaire developed by media experts, and a trial questionnaire developed by users. Each questionnaire was compiled based on assessment guidelines that included aspects of learning design, module quality, and visual communication elements within the module. The results of this assessment will be used to evaluate and revise the module to suit the needs and preferences of users better. The evaluation stage was conducted to assess the effectiveness of the application in enhancing students' self-directed learning and their dance skills. [Cynthia \(2007\)](#) argues that good evaluation should be based on data collection from various sources, including feedback from users (students) and measurement of student performance before and after using the application.

RESULT AND DISCUSSION

The development of the Cikeruhan Dance Digital Module application follows a user-centered design approach to ensure that the application meets the needs of users, specifically students and teachers. Based on

insights from the needs analysis, the application's sitemap is designed to provide easy and intuitive access to various learning features, including dance materials, video tutorials, and evaluation quizzes. The system structure is designed by separating two main aspects: the client side (user) and the server side.

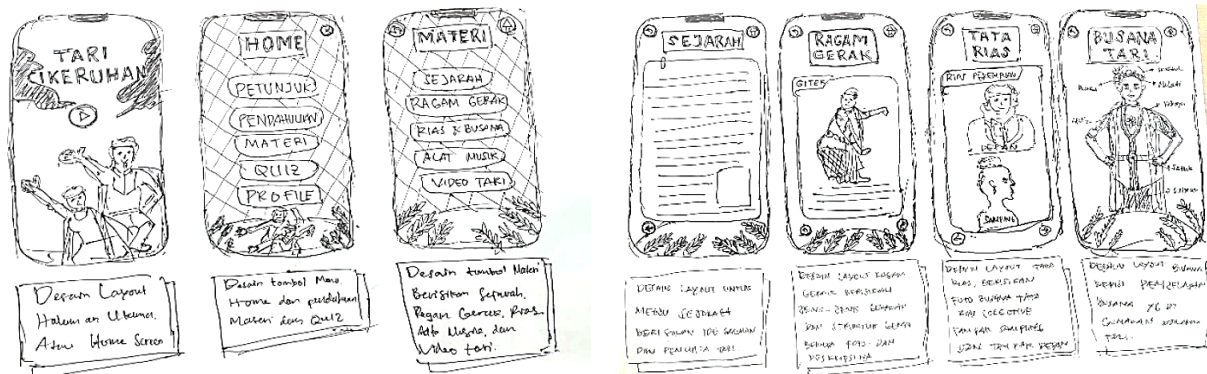


Figure 1. Wireframe Digital Module Application Design

The development of the Android-based digital module began with the creation of a wireframe as a basic visual framework. This wireframe outlined the initial flow and structure of the app, such as the placement of buttons, menus, and page navigation. It was used to ensure that all user needs, specifically those of students and teachers, were properly addressed. From this wireframe, the user interface (UI) design was developed, enriching the appearance with colors, illustrations, icons, and typography suited to the Sundanese cultural theme. The stages of translating the wireframe into the application include several important steps. First, wireframe creation organized the initial screens, including a Play button, a main menu with options like Instructions, Introduction, Material, Quiz, and Profile, and a Material submenu divided into History, Movement Variations, Costume & Makeup, Musical Instruments, and Dance Videos. Second, UI design development transformed the simple wireframe into an attractive, culturally nuanced visual design. Third, front-end development translated this design into functional application code on the client side, ensuring all buttons and navigation worked as planned. Fourth, back-end development provided a server to store materials, videos, and quiz results, enabling the application to serve content as needed dynamically. After that, integration and testing were conducted to ensure all elements functioned smoothly and the built application remained faithful to the original design.

This application is designed for Android, allowing students to learn Cikeruhan dance independently, access learning materials, and follow video tutorials demonstrating dance steps. Students can also interact with the quiz feature to evaluate their understanding of the material. The application enables students to learn at their own pace, anywhere and at any time, without restrictions on time or location. On the server side, a website-based platform is used by teachers to manage system data, including learning materials, video tutorials, and student quiz results. Teachers can update learning content and monitor student progress in real-time through the admin interface.



Figure 2. Main Page

On the main page of the application (Figure 2), students are greeted with a simple and easy-to-navigate display, with a clear navigation menu at the bottom of the screen. This main page serves as a starting point for users to select the material they want to study. The user-friendly interface design ensures that students from various technological backgrounds can easily access the various features provided in the application.



Figure 3. Material Page

- The Material Menu is the main part of this application, which is divided into several learning topics:
- History:** In this section, students can learn about the background and development of topics related to dance, including the history and development of folk dance, particularly the Cikluhan dance. The material is presented in text form, accompanied by relevant images and additional references to enhance understanding.
 - Movement Structure:** This material reviews the basics of body movements, integrated with explanations, so that students can quickly understand the variety of movements in the Cikluhan dance. This module features illustrations of movements, step-by-step descriptions, and practical tips and tricks for practicing these movements.



Figure 4. Makeup and Costume

- Makeup and Costume (Figure 4):** In this topic, students learn to understand makeup and costume theory cognitively, as well as the techniques and basics of makeup and fashion selection that are appropriate for a particular cultural context or theme. The material is presented in the form of text, tutorial images, and easy-to-follow practical steps.



Figure 5. Musical Instruments

- d) Musical Instruments (Figure 5): This topic contains cognitive knowledge about folk dance accompaniment instruments. Visuals are depicted using musical instruments, and a play button is included, allowing audio to be played within the application.



Figure 6. Video Tutorials

- e) Video Tutorials: Additionally, the app offers video tutorials that demonstrate firsthand how a particular technique or skill can be applied. These videos aim to provide real-world examples that deepen students' understanding of the material they have read.



Figure 7. Quiz Page

After students have studied the material, they can test their understanding through assessment quizzes available at the end of each topic (Figure 7). These quizzes comprise a variety of multiple-choice and short-answer questions designed to assess the extent to which students understand the concepts they have learned. Immediate feedback is provided after the quizzes are completed, allowing students to identify their strengths and weaknesses and providing an opportunity to improve their understanding. Initial evaluations of the app's use indicate that students feel more motivated to learn independently. They can study at their own pace and return to material they have not yet understood without time or place constraints. The interactive quiz feature gives them a sense of accomplishment after each study session and encourages them to improve on their previous assessments. Additionally, the video tutorials offer a more practical and visual approach to theoretical material, making it easier for students to grasp complex concepts.

The validation of the Cikeruhan Dance Digital Module's content involved experts in dance, dance teaching, and multimedia to ensure that the material met the needs and developmental requirements of students. The application's content supports independent dance learning, enhancing students' understanding of Cikeruhan dance techniques and history. To make learning materials more engaging and accessible, strategies such as incorporating attractive visuals, utilizing dance movement animations, and employing step-by-step illustrations are employed. These elements aim to keep students interested and involved in the learning process. Validation of the application's design, logo, and branding involved collaborating with graphic design experts and branding professionals to ensure a high visual appeal and recognizability. The application interface design demonstrates good quality and interactive functionality. The use of responsive design elements and simple

navigation ensures a smooth user experience. Although the design is optimal, monitoring design trends and updating elements every 2-3 years will help maintain relevance to user preferences and technological advancements. Below are the results of the design expert validation.

Table 1. Trial Participants

Information	Description
Number of trial participants	8 People (Small-scale trial), 20 People (Large-scale trial)
City of Origin	Bandung (UPI Dance Arts Education Student)
Age of trial participants	19 - 21 years

The validation of the Cikeruhan Dance Digital Module's content involved experts in dance, dance teaching, and multimedia to ensure that the material aligned with students' needs and development. The application's content supports independent dance learning, enhancing students' understanding of Cikeruhan dance techniques and history. To improve the learning experience, further efforts are needed to make the material more engaging and accessible through interactive and visual approaches. Strategies such as attractive visuals, dance movement animations, and step-by-step illustrations aim to keep students interested and involved. Validation of the application's design, logo, and branding involved collaborating with graphic design experts and branding professionals to ensure a high visual appeal and recognizability. The application interface design demonstrates good quality and interactive functionality. The use of responsive design elements and simple navigation ensures a smooth user experience. Although the design is optimal, monitoring design trends and updating elements every 2-3 years will help maintain relevance to user preferences and technological advancements. Below are the validation results.

Table 2. Design expert validation results

Validation Components	Validation Points	Input from Media Experts	Comment
Overall Application Design	Attractive design	The application design must convey an aesthetic that aligns with the cultural and dance theme of Cikeruhan.	Ensure the visual design is not only visually appealing but also easy for users to navigate and comprehend the material.
	Easy to use	Simplicity and consistency of design elements are essential to ensure the app is easy to use.	Consistent use of design elements will help users feel more comfortable and familiar when interacting with the system.
Color Palette	According to the user target	Select a color palette that aligns with users' age and demographic preferences. For example, bright colors are suitable for young people, while more muted colors are preferred for older users.	Colors should reflect the Cikeruhan dance culture while also considering visual comfort for older users or those with visual impairments.
Application Layout	Easy to read	Make sure text, buttons, and other elements are large enough and easy to read.	Avoid using text with a small size or a background color that is too dark to make it easily readable.
Illustration in Application	According to the user target	The illustrations used must depict easily understandable dance movements, especially for beginners.	Illustrations should visualize each step of the dance movement, and, if possible, use illustrations that are closely tied to the local Cikeruhan culture to increase closeness to users.
Application Icon	Clear to access the application	Ensure the app icon is clear and easy to understand, reflecting the app's function (e.g., a dance move icon or a multimedia device).	Icons should be easily recognizable and intuitive, providing immediate clues about the features within the app. Use standard icons that are familiar to many users to facilitate more straightforward navigation.

Table 3. Material Expert Validation Results

Indicator	Digital Module	
	Percentage (%)	Information
Clarity and relevance	91.00	Very Valid
Accuracy	84.50	Quite Valid
Depth and ease of material	93.00	Very Valid
Completeness and Quality	90.25	Very Valid
Systematic, sequential, clear logical flow	82.50	Quite Valid
Consistency	84.00	Quite Valid
Visual	89.75	Very Valid
Simple and charming	91.50	Very Valid
Communicative	92.25	Very Valid
Average	88.71	Very Valid

Tables 3 and 4 present the validation results from material experts and media experts related to the development of the Cikeruhan Dance Digital Module. The material expert validation results show that the module has very good quality, with high percentages for indicators of clarity and relevance (91.00%), depth and ease of material (93.00%), and completeness and quality of material (90.25%). These indicators suggest that the material is very clear, complete, and easy to understand. Several indicators, such as accuracy (84.50%), systematic and sequential presentation (82.50%), and consistency (84.00%), require slight improvements to be more optimal, although they are still considered quite valid. Additionally, the visual and communicative aspects of the material received very positive assessments, with percentages of 89.75% and 92.25%, indicating that the material is presented engagingly and effectively to support the learning process.

Table 4. Significance Test Table

Statistic	Score	The mean of the data is 89.19%, which is above the 85% threshold. The standard deviation is 4.01, indicating moderate variability. The minimum value is 82.25%, and the maximum value is 95%, showing a range of values across the indicators. The t-statistic is 2.76, and the p-value is 0.028, which is below the typical significance level ($\alpha = 0.05$). This suggests that the average value of the indicators is significantly greater than 85%, and the data can be considered statistically valid.
Average	88.19	
Standard Deviation	4.01	
Min	82.25	
Max	95.00	
Quartil 1 (Q1)	88.50	
Quartil 3 (Q3)	91.00	
t-statistik	2.76	
p-value	0.028	

The hypothesis testing began with formulating the null hypothesis (H_0), which stated that the average value of the indicators is less than or equal to 85%, and the alternative hypothesis (H_1), which stated that the average value of the indicators is greater than 85%. The calculated t-statistic value of 2.84 shows that the sample mean is sufficiently far from the hypothesized value of 85%. Furthermore, the p-value obtained was 0.022, which is smaller than the commonly used significance level of 0.05. Therefore, the null hypothesis is rejected, and it can be concluded that the average value of the indicators is significantly greater than 85%. Based on this statistical test, it can be concluded that the average value of the indicators for the digital module validation is significantly greater than 85%, with a p-value of 0.022. Therefore, these indicators can be considered statistically valid, and the material presented has achieved a good level of quality.

Table 5. Media Expert Validation Results

Indicator	Digital Module	
	Percentage (%)	Information
Relevance of media to learning objectives	92.50	Very Valid
Completeness of presentation	89.50	Very Valid
Ease of understanding	90.25	Very Valid
Writing system	82.25	Quite Valid
Consistency	90.50	Very Valid
Color and layout design	95.00	Very Valid
Typography	83.50	Quite Valid
Communicative	90.00	Very Valid
Average	88.71	Very Valid

Meanwhile, the validation results from media experts also showed very good quality, with the highest percentage in color and layout design indicators (95.00%), indicating that the application design is very attractive and user-friendly. The relevance of the media to learning objectives (92.50%) and ease of understanding (90.25%) received very good scores, suggesting that the media effectively supports learning. Although indicators such as writing systematics (82.25%) and typography (83.50%) require some improvement to ensure a more structured presentation and optimal readability, overall, the media strongly supports learning objectives. With an average percentage of 88.71%, the validation results from media experts indicate that the media aspect is very valid, with some areas for improvement to achieve higher quality. Both material and media aspects of the Cikeruhan Dance Digital Module have been successfully developed, although some areas can be improved to enhance the user experience. The module's testing was conducted in two stages to ensure its quality and effectiveness as a digital dance learning tool. The first stage involved a small-scale trial with eight students from the Dance Education Study Program at Indonesian Education University (UPI). This trial aimed to evaluate the usability of the application, the effectiveness of the learning materials, and user interaction with key features. The results were used to make initial improvements, including refining the user interface and material structure.

Table 6. Significance Test

Statistic	Score	
Average	88.75	Mean: The average value of all indicators is 88.75, which indicates that overall, the digital module validation results are relatively high. Standard Deviation: The standard deviation value of 3.74 shows that the variation or deviation of values around the mean is not very large, meaning the data is quite consistent. Min and Max: The minimum value is 82.50, and the maximum value is 93.00, indicating a relatively narrow range of variation between these indicators. Quartile 1 (Q1) and Quartile 3 (Q3): Q1 is 84.50 and Q3 is 91.50, indicating a fairly even distribution of the data, with most values falling within this range.
Standard Deviation	3.74	
Min	82.50	
Max	93.00	
Quartil 1 (Q1)	84.50	
Quartil 3 (Q3)	91.50	
t-statistik	2.84	
p-value	0.022	

The hypothesis testing was conducted by setting the null hypothesis (H_0), which stated that the average value of the indicators is less than or equal to 85%, and the alternative hypothesis (H_1), which stated that the average value of the indicators is greater than 85%. The calculated t-statistic of 2.76 demonstrates that the sample mean is sufficiently far from the hypothesized value of 85%. Moreover, the p-value of 0.028, which is smaller than the commonly accepted significance level of 0.05, leads to the rejection of the null hypothesis. Thus, it can be concluded that the average value of the indicators is significantly greater than 85%. Based on this statistical test, it can be concluded that the average value of the indicators for the digital module validation is significantly greater than 85%, with a p-value of 0.028. Therefore, these indicators can be considered statistically valid, and the material presented has achieved a good level of quality.

Table 7. Small-scale trial results

Indicator	Percentage (%)	Information
Clarity and relevance of material to learning objectives	93.75	Very Valid
Accuracy	81.25	Quite Valid
Depth to understand	84.375	Quite Valid
Completeness and Quality	78.125	Quite Valid
Writing system	81.25	Quite Valid
Consistency	87.50	Very Valid
Visual	81.25	Very Valid
Simple and charming	96.875	Very Valid
Communicative	81.25	Very Valid
Average	85.07	Very Valid

The small-scale trial results for the Cikeruhan Dance Digital Module showed very valid results in most indicators. The clarity of the material and its relevance to the learning objectives scored high (93.75%), as did simplicity and attractiveness (96.875%), indicating an attractive and easy-to-understand module design. However, several aspects, such as accuracy (81.25%) and completeness of material (78.125%), require improvement to enhance information quality. The depth of material and systematic writing also need improvement, with scores of 84.375% and 81.25%. Overall, with an average of 85.07%, the module is very

valid, although some areas need improvement. In the second stage, a large-scale trial was conducted with 20 students from the same program. The focus was to validate the user interface more broadly and ensure smooth access on various Android devices. Students provided feedback on the convenience of navigation, the completeness of the material, and their level of involvement in the learning process. The evaluation also assessed the application's effectiveness in increasing students' motivation to learn independently and practice dance in a fun way.

Table 8. Large Group Scale Trial Results

Indicator	Percentage (%)	Information
Clarity and Relevance	93.75	Very Valid
Accuracy	83.75	Very Valid
Depth and ease of material	86.25	Very Valid
Completeness and Quality	78.75	Quite Valid
Systematic, sequential, clear logical flow	76.25	Quite Valid
Consistency	86.25	Very Valid
Visual	95.00	Very Valid
Simple and charming	98.75	Very Valid
Communicative	92.50	Very Valid
Average	87.91	Very Valid

The results of the large-scale trial of the Cikeruhan Dance Digital Module showed that this module was very valid in most indicators. The clarity and relevance of the material obtained were 93.75%, indicating that the material was highly suitable for the learning objectives. Meanwhile, the accuracy and depth of the material each obtained 83.75% and 86.25%, respectively, indicating that the information presented was valid and easy to understand. The aspects of completeness, quality, and systematic writing scored lower (78.75% and 76.25%), indicating that there is room for improvement. The visual design and simplicity of the module were highly attractive, with scores of 95.00% and 98.75%, while the communication of the material achieved a score of 92.50%, indicating effective delivery. Overall, with an average of 87.91%, this module was very valid, although some areas needed further improvement. This development research has successfully created an Android-based digital module to meet the learning needs of students in the Dance Education Study Program at UPI Bandung. This Module category is said to be valid and feasible, but it must, of course, go through the validation stages of media experts and material experts, as well as product trials with students directly. According to the product trial results, the validation results of material experts yielded an average of 88.71%.

Based on the provided data, we can compare the results of the small-scale and large-scale trials of the Cikeruhan Dance Digital Module to observe the differences and analyze the factors that contributed to these variations. Small-Scale Trial: The average result for the small-scale trial was 85.07%, with most indicators receiving very valid scores (above 80%), although a few indicators scored moderately valid (below 80%), such as accuracy (81.25%) and completeness of material (78.125%). Large-Scale Trial: The average result for the large-scale trial was slightly higher at 87.91%. Most indicators also yielded very valid results, but there was a slight decrease in some indicators, such as the completeness of material (78.75%) and systematic logical flow (76.25%). Clarity and Relevance of Material (93.75% - 93.75%): Both trials yielded highly valid results for this indicator, indicating that the material presented is both relevant and easy to understand for the participants. Accuracy (81.25% in the small-scale trial, 83.75% in the large-scale trial): There was a slight improvement in the large-scale trial, though it remains moderately valid. This suggests that, although the accuracy of the information is not poor, there is still room for improvement in the quality of the information presented. Depth of Material (84.375% in the small-scale trial, 86.25% in the large-scale trial): A small increase in the large-scale trial indicates that participants found the material to be deeper and easier to understand. This improvement may be attributed to enhancements in the presentation or format of the material. Completeness and Quality (78.125% in the small-scale trial, 78.75% in the large-scale trial): Both trials showed moderately valid results for this indicator, suggesting that while the material is fairly complete, some aspects may still lack detailed explanations or additional information needed to achieve a higher level of completeness. Systematic and Logical Flow (81.25% in the small-scale trial, 76.25% in the large-scale trial): This indicator slightly declined in the large-scale trial, suggesting that despite improvements in various aspects, the logical flow of the module still needs to be more systematically structured. Visual Design and Simplicity (Visual: 81.25% in the small-scale trial, 95.00% in the large-scale trial; Simple and charming: 96.875% in the small-scale trial, 98.75% in the large-scale trial): Both trials showed very high scores for visual design and simplicity, with a slight improvement in the large-scale trial. This indicates that the aesthetic and simplicity of the design were highly appreciated by the participants and contributed to the module's appeal. Communicative (81.25% in the small-scale trial, 92.50% in the large-scale trial): A significant improvement was seen in the large-scale trial, indicating that the delivery of material was more effective and communicative when tested with a larger group of participants.

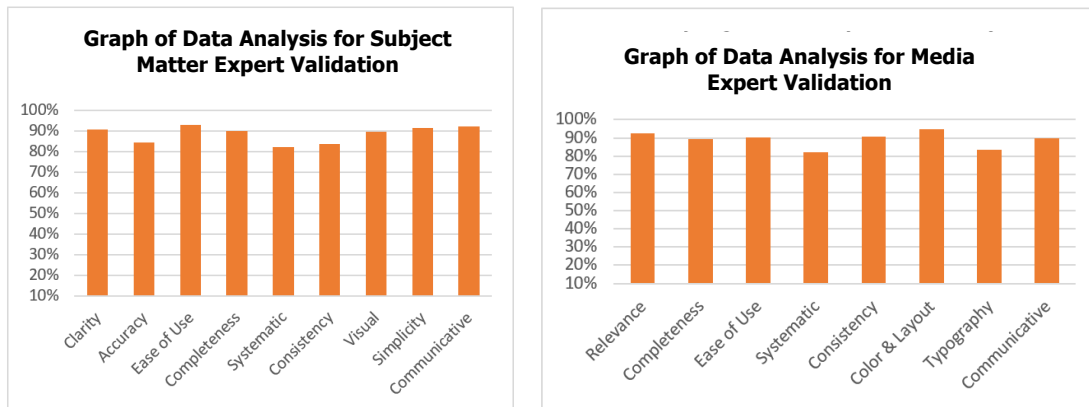


Figure 8. Validation Analysis of Material and Media Experts

The development of the Cikeruhan Dance digital module aims to support an independent learning process by prioritizing self-directed learning, which, of course, remains under the guidance of the lecturer as a follow-up to the learning process itself. The material presented is clear and follows the needs of the learning process and the Folk Dance learning curriculum at the UPI Bandung Dance Education Study Program. The module is certainly equipped with attractive images and visuals, so that students do not get bored using the application. Based on the results of the media expert validation, it is shown that this application is suitable for use with an average percentage of 88.71%.

The Cikeruhan dance digital module is designed as a comprehensive, interactive, and contextual independent teaching material to help students understand and practice the traditional Cikeruhan dance. This module consists of several main parts, namely introduction, materials, evaluation, and supporting media in the form of video tutorials and dance performance videos. The introduction provides an overview of the learning objectives, the scope of the material, and the importance of preserving the Cikeruhan dance as a vital part of Sundanese cultural heritage. The material menu in this module includes five main structured topics, namely the history of the Cikeruhan dance which discusses its origins and cultural values, a variety of movements that explain the basic movements and characteristics of its movements with illustrations and supporting videos, costumes and makeup that explain the philosophy behind traditional costumes and makeup, accompanying musical instruments that introduce various instruments and typical rhythms that blend with dance movements, and video tutorials that display practical learning steps and dance videos to show the performance as a whole.

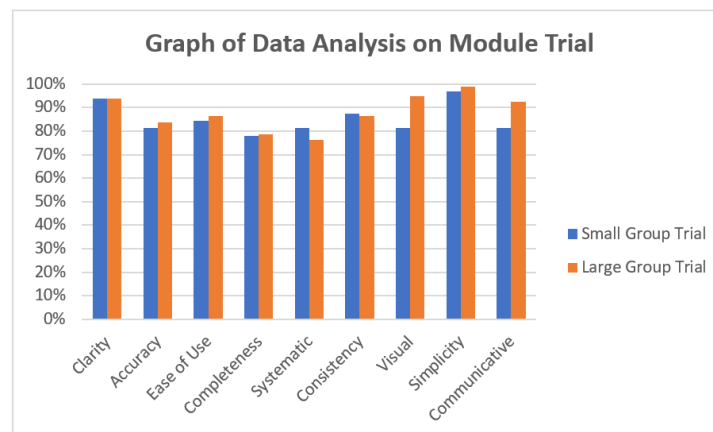


Figure 9. Trial Comparison

To measure students' understanding, this module is equipped with an evaluation in the form of a digital, interactive quiz that includes various question types, such as multiple-choice, short-answer, and video-analysis questions. This quiz is not only intended to test understanding, but is also designed to be interesting and foster students' interest in learning Cikeruhan dance. After going through the validation stage, the module was tested on students in two stages. The percentage of small group trial results averaged 85.07%, and large group trials averaged 87.91%. Details of the module trial results are presented in Figure 9. According to the trial data analysis graph, the large group trial achieved a higher percentage (87.91%) compared to the small group trial (85.07%). This difference may be attributed to the prior familiarity of the large group with certain aspects of

the material. The trial results indicate that all aspects are considered Very Valid. The module's attractive design, featuring engaging colors, typography, and visuals, can enhance student motivation (Rujas et al., 2024). Additionally, the module's language is communicative and straightforward, making it user-friendly. The language used in the module adheres to standard Indonesian, with sentences and vocabulary tailored to students' developmental levels (Hernawan & Andriyani, 2011). This study's Android-based digital module for Cikeruhan Dance learning demonstrates several advantages over previous research. A comparison between this module and others is presented in Table 9.

Table 9. Differences Research output

Aspect	This Research	Previous Research
Content Focus	Cikeruhan Dance	General Folk Dances
Learning Approach	Self-Directed Learning (SDL) with structured guidance	Independent learning without specific guidance
Multimedia Integration	Video tutorials, explanatory texts, interactive exercises	Limited to texts and images
Platform	Android app specifically for Cikeruhan Dance	Android app for various folk dances
Development Goal	Enhance students' understanding and skills in Cikeruhan Dance	Introduce various folk dances in general
User Evaluation	Trials with dance education students show effectiveness	No specific user evaluation

Several factors can explain the differences in results between the small-scale and large-scale trials. One key factor is the number of participants. The large-scale trial involved 20 participants, which means there was more feedback and a wider range of perspectives. This likely influenced evaluations of material completeness and systematic logical flow, as more participants could provide clearer insights into the structure and content of the material. Diversity of Users: The large-scale trial may have included participants with diverse levels of experience and technical skills. Participants with higher experience or a better understanding may have felt more satisfied with the depth of the material, while those with varied backgrounds may have focused more on aspects such as completeness and logical presentation. Improvement in UI/UX Responsiveness: The improvement in the communicative and visual design aspects in the large-scale trial may be attributed to revisions or enhancements in the user interface (UI) and user experience (UX), making it easier to navigate and understand following feedback from the small-scale trial. This could have positively impacted participants' perceptions of communication and the simplicity of the module. Time Given to Explore the Module: Participants in the large-scale trial may have had more time to explore the module or more opportunities to provide feedback after use, allowing them to delve deeper into the material and provide more comprehensive critiques. The small-scale trial may not have allowed for the same depth of exploration. Refinements Based on Feedback: The results of the small-scale trial could have been used to improve several aspects of the module before the large-scale trial. For example, visual design, logical flow, and the communication of material could have been improved based on feedback received from the small-scale trial, which would have contributed to higher scores in the large-scale trial.

This comparison demonstrates that the module developed in this research offers advantages in terms of specialized content, a structured learning approach, rich multimedia integration, and a focus on enhancing students' competencies in Cikeruhan Dance. This differentiates this module from those developed in previous studies, which are more general and do not provide specific learning guidance (Harini et al., 2024). The development of the Android-based *Cikeruhan* dance digital module holds great potential for applications beyond the research context, particularly within formal educational settings such as elementary and secondary schools. This module can be integrated into the arts and culture curriculum to support independent and interactive learning of traditional dance. With comprehensive multimedia features, including tutorial videos, explanatory texts, and interactive exercises, students can more easily understand dance movements independently, without relying solely on the presence of a teacher. Moreover, the use of Android-based technology enables the module to be widely accessible, even in areas with limited access to arts education facilities, thereby helping to equalize access to local cultural learning.

At the community level, the module can also be utilized in arts training programs held in dance studios, community centers, or regional cultural preservation initiatives. With its flexible and user-friendly format, the module allows local communities to conduct traditional dance training without the constant need for professional instructors. Implementing the module at the community level can also raise young people's awareness of the importance of preserving regional culture through a digital approach that is more closely aligned with their daily lives. Therefore, the application of this module beyond the research context will broaden its positive impact, both in the field of formal education and in efforts to preserve national culture. Thus, this research makes a

significant contribution to the development of educational technology, particularly in dance education, and offers innovative solutions in introducing and preserving Indonesian culture through digital platforms.

The development of the Android-based Cikeruhan Dance digital module has had significant positive impacts and made notable contributions to the field of dance education. One of the main impacts is the enhanced understanding and skill development among students (Ariyani et al., 2022). Through the use of video tutorials, explanatory texts, and interactive exercises, students can independently learn the techniques of Cikeruhan Dance, which supports the findings of previous research that highlight how Android-based learning media improves student comprehension of folk dance materials (Fauziah et al., 2018). Another key contribution is the empowerment through digital technology. By utilizing Information and Communication Technology (ICT) in dance education, the module increases student engagement and creativity, providing a more dynamic and engaging learning experience (Hadi, 2020; Apostol & Hernández-Rodríguez, 2024). This aligns with the development of multimedia learning tools that promote active participation and enhance learning outcomes (Perera, 2023; Lian & Xie, 2024).

In this study, the validation process for the *Cikeruhan* dance digital module engaged six experts specializing in dance education, educational technology, and multimedia design. The experts were purposively selected based on their extensive professional experience in developing instructional media, particularly those focused on traditional dance education, with a specific emphasis on Sundanese folk dance. The expert selection was intended to ensure that the developed module adhered to both pedagogical standards and cultural authenticity. The validation procedure followed a systematic sequence of steps. Initially, the experts were provided with a structured assessment instrument consisting of indicators derived from established theories of educational instrument validation. The instrument evaluated eight critical aspects: alignment with learning objectives, completeness of material presentation, clarity and comprehensibility of content, organization and coherence of writing, content consistency, visual design elements (including color scheme and layout), typographic quality, and the communicative effectiveness of the module. Subsequently, each indicator was rated by the experts using a percentage scale to quantify levels of acceptability across the evaluated dimensions. Finally, the collected data were subjected to quantitative analysis using descriptive statistical methods, including the calculation of mean scores, standard deviations, and t-tests to assess whether the module satisfied the predetermined validity criteria. This structured approach provided an objective and systematic measurement of the module's validity, thereby supporting its readiness for application within educational settings.

Furthermore, the preservation and development of local culture is significantly supported by the integration of Cikeruhan Dance into the digital platform. This enables broader access to cultural knowledge, allowing younger generations to easily learn and appreciate their cultural heritage, thereby promoting its sustainability (Krisnanik et al., 2023). Lastly, the module contributes to increased student involvement and motivation in the learning process. With interactive and flexible learning approaches, students are more motivated and actively engaged, which enhances the overall learning process and application of the dance techniques (Wahyudi, 2022). Based on expert validation results, the overall average score for the *Cikeruhan* dance digital module indicators reached 89.19%, with a standard deviation of 4.01. This indicates that, overall, the module quality was rated highly by the experts, with a relatively low level of variation among evaluators. The small standard deviation suggests consistent assessments from the validators, reinforcing the reliability of the data. The minimum value of 82.25% and maximum value of 95% indicate that all indicators fell within a high validity range, with no extreme deviations toward lower ratings, demonstrating stable perceptions of the module's quality.

Further quartile analysis reveals that Quartile 1 (Q1) is 88.00% and Quartile 3 (Q3) is 91.00%. This means that 50% of the assessment data falls within this narrow range, reflecting a highly concentrated distribution at a very good validity level. The absence of outliers in the boxplot further supports the interpretation that all evaluated aspects, ranging from content relevance and material organization to ease of understanding and visual quality aspects such as color, layout, and typography, were consistently perceived positively by all experts. The t-statistic test yielded a t-value of 2.76 and a p-value of 0.028, which is lower than the 0.05 significance level. This result demonstrates that the average indicator score is statistically significantly greater than the minimum threshold of 85%, thereby rejecting the null hypothesis. This indicates that the module's quality is not only rated favorably in descriptive terms but also meets inferential statistical criteria, strengthening the scientific validity of the findings.

Factors contributing to the high validation scores include the integration of multimedia-based instructional design according to Mayer's theory, the selection of locally relevant cultural content aligned with the target learners, and visually appealing, communicative design elements. Additionally, the expertise of the validators, who are experienced in educational technology and folk dance, played a key role in providing objective and competent assessments. The coherence between content quality, design, and the involvement of field-specific validators lends conceptual and methodological robustness to the validation results. The findings of this study align with Mayer's theory on multimedia learning, which posits that the simultaneous use of text,

images, and videos can enhance learner comprehension. This digital module integrates various multimedia elements to support the independent and effective learning of *Cikeruhan* dance techniques, while also fostering the concept of Self-Directed Learning (SDL), allowing students to regulate their own learning pace and methods. This is consistent with Perera (2023) and Lian and Xie (2024), who demonstrate that technology-based media enhances engagement and learning outcomes.

Based on the validation results and theoretical discussion, it is recommended that this module be implemented more broadly, not only within higher education institutions but also in primary and secondary schools, as well as in arts and culture communities. To support its implementation, it is essential to provide training for teachers and arts instructors on how to use the module effectively, and to develop the application further to ensure compatibility with various Android versions and different hardware devices, thereby improving accessibility for a wider range of users. One of the limitations of this study is the potential for participant bias, considering that the majority of respondents were dance students who are already familiar with digital technology. Their familiarity with Android-based devices and learning applications may have influenced the validation results of the module, likely leading to more favorable assessments compared to users with less technological experience. Therefore, generalizing the findings to a broader population, such as elementary school students or the general public, should be approached with caution. Additionally, there are technical limitations related to the application's compatibility with various versions of the Android operating system. The testing of this module has not covered all device variations and Android versions available on the market, which may lead to potential issues regarding accessibility or application performance on specific devices. These limitations must be acknowledged in order to encourage further development efforts that ensure the module can be optimally accessed by a wide range of users under diverse technical conditions.

CONCLUSION

This research has successfully developed and validated an Android-based digital module for *Cikeruhan* Dance, a novel and interactive learning medium for students in the Dance Arts Education Study Program at UPI Bandung. This module not only enhances students' interest and motivation in learning but also serves as a creative teaching tool, fostering a more engaging and effective learning experience. The module's design adheres to user-friendly principles, incorporating communicative language, simple terminology, and an aesthetically pleasing visual appearance. The comprehensive material menu, encompassing the history of dance, various movements, costumes and makeup, accompanying musical instruments, video tutorials, and dance performances, renders this module a contextual and interactive learning tool. The module's validation through a rigorous multi-stage process, including expert validation and student trials, demonstrates its efficacy in supporting independent learning and self-directed learning. The validation results yielded an average score of 88.71% from both material and media experts, indicating that the module's content is explicit, aligned with the curriculum, and visually appealing. Student testing, conducted in two phases, revealed that the module is effective in enhancing students' comprehension, regardless of their initial levels of understanding. The integration of technology and online learning elements in this module fosters active student engagement and interactivity. This research makes a significant contribution to both the academic and practical domains. Academically, it advances the understanding of the examined phenomenon and provides a foundation for future studies. The findings also have implications for the development of methodologies in future research. In practical contexts, this research has substantial impacts on stakeholders, including policymakers and practitioners. The results can inform decision-making and improve the quality of practices and policies, ultimately benefiting society. In conclusion, this research demonstrates the potential of technology-enhanced learning tools in education, providing a valuable reference for stakeholders seeking to address the challenges and opportunities in this field.

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