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Development of Aplikasi Belajar Seni (SIBENI) Interactive Learning Media Using Unity for Indonesian Cultural Arts

Muhammad Isfa' Lana, Suprih Widodo*
UPI Campus in Purwakarta, Universitas Pendidikan Indonesia
***Corresponding Author e-mail: supri@upi.edu**

Abstract: This research aims to develop SIBENI educational applications as an interactive learning media for Nusantara arts and culture that can increase the interest and understanding of elementary school students. The development was carried out using the Multimedia Development Life Cycle (MDLC) method through the stages of concept, design, material collection, assembly, testing, and distribution, accompanied by functionality tests using black box testing, usability tests with the System Usability Scale (SUS), and content validity using the Learning Object Review Instrument (LORI) instrument by material experts. The test results show that the SIBENI application functions optimally with a 100% suitability level, obtaining a SUS score of 88.5 (category A+ / Best Imaginable), and 100% content validity, which indicates the application is easy to use, stable, and presents accurate and appropriate materials. These findings have an impact on increasing the effectiveness of arts and culture learning, while contributing to the preservation of Nusantara culture through the provision of digital media that is attractive, easily accessible, and relevant to modern learning needs.

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Introduction

In today's digital era, technological developments have become an important part of various aspects of life, including education. Education is no longer just a process of passing on values from one generation to the next, but is also required to be able to adapt, change and develop learning methods so that they remain relevant to the needs of the times (Supriono & Rozi, 2018). One form of this development is the use of interactive learning media which can increase student involvement in the learning process.

Interactive learning emphasizes active involvement between teachers and students through two-way activities, such as discussions, questions and answers, and collaborative activities (Aminatun et al., 2022). The use of interactive multimedia has also been proven to improve students' mastery of concepts, learning outcomes, and critical thinking skills (Harsiwi & Arini, 2020). With the support of the development of digital technology, the use of devices such as computers, gadgets, and the internet has become an effective alternative in supporting modern learning which requires broad, flexible, and interesting access. (Utami & Dewi, 2020). In addition, interactive multimedia is considered very suitable as a learning medium because it

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is able to simplify complex material into visual forms or light educational games, so that it is easier to understand and increases students' learning motivation. (Pribadi et al., 2022).

The government has emphasized the importance of providing learning materials on traditional Indonesian music for both formal and informal education. However, in practice, many schools still face limitations in accessing comprehensive and interactive cultural learning resources supported by digital technology. This gap highlights the need for alternative learning media that are engaging, accessible, and capable of supporting arts and cultural education, particularly at the elementary school level. Field interviews with teachers at SDN 04 Nagri Kaler further indicate that elementary school students show higher enthusiasm when learning activities are supported by technology-based media incorporating audio and visual elements.

On the other hand, the current of globalization and the entry of foreign cultures through digital media has the potential to shift the interest of the younger generation towards local culture. Preserving local culture is important to maintain national identity while developing the creativity and character of the younger generation (Nahak, 2019; Saenal, 2020). However, these preservation efforts still face obstacles. Although the government has been providing arts facilities since 2012, in 2018, only 4,300 schools received them (Kemendikbudristek, 2024). Meanwhile, the number of schools in Indonesia reached 438,983 (Kemendikdasmen, 2025). This means that only around 8.77% of schools have adequate arts facilities. This situation highlights the need for alternative media that can help teachers deliver arts and culture lessons in an engaging and accessible way.

In response to the need for accessible and engaging learning infrastructure that supports student development, the SIBENI Education Application was developed as a technology-based arts and culture learning medium. This application presents interactive materials on musical instruments, regional songs, regional dances, and traditional clothing from the six major islands of Indonesia. SIBENI is built using the Unity platform, which is widely recognized for its flexibility in developing interactive multimedia content (Alvendri et al., 2023; Sofwan & Wibowo, 2019), enabling a more engaging learning experience that aligns with the characteristics of today's learners.

Digital media has been widely used as an alternative approach to support the preservation and learning of local culture in the educational context. Several previous studies have implemented digital games to introduce cultural content, such as regional traditions and local arts, through mobile-based learning media. However, most of these studies remain limited in terms of cultural coverage and interaction depth, as they generally focus on specific regions and provide relatively simple user interactions, indicating the need for more comprehensive and immersive cultural learning applications.

Other relevant research is indicated by (Yuniar et al., 2025) who developed the Android-based History Hunt application as an interactive history learning medium using the MDLC method. The results of this study show that digital media is able to increase students' interest in learning through visual displays and simple navigation, but is still limited to one type of material. Similar research by (Putri Alina Sidik et al., 2025) through the Artsia application, we also found increased learning engagement, but the cultural coverage presented was still narrow. These two findings emphasize the need for more comprehensive learning media, thus encouraging the development of SIBENI which integrates art materials from six major Indonesian islands with more complete interactive features.

International research also shows similar trends. Camuñas-García et al. (2024) confirm that heritage-based games are able to increase user engagement, but most still focus on single content. Li and Zhang (2025) show that cultural educational games in the museum context have

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not yet reached a broader learning context. Immersive technologies such as AR/VR (Anwar et al., 2025; Srdanović et al., 2024) offer great potential; however, they require high-performance devices, making them less suitable for primary education settings. As a result, elementary schools still lack accessible and comprehensive digital learning media that can effectively support cultural arts education without demanding advanced technological infrastructure.

Based on these studies, there is no application that comprehensively integrates art materials from the six major islands of Indonesia, including musical instruments, regional songs, regional dances, and traditional clothing in a single Unity Android-based educational application equipped with interactive features such as adaptive quizzes and traditional clothing dress-up. This condition is urgent to address, considering the declining exposure of elementary school students to local cultural content in the midst of rapid digitalization. Therefore, this research aims to develop the SIBENI Educational Application as an interactive learning medium for Indonesian arts and culture that is engaging, accessible, and capable of supporting elementary school teachers in introducing the diversity of Indonesian culture in the digital era.

Research Method

This research uses the Multimedia Development Life Cycle (MDLC) method as a systematic approach in designing and developing multimedia applications. MDLC was chosen because it is able to integrate various elements such as images, audio, video, animation, and interactive components in one learning application (Rahmatika et al., 2023) and support the innovation process through structured development stages (Laksana et al., 2021). This method consists of six main stages, namely Concept, Design, Material Collection, Production, Testing, and Distribution, which are the basis for developing the SIBENI Educational Application.

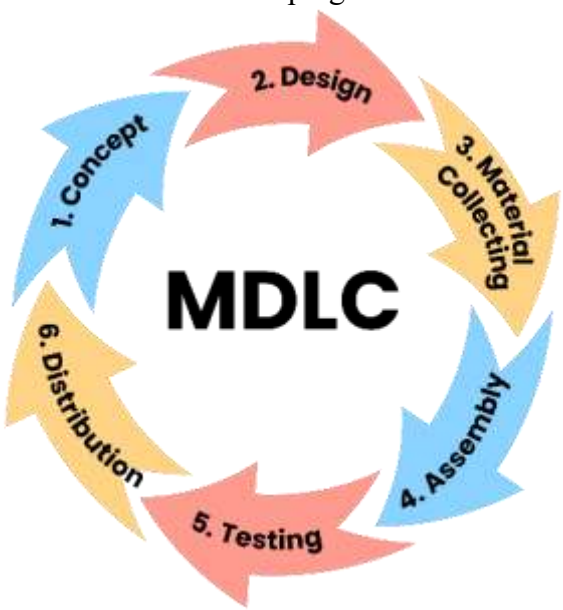

Figure 1. Stages of the Multimedia Development Life Cycle (MDLC) according to Luther (1994), quoted in (Nugraha, 2022)

The application testing involved 15 respondents, consisting of 2 elementary school teachers, 3 Information Systems and Technology Education students, and 10 elementary school students in grades 4–6. The selection of respondents took into account the characteristics of both direct users and technical evaluators, such as the ability to use Android devices and experience in utilizing digital media for learning. Data collection was carried out through the

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System Usability Scale (SUS) questionnaire, direct observation, and respondent notes. The SUS instrument is used to assess usability aspects, such as ease of use, navigation consistency, and interaction comfort. Observations were conducted to see the smoothness of navigation, application response, and technical problems that arose, while respondents' notes were used as material for product improvement.

Application feasibility assessment is carried out through three main aspects, namely functional feasibility, usability, and content feasibility. Functional feasibility assesses whether all features including navigation, audio/video playback, dress-up features, and quizzes work as designed. The usability aspect refers to the principles of ISO 9241-11, including effectiveness, efficiency, and user satisfaction in interacting with the application. The content suitability assesses the accuracy of cultural material, suitability to the characteristics of elementary school students, completeness of material from the six large islands of Indonesia, and its relevance to the arts and culture curriculum.

Result and Discussion

Result

Concept

At the conceptual stage, the researcher determined the main objective of developing the SIBENI application, namely to provide arts and culture teaching materials that are interesting, easy to use, and able to support elementary school teachers in introducing the diversity of Indonesian culture. Furthermore, this application is designed as a medium for cultural preservation amidst the increasing influence of globalization. Figure 2 displays the official SIBENI application logo, which represents the product's identity.

Figure 2. SIBENI Application Logo

The SIBENI app is designed around several key features. First, it features regional song material complete with audio, lyrics, and descriptions, enabling students to understand and sing regional songs from Indonesia's six major islands. Second, the regional musical instrument feature presents images, descriptions, and instrument sounds to help users recognize their shapes and sound characteristics. Third, the regional dance feature includes images, movement videos, accompanying audio, and brief explanations so students can learn the dances in a more contextual way.

The next feature is Dress Up traditional clothing, where users can choose a male or female character and change traditional clothing that can be purchased using coins. Coins are

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earned from correct answers in the quiz feature so this feature not only introduces traditional clothing, but also motivates students to continue learning. The quiz feature uses the Fisher-Yates randomization algorithm so that questions appear randomly and differ between users. This feature includes correct/incorrect feedback and a summary of results to help students determine their level of understanding.

This application has a minimum device specification of Android 8.0 "Oreo" (API Level 26), so that the application can still be accessed optimally on devices commonly used by students and teachers.

Design

At the design stage, the developer creates a storyboard as a visual reference to describe the navigation flow and relationships between views in the SIBENI application. Storyboards serve to ensure that each feature is structured logically, easily accessible, and consistent with the learning objectives established at the concept stage. Through this design, the user interaction flow starting from the main page, selection of cultural materials, dress-up features, to quizzes can be clearly visualized, thus facilitating the production process in the next stage.

Figure 3. SIBENI Application Storyboard

Figure 4. SIBENI Application Storyboard

Material Collecting

At this stage, all the materials needed to build the SIBENI application are collected, including visual elements, audio, video, and supporting text materials. The material collection

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was carried out through several trusted platforms, including Canva, Google, YouTube, Pixabay, and IconPlatform. Canva was used to design the application interface, while Google was used as a search source for cultural materials including descriptions of musical instruments, regional songs, regional dances, and traditional clothing.

YouTube and Pixabay are used to obtain audio buttons, backsound, and supporting videos for regional dance material. Additionally, IconPlatform is used to create and customize button icons used in each scene. The use of various sources ensures that the material presented is not only visually and audibly appealing, but also credible, relevant, and appropriate to the cultural learning needs in the SIBENI application.

Assembly

At this stage, the application is created by combining the acquired materials using the application processor, Unity. The final result of the program after being exported as an Android application is as follows:

Figure 5. Start Scene
Source: SIBENI Application

Figure 6. Main Menu
Source: SIBENI Application

When users open the SIBENI application, they will immediately be greeted with the initial display (Start) as in figure 5. On this screen, users can select the Play button to enter the main menu, the Information button to find out the application version and developer information, the Exit button to exit the application, and the Sound On/Off button to adjust the background sound. After selecting the Play button, users will be directed to the Main Menu as in figure 6, where they can select one of the islands by clicking on the available island names.

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Figure 7. Island Menu
Source: SIBENI Application

Figure 8. Learning Menu
Source: SIBENI Application

Figure 9. Musical Instrument Learning Menu
Source: SIBENI Application

After selecting an island, the user is given two options: Learn or Quiz as shown in figure 7. By clicking on either one, the user can begin exploration.

If users select Learn, they will be directed to a learning menu displaying various options, as shown in Figure 8. Users can click on images of musical instruments, traditional dances, or folk songs to play related sounds and videos. To return to the previous menu, users simply press the back button in the bottom left corner.

Figure 10. Quiz
Source: SIBENI Application

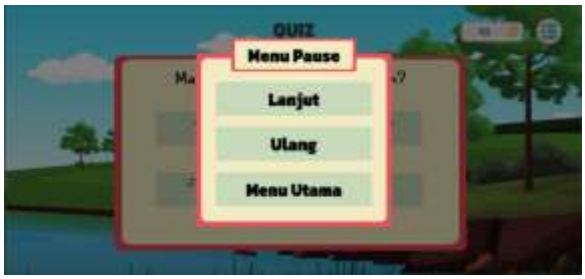

Figure 11. Pause Quiz

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Source: SIBENI Application

If users select Quiz, they will be taken to the quiz menu, as shown in Figure 10, where they can answer questions to earn coins. Each correct answer will earn 10 coins, while each incorrect answer will earn no coins. To exit the quiz menu, users can press the Pause button in the upper right corner and then select the main menu, as shown in Figure 11.

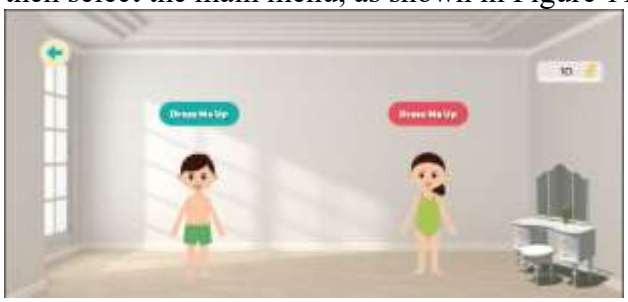

Figure 12. Dress Up
Source: SIBENI Application

Figure 13. Character Dress Up
Source: SIBENI Application

In the main menu, users can also access the Dress Up feature by clicking the Dress Up button in the top right corner. Here, users can select a male or female character, as shown in Figure 12, and dress them up, as shown in Figure 13, in a variety of available outfits. Clothing can be purchased using coins earned from the quiz feature. Once finished dressing up the character, users can return to the main menu by pressing the back button in the bottom left corner.

Figure 14. Pop Up Exit
Source: SIBENI Application

To exit the application, users simply return to the Start screen and press the Exit button. The application will automatically close, as shown in Figure 14.

Testing

After the Assembly stage is completed, the testing process is carried out to ensure that the SIBENI application functions properly, is easy to use, and is suitable as a learning medium.

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Testing was carried out using two approaches, namely functional testing (black box) and user feasibility testing using the System Usability Scale (SUS) as well as content validation by experts.

Black box testing is conducted to assess the functional feasibility of an application, ensuring that every button, navigation, audio/video playback, dress-up feature, and quiz system function as designed. This testing is conducted by a randomly selected sample of users to assess how the application responds to live interactions in the field.

Table 1. SIBENI Test Results with Black Box Testing Technique

No	Modules/Features	Tested User Actions	Expected results	Test Results
1	Splash Screen	Open the application	Splash screen appears correctly	100% Compliant
2	Start Scene	Turn sound on/off, open info, exit application, enter main menu	All buttons function as designed	100% Compliant
3	Main Menu	Select the island menu	Island menu appears	100% Compliant
4	Island Menu	Select the study and quiz menu	Study menu / quiz menu appears	100% Compliant
5	Learning Regional Songs	Next/prev navigation, play/pause audio	Material changes, audio plays/pauses	100% Compliant
6	Learn Musical Instruments	Navigate the material, play the sound of musical instruments	The material changes and audio appears	100% Compliant
7	Learn Regional Dance	Play/pause/stop video	The video works as designed	100% Compliant
8	Quiz	Pause, select an answer, correct/incorrect feedback appears	The quiz system is running and feedback is displayed	100% Compliant
9	Pause Screen	Restart, continue, to the main menu	All navigation is running	100% Compliant
10	Information	Closing the information page	Page closes	100% Compliant
11	Exit Application	Yes/No Confirmation	Application closes or cancels	100% Compliant
12	Dress Up	Choose a character, buy and wear traditional clothes	Dress-up feature works optimally	100% Compliant
13	Back Button	Navigation between scenes	Moving according to plan	100% Compliant

The results of the black box testing show that all 13 modules tested in the SIBENI application function according to the design. There were no findings of non-conformity in any of the test scenarios carried out, so the success percentage reached 100%. Thus, the SIBENI application is declared functionally feasible and ready to be used in the next testing stage, such as usability testing and content validation.

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Furthermore, usability testing using the System Usability Scale (SUS) instrument was given to 15 respondents consisting of 2 elementary school teachers, 3 Information Systems and Technology Education students, and 10 students in grades 4-6. This instrument was used to assess ease of use, display clarity, navigation convenience, and the extent to which the application supports the user's learning experience. The SUS scores are shown in Table 2.

Table 2. SUS Score Calculation Results

R	Total	Total x 2,5	R	Total	Total x 2,5
R1	37	92,5	R11	37	92,5
R2	35	87,5	R12	37	92,5
R3	35	87,5	R13	35	87,5
R4	38	95	R14	32	80
R5	31	77,5	R15	33	82,5
R6	38	95	**Total**	**531**	**1327,5**
R7	33	82,5	**Average**	**35,4**	**88,5**
R8	38	95	**Mode**	**37**	**92,5**
R9	37	92,5	**Min**	**31**	**77,5**
R10	35	87,5	**Max**	**38**	**95**

Table 3. SUS Score Interpretation Scale

Grade	SUS	Percentile range	Adjective	Acceptable	NPS
A+	84.1 - 100	96 - 100	Best Imaginable	Acceptable	Promoter
A	80.8 – 84.0	90 - 95	Excellent	Acceptable	Promoter
A-	78.9 – 80.7	85 - 89		Acceptable	Promoter
B+	77.2 – 78.8	80 - 84		Acceptable	Passive
B	74.1 – 77.1	70 - 79	Good	Acceptable	Passive
B -	72.6 – 74.0	65 - 69		Acceptable	Passive
C+	71.1 – 72.5	60 - 64		Acceptable	Passive
C	65.0 – 71.0	41 - 59		Marginal	Passive
C-	62.7 – 64.9	35 - 40	OK	Marginal	Passive
D	51.7 – 62.6	15 - 34		Marginal	Detractor

Source : (Lana & Majid, 2024)

Based on the results of the SUS score calculation in Table 2, the total score obtained after each value is multiplied by 2.5 is 1,327.5, with an average value of 88.5. This value is in the Grade A+ category with a rating level of "Best Imaginable" according to the SUS score interpretation scale explained in the article (Lana & Majid, 2024) in table 3, which means that the SIBENI application is assessed as having a very high level of usability, is easy to use, and provides an excellent user experience.

In addition, content validity is assessed by teachers acting as material experts using the Learning Object Review Instrument (LORI) which consists of 10 assessment items on a scale of 1 – 5. The assessment includes aspects of Content Quality, Learning Goal Alignment, Feedback and Adaptation, and Motivation. The assessment results show a total score of 50 out of a maximum score of 50. The validation value percentage is calculated using the formula:

$$n = \left(\frac{Score\ obtained}{Maximum\ Score}\right) \times 100\%$$

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$$n = \left(\frac{50}{50}\right) \times 100\% = 1 \quad (1)$$

n = Hasil Persentare

Thus, the content validity test results for the SIBENI educational application reached 100%, indicating that the application material is in the excellent category and suitable for use in learning activities. Details of the validation results are presented in Table 4.

Table 4. Validity Test Details

No	Criteria	Evaluation					Result
1	**Content Quality**						
	Ketelitian Materi	1	2	3	4	5	5
	Ketepatan Materi	1	2	3	4	5	5
	Keteraturan dalam penyajian materi	1	2	3	4	5	5
	Ketepatan pada tingkatan detail materi	1	2	3	4	5	5
	Average Score						**5**
2	**Interaction Usability**						
	Sesuai dengan tujuan pembelajaran	1	2	3	4	5	5
	Sesuai dengan aktivitas pembelajaran	1	2	3	4	5	5
	Sesuai dengan penilaian dalam pembelajaran	1	2	3	4	5	5
	Sesuai dengan karakteristik siswa	1	2	3	4	5	5
	Average Score						**5**
3	**Feedback and Adaptation**						
	Konten adaptasi atau umpan balik dapat dijalankan oleh pelajar atau model pelajar berbeda	1	2	3	4	5	5
	Average Score						**5**
4	**Motivation**						
	Kemampuan memotivasi dan menarik perhatian pelajar	1	2	3	4	5	5
	Average Score						**5**

Distribution

After the testing phase is completed and the SIBENI application is declared functionally, usability, and content-friendly, the application is then distributed to target users. The application installation file is stored on online storage media (Google Drive) so that it can be downloaded via a link shared with teachers and students. Through this mechanism, applications can be installed on Android-based smartphone devices easily and flexibly. This distribution stage ensures that the SIBENI application can be directly accessed by elementary school students as an interactive arts and culture learning medium and supports the preservation of Nusantara culture.

Discussion

The results of development and testing show that the SIBENI Education Application demonstrates very high functional quality, usability, and content suitability. The black box testing produced a 100% success rate, indicating that all 13 application modules functioned exactly as designed without errors across all test scenarios. This result confirms that the system architecture and implementation are stable and reliable, which is essential for learning media

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used by elementary school students who require consistent and error-free interaction. A stable application minimizes technical disruptions and allows students to focus on learning activities rather than system operation.

In terms of user experience, the System Usability Scale (SUS) score reached an average value of 88.5, placing the application in the Grade A+ (Best Imaginable) category. This high usability score indicates that users can easily understand the navigation, operate the features, and complete learning activities without requiring additional guidance. For elementary school contexts, high usability is crucial because students have varying levels of digital literacy, and teachers often need media that can be used directly without extensive training. The positive usability result also supports the effectiveness of the interface design and interaction flow implemented in SIBENI.

Furthermore, the content validity evaluation using the Learning Object Review Instrument (LORI) obtained a score of 100%, confirming that the learning materials, instructional objectives, feedback mechanisms, navigation structure, and motivational elements meet excellent quality standards. This finding indicates that the content presented in SIBENI is not only technically functional but also pedagogically appropriate and aligned with learning objectives in arts and cultural education. High content validity ensures that the application can be safely integrated into classroom learning as a complementary instructional medium.

Compared to previous studies, SIBENI demonstrates significant improvements in both content coverage and interactivity. Rahmadi and Triawan (2021) focused solely on the Besemah cultural quiz, while Setyowahyudi et al. (2023) were limited to introducing Balinese culture using Wordwall. Palendya (2023) developed music-based cultural learning media but did not incorporate advanced interactive elements. SIBENI expands beyond these limitations by integrating multiple forms of cultural content regional songs, musical instruments, regional dances, and traditional clothing from six major Indonesian islands within a single application. The inclusion of traditional clothing dress-up features and adaptive quizzes based on the Fisher–Yates algorithm further enhances user engagement and supports varied learning experiences.

In the context of international research, studies by Camuñas-García et al. (2024) and Li and Zhang (2025) demonstrate that cultural games can increase user engagement but remain constrained to single-content focus and museum-based learning environments. Immersive technologies explored by Srdanović et al. (2024) and Anwar et al. (2025) offer rich cultural experiences but require high-performance devices, limiting their applicability in elementary education. In contrast, SIBENI is designed with minimal hardware requirements (Android 8.0), making it more accessible and realistic for implementation in Indonesian elementary schools where device limitations are common.

Overall, these findings indicate that SIBENI not only fills the research gap identified in previous studies but also provides a comprehensive, interactive, and practical cultural learning model. The combination of perfect functional performance (100%), excellent usability (SUS 88.5), and full content validity (100%) demonstrates that SIBENI is not only feasible but also effective as an educational medium. Therefore, SIBENI has strong potential to support elementary school teachers in introducing and preserving Indonesian arts and culture through engaging digital learning experiences.

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Conclusion

Based on the results of development and testing, the SIBENI application has proven to be suitable and effective as an interactive arts and culture learning medium. Functionality testing through black box testing showed a 100% suitability level, the System Usability Scale (SUS) score reached 88.5 with an A+ (Best Imaginable) category, and the content validity test obtained a score of 100%. These results confirm that the application runs stably, is easy to operate, and is able to present accurate material that is in accordance with the learning characteristics of elementary school students. In addition, the research findings also confirm that SIBENI surpasses previous studies through broader content coverage, richer levels of interactivity, and ease of access, as it successfully integrates materials on regional songs, musical instruments, regional dances, adaptive quizzes, and traditional clothing dress-up features from six major Indonesian islands in one Android application.

For future development, several improvements are recommended to optimize SIBENI, including: compressing the application size to make it lighter, adding guide characters that can be dressed up and appear in each material, enriching the learning content, adjusting the number of quiz questions to the material coverage, updating the interface to be more modern, providing usage options on both computers and smartphones, and adding online-based assessment, suggestion, and feedback features. With this continued development, SIBENI is expected to be able to provide a more engaging and adaptive learning experience while strengthening its contribution to the preservation of Nusantara arts and culture through the use of digital technology.

Recommendation

Based on the results of this study, further development of the SIBENI educational application is recommended to focus on improving technical efficiency and expanding learning features. One obstacle identified is the relatively large application size due to the integration of multimedia content, so asset compression optimization is needed to make the application run more smoothly on devices with low specifications. Further research is also recommended to add a dressed-up guide character so that it can appear consistently in each material as a learning companion, as well as expand and deepen the arts and culture content to cover more regions and a variety of materials.

Furthermore, the number and difficulty level of quiz questions need to be adjusted to the scope of the material to increase the validity of learning evaluations. In terms of design, improvements to the user interface with a more modern and adaptive display are recommended to increase student engagement. The limitations of this study lie in the testing that was still conducted on a limited scale and on a single Android platform. Therefore, further research is recommended to involve a larger number of respondents, quantitative testing of learning effectiveness, and development of cross-platform applications to make the research results more general and comprehensive.

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