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Implementation of the MDLC Method for Optimizing Smart Board Functionality in a Sundanese Alphabet Educational Game Application

Miftah Nurjamil*, Yiyi Supendi, Irwin Supriadi
Universitas Langlangbuana, Indonesia
Email: miftahnurjamil21@gmail.com*

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Abstract

Sundanese script learning in elementary schools still faces obstacles in terms of student involvement and understanding due to the use of conventional methods that tend to be passive. This research aims to develop a Smart Board-based learning game application using the Multimedia Development Life Cycle (MDLC) method and evaluate its effectiveness in improving the quality of learning. The developed app integrates interactive multimedia, gamification, and touch-based interactions to create a more active and engaging learning experience. System testing is carried out using the black box testing method to ensure that all application functions run properly. Evaluations were conducted on 50 elementary school students using a Likert scale questionnaire with indicators of understanding, motivation, and interaction. The results showed that the application obtained an average score of 4.72 which was included in the category of very effective. The motivation aspect has the highest score, followed by interaction and understanding, which shows that the application of gamification and Smart Boards is able to significantly increase student engagement and understanding. Thus, the app can be an effective alternative to interactive learning media as well as support the preservation of local culture through a technology-based approach.

INTRODUCTION

The Sundanese script is a form of cultural heritage that has high historical value and represents the local identity of the people of West Java. The existence of the Sundanese script not only served as a written communication tool in the past but also functions as a cultural symbol that needs to be preserved by the younger generation. However, in learning practice at the elementary school level, mastery of the Sundanese script remains relatively low and not yet optimal (Insani & Kholiq, 2025).

The main problem faced in learning the Sundanese script lies in the learning methods, which are still conventional. In this approach, the learning process tends to be teacher-centered, where students passively receive material without active interaction. This condition causes students to be less involved in the learning process, resulting in a low level of understanding and a lack of motivation to learn (Bahmanbijar et al., 2019; Feng & Xiao, 2024; Meşe & Sevilen, 2021; Syakur et al., 2023).

In addition, the characteristics of the Sundanese script, which has a complex visual form, also present a challenge for students. Without supporting learning media, students tend to have difficulty recognizing and remembering the script effectively. This indicates that a learning approach is needed that can accommodate students' visual and interactive needs (El-Sabagh, 2021; Lu & Hanim, 2024; Omoseebi et al., 2024; Yang, 2025).

Previous research has shown that the use of technology-based learning media, such as e-learning and web-based applications, can improve flexibility and accessibility in the learning

process (Nurajizah et al., 2021; Wisnu, 2025). However, without engaging interactive elements, the use of this technology has not had a significant impact on increasing student engagement.

In this context, a gamification approach is one solution that can be applied to increase students' motivation to learn. Gamification is the application of game elements in non-gaming contexts, such as learning, with the aim of increasing user engagement. Elements such as points, levels, and challenges have been shown to provide stimuli that encourage students to be more active in learning (Hidayat & Syarif, 2023; Twiningsih et al., 2024). In addition, reward systems in gamification can also increase students' intrinsic motivation in completing learning tasks (Istiq'faroh, 2024; Wijaya, 2021).

In addition to gamification, the use of interactive technology such as Smart Boards also provides opportunities to create more engaging learning experiences. Smart Boards allow direct interaction through touchscreens, enabling students to actively participate in the learning process. These interactions are not only visual but also involve kinesthetic aspects that can improve students' memory (Lestari et al., 2025; Wardani et al., 2022).

The use of interactive multimedia-based learning media that combines visual, audio, and interactive elements has also been proven to improve students' understanding of the material being taught (Peláez & Solano, 2023). This shows that the integration of various technologies in learning plays an important role in improving the quality of the teaching and learning process.

Based on these problems, this study aims to develop a Smart Board–based Sundanese script learning application by integrating gamification and interactive multimedia approaches using the Multimedia Development Life Cycle (MDLC) method (Ramadhan & Herlawati, 2022), as well as evaluating its effectiveness in improving student understanding, motivation, and interaction.

The novelty of this research lies in the integration of Smart Board technology, gamification, and kinesthetic-based learning into a single Sundanese script learning application that focuses not only on delivering material but also on enhancing interaction and the direct learning experience of students.

This literature review aims to provide a theoretical foundation and strengthen the arguments in the research conducted. In addition, it is used to identify developments in previous research related to the use of technology in learning, especially interactive multimedia, gamification, and Smart Boards in improving the quality of learning.

The development of information technology has encouraged the emergence of various innovations in learning media, one of which is the use of web-based applications. Web-based learning media provides convenience for students to access learning materials without being limited by space and time. Research shows that web-based learning applications can increase flexibility and support students' independent learning processes (Nurajizah et al., 2021; Wisnu, 2025). However, the level of interactivity in web-based media remains a challenge, as most applications are still static and lack active user interaction.

To overcome these limitations, interactive multimedia is one of the approaches widely used in the development of learning media. Interactive multimedia combines various elements such as text, images, audio, and user interaction in one integrated system. Research shows that the use of interactive multimedia can improve students' understanding of learning materials, especially visual content (Peláez & Solano, 2023). This is because students can receive information through multiple senses simultaneously, making the learning process more effective.

In addition to interactive multimedia, the gamification approach is also an effective solution for increasing student learning motivation. Gamification involves applying game elements in learning contexts, such as point systems, levels, and challenges. Research shows

that gamification can increase student involvement in the learning process and encourage them to be more active in completing assigned tasks (Hidayat & Syarif, 2023; Twiningsih et al., 2024). Furthermore, reward systems in gamification provide additional motivation for students to achieve better results (Istiq'faroh, 2024; Wijaya, 2021).

In the development of learning technology, the use of interactive devices such as Smart Boards is increasingly common. A Smart Board is a technology that allows users to interact directly with a system through a touchscreen interface. Research shows that the use of Smart Boards in learning can significantly increase student participation, as students can be directly involved in the learning process (Lestari et al., 2025; Wardani et al., 2022). This interaction provides a more active and less monotonous learning experience compared to conventional methods.

Furthermore, kinesthetic-based learning is also an important factor in increasing learning effectiveness, especially for visual materials such as scripts. Kinesthetic learning involves physical activity in the learning process, such as writing or drawing, which can help improve students' memory of the material being studied (Nugraha, 2022). Other research has also shown that touchscreen-based technology can support kinesthetic learning by providing direct interaction between students and systems (Nugraha, 2022).

In the process of developing learning applications, system development methods also play a very important role. One widely used method in multimedia application development is the Multimedia Development Life Cycle (MDLC). This method consists of systematic stages, including concept, design, material collection, assembly, testing, and distribution (Ramadhan & Herlawati, 2022). With clearly defined stages, the application development process can be carried out in a structured manner and produce a system that meets user needs.

Based on a review of various previous studies, it can be concluded that interactive multimedia, gamification, and Smart Board technology each offer advantages in improving the quality of learning. However, most previous research has developed these learning media separately, resulting in less optimal outcomes in improving overall student engagement and understanding.

Therefore, this study seeks to integrate the three approaches—interactive multimedia, gamification, and Smart Board technology—into a single Sundanese script learning application developed using the MDLC method. This integration is expected to create a more interactive learning experience, increase student motivation, and strengthen understanding of the material being taught. Practically, this research offers benefits for teachers as an alternative interactive learning medium that can enhance classroom engagement and effectiveness. For students, the application can improve motivation, understanding, and participation in learning the Sundanese script. For schools, this study can serve as a reference in adopting innovative learning technologies to improve the quality of education. Additionally, for future researchers, this study provides a foundation for further exploration in the development of integrated educational technology and culturally based learning applications.

METHOD

This research was a type of research and development that aimed to produce a Smart Board–based Sundanese script learning application and evaluate the effectiveness of its use in the learning process.

The method used in the application development was the Multimedia Development Life Cycle (MDLC), which consists of six main stages: concept, design, material collection, assembly, testing, and distribution (Ramadhan & Herlawati, 2022). This method was chosen because it has a systematic flow and is suitable for the development of interactive multimedia applications.

The concept stage was the initial phase that aimed to identify system requirements and

determine application development goals. At this stage, an analysis of problems in learning the Sundanese script was conducted, especially those related to the low level of student involvement and understanding. In addition, user needs were identified to ensure that the developed application aligned with the characteristics of elementary school students.

The design stage was carried out to develop the user interface and application navigation structure. The design process considered aspects of usability and interactivity so that the application could be easily used by students. At this stage, the integration of gamification elements, such as point and level systems, was also designed.

The material collection stage involved gathering the materials used in the application, such as Sundanese script content, images, and other multimedia elements. The materials were tailored to meet learning needs and ensure relevance to users.

The assembly stage was the application development process in which all designed components were integrated. At this stage, the main features—namely the learning menu, practice menu, and gamification-based learning games that supported direct interaction through the Smart Board—were implemented.

The testing stage was conducted to ensure that the application functioned as intended. Testing was performed using the black-box testing method, which focuses on evaluating system functions based on inputs and outputs without examining the internal structure of the program. All major features of the application were tested to ensure the absence of malfunctions.

The final stage was distribution, which involved deploying the application to users in a learning environment. At this stage, the application was used by students as an interactive learning medium.

The subjects in this study were elementary school students who used the developed learning application. The number of respondents in this study was 50 elementary school students. Data collection was conducted through observation, literature review, and questionnaires.

The research instrument used a Likert scale with assessment indicators including aspects of understanding, motivation, and user interaction. The data obtained were then analyzed by calculating the mean score to determine the level of effectiveness of the application. The average score was subsequently categorized into assessment criteria to determine the application’s success rate in learning.

By using systematic development methods and measurable evaluation techniques, this research was expected to produce a learning application that not only functioned well but was also effective in improving the quality of Sundanese script learning.

RESULTS AND DISCUSSION

This research produced a Smart Board-based Sundanese script learning application designed to improve students' understanding, motivation, and interaction in the learning process. This application integrates learning, exercise, and game features in one interactive system, so that students not only receive material, but also directly engage in the learning process.

1. Main Menu View

The main menu view is the starting page that is displayed when the application is run. This page serves as a navigation hub that connects all the features in the app.

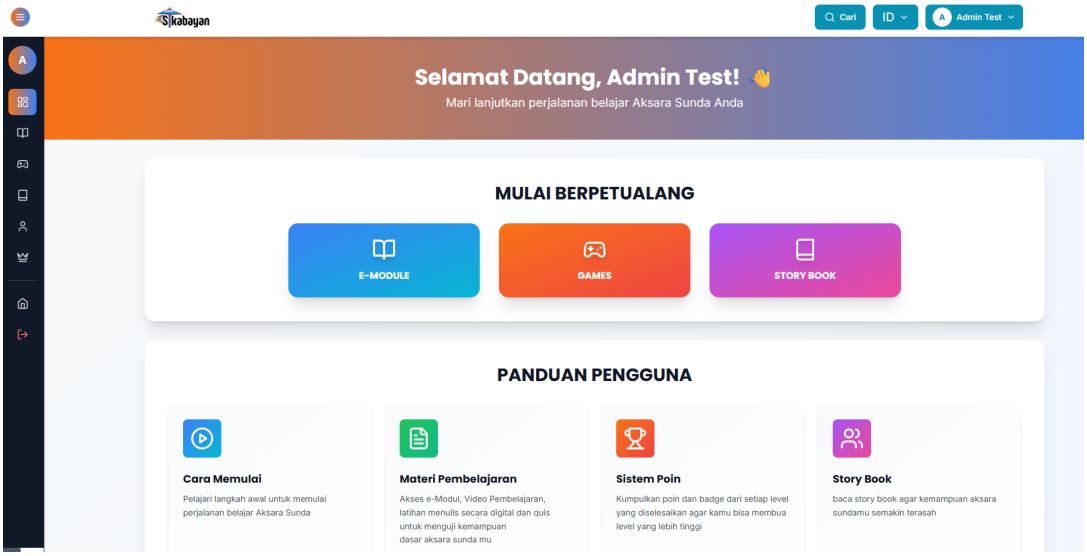

Figure 1. App Main Menu Display
Source: Developed by the authors (2026)

On this page there are three main menus, namely the learning menu, the practice menu, and the game menu. Each menu is equipped with different visual and color icons to make it easier for students to recognize the function of each menu.

Based on the results of using the application, students can quickly understand the function of each menu without requiring significant help from the teacher. This shows that the application interface design has met the usability aspect.

2. Learning Menu

The learning menu is used to present Sundanese script material to students visually and in a structured manner.

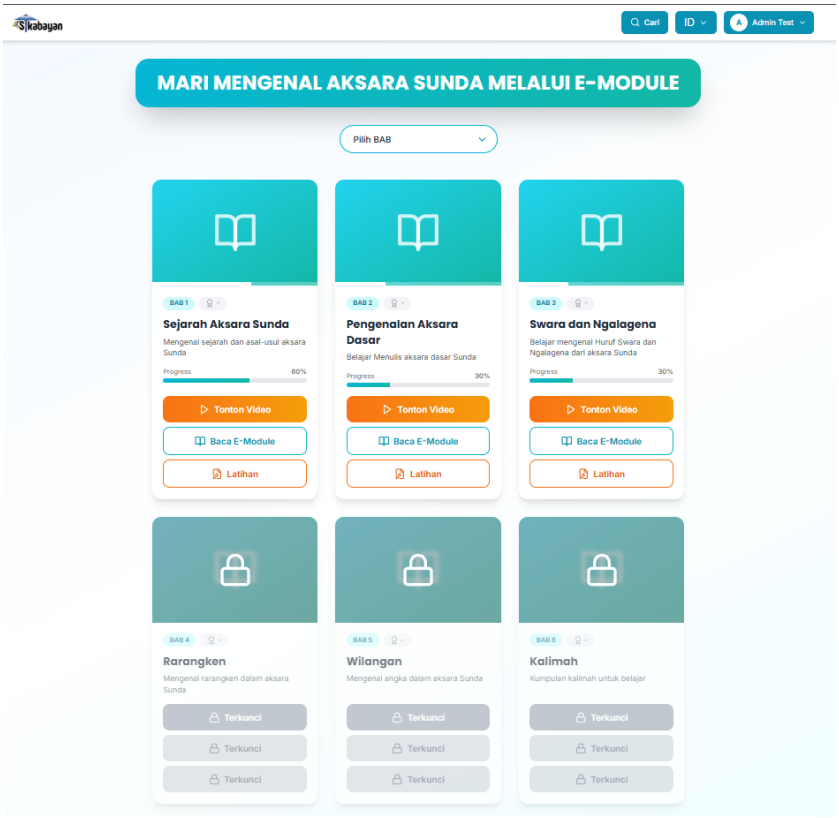

Figure 2. Learning Menu View
Source: Developed by the authors (2026)

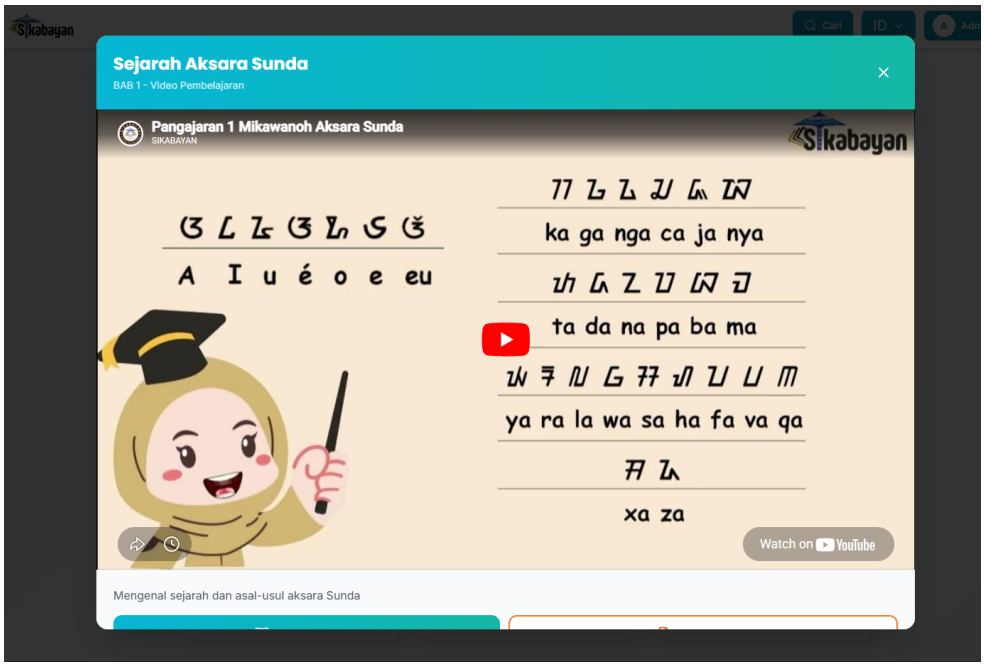

Figure 3. Learning Menu View (watch video)
Source: Developed by the authors (2026)

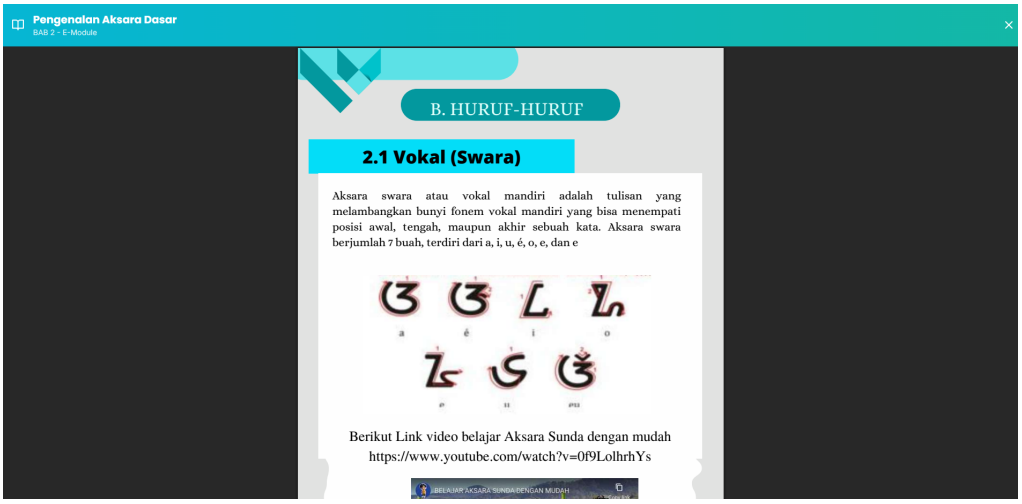

Figure 4. Learning Menu Display (e-module)
Source: Developed by the authors (2026)

The material is presented in the form of videos and character images accompanied by brief explanations. The presentation is done in stages, starting from basic script to more complex levels. This makes it easier for students to understand the material systematically.

During the use of the app, students show a higher level of attention to the visually presented material. This shows that visual-based learning media is more effective in helping students recognize the form of script.

3. Exercise Menu

The practice menu is a feature that allows students to practice writing Sundanese characters directly using the Smart Board.

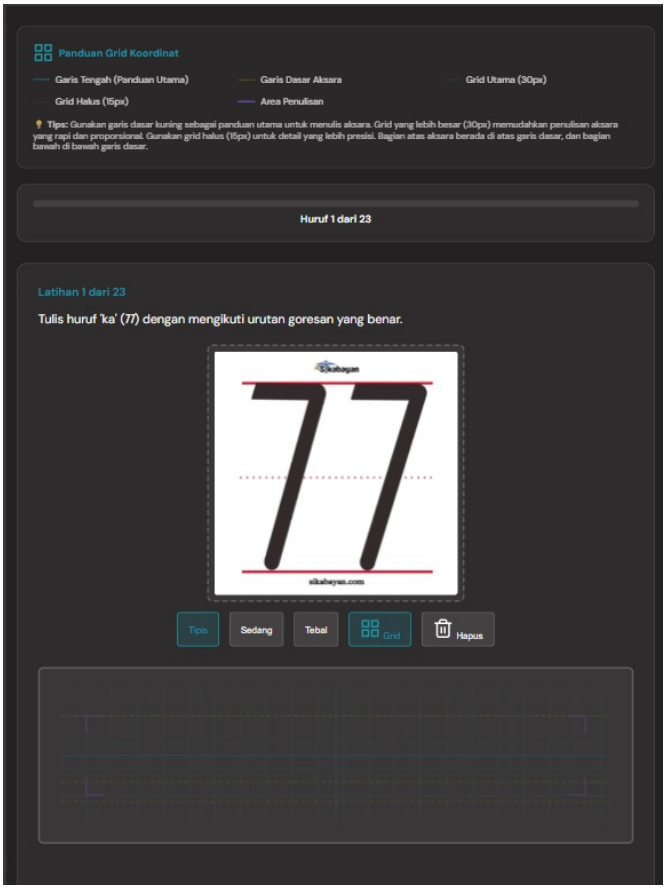

Figure 5. Exercise Menu Display
Source: Developed by the authors (2026)

In this feature, students are asked to write characters according to the example given. The system will respond to the student's writing, so that students can find out the mistakes made.

Direct interaction through touch screens makes students more active in the learning process. Students not only see the material, but also do writing activities, so learning becomes more interactive.

The results of observations showed that students were more enthusiastic in using this feature compared to conventional training methods.

4. Learning Game Menu

The learning game menu is a key feature in the application that is designed using a gamification approach to increase student motivation and engagement in the learning process. In addition to individual games, the app also provides a group game mode that allows students to play as a team.

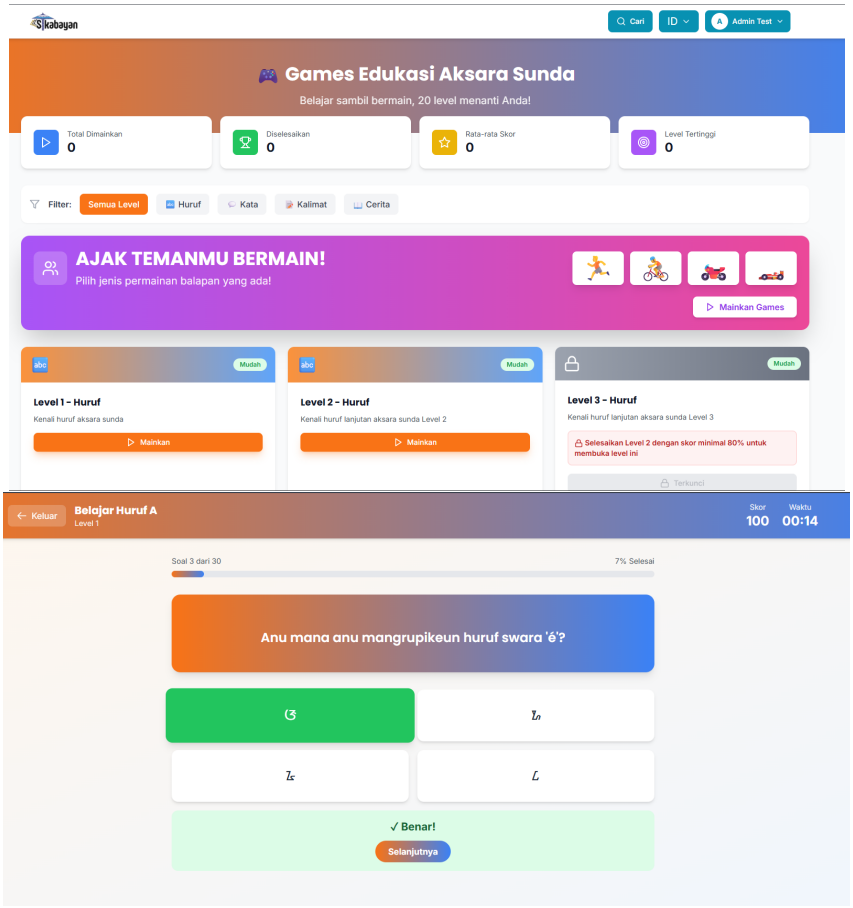

Figure 6. Individual Learning Game Views
Source: Developed by the authors (2026)

In this menu, students are given questions in the form of games that must be solved. Each correct answer will give a point, while an incorrect answer will be given feedback.

The game is designed with a gradual level system. This encourages students to keep trying and improving their abilities. Based on the results of use, students show a high interest in completing each available level.

Figure 7. Group Learning Game View
Source: Developed by the authors (2026)

In this mode, students are divided into two groups, namely Team A and Team B, which compete with each other in answering Sundanese script questions. Each group is given the same question and must choose the correct answer within a predetermined time.

The game is designed in the form of car racing, where each correct answer will make the team's vehicle move forward towards the finish line. This system creates a competitive atmosphere that encourages students to think quickly and work together in teams.

In addition, there is a timer feature that limits the time to answer, so students are required to focus and be responsive to the questions given. Each team's score is displayed live, so students can see the progress of the game in real-time.

Based on the results of observations during the use of the application, this group game mode is able to significantly increase interaction between students. Students not only focus on individual answers, but also discuss and work closely with team members to determine the correct answer.

In addition to increasing motivation, this feature also creates a more fun and competitive learning atmosphere. Students show high enthusiasm during the game, which can be seen from their active involvement in answering questions and the desire to win the game.

Thus, the application of the group game mode in the app not only serves as a medium for learning evaluation, but also as a means to improve cooperation, communication, and student participation in the learning process.

5. System Testing (Black Box Testing)

The system testing in the Sundanese script learning application was carried out using the black box testing method. This method is used to test the functions contained in the application based on the compatibility between the input provided and the output produced, regardless of the internal structure of the system.

The purpose of this test is to ensure that all features in the application can run as expected and can be used properly by users, especially students as the main user. The test is focused on the main features contained in the application, namely the main menu, learning menu, practice menu, and learning game menu.

The testing process is carried out by running each feature based on the usage scenarios that are common to the user. Each test scenario is designed to see if the system can respond correctly to user input and generate an appropriate output.

Table 1. Testing Menus and features

No	Features	Testing Scenarios	Expected Output	Results
1	Main Menu	Choose a learning, exercise, and game menu	Menus are accessible and move pages correctly	Successful
2	Learning	Display the material of the script	The material appears according to the user's preferences	Successful
3	Exercise	Script input via touch screen	The system responds to input and displays results	Successful
4	Individual Games	Answering questions	The system provides feedback and scores	Successful
5	Group Games	Team A and Team B Interactions	Score and object movements run according to game logic	Successful
6	Timer	Game Deadline	Running and stopping times according to the rules	Successful

Source: System testing results using Black Box Testing method (2026)

Based on the results of the tests that have been carried out, all features in the application can run as expected without significant functional errors being found. This indicates that the developed application has met the functionality aspect of the system.

In addition, the system is also able to respond well to user interactions, both in menu navigation, learning processes, exercises, and games. In the group game feature, the system is able to manage the interaction of two teams simultaneously, including scoring calculations and moving objects in real-time.

Thus, it can be concluded that this Smart Board-based Sundanese script learning application has met functional needs and is ready to be used as an interactive learning medium in the learning process.

6. Evaluation Results

An evaluation was carried out on 50 respondents who had used the learning application at SD Sukamulya, Tasikmalaya City.

Table 2. Results of Evaluation of the Use of Sundanese Script Learning Games

Yes	Aspects	Average Score	Percentage	Categories
1	Learning Effectiveness	± 4.71	± 94.2%	Highly effective
2	Reading & Writing Skills	± 4.69	± 93.8%	Highly effective
3	Gamification & Interaction	± 4.73	± 94.6%	Highly effective
4	Use of Smart Boards	± 4.74	± 94.8%	Highly effective
5	Impact on Value	± 4.76	± 95.2%	Highly effective

Source: Processed data from questionnaire results of 50 respondents (2026)

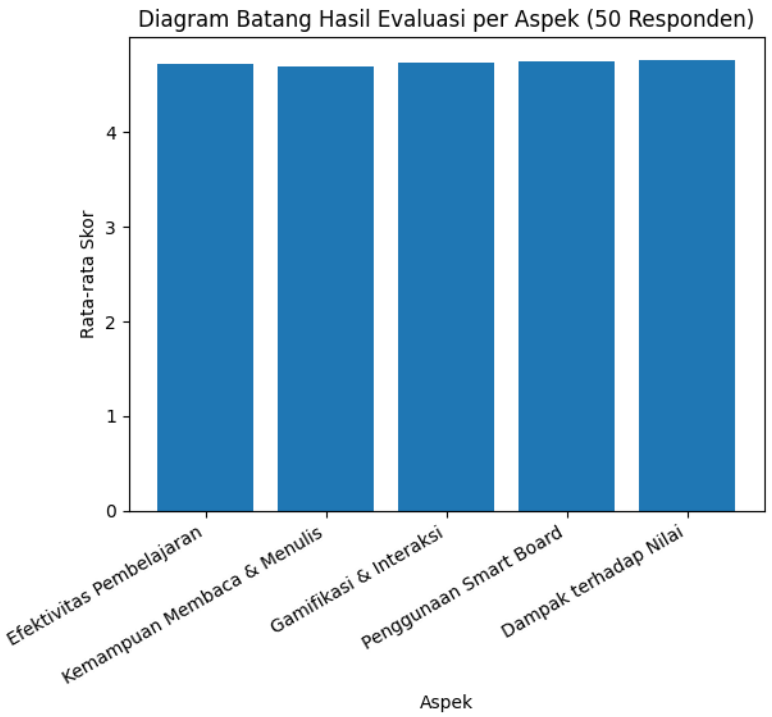

Figure 8. Bar Diagram of the Results of the Evaluation of the Use of Sundanese Script Learning Games

Source: Processed data from questionnaire results (2026)

Based on the results of the evaluation of 50 respondents, it was found that all aspects of the assessment showed an average score of 4.72 out of a scale of 5, which was included in the

very good category. The learning effectiveness aspect obtained an average score of 4.71, reading and writing skills of 4.69, gamification and interaction of 4.73, use of smart boards of 4.74, and impact on scores of 4.76.

The aspect with the highest score is the impact on grades, which shows that the use of Sundanese script game applications makes a positive contribution to improving student learning outcomes. In addition, the high value of gamification and interaction shows that a game-based approach is able to increase student engagement and learning motivation.

Overall, these results show that the application developed is very effective and feasible to be used as an interactive learning medium in improving students' understanding, skills, and learning outcomes in Sundanese script materials. Thus, the integration of game-based technology and smart boards in learning can be an innovative solution to improve the quality of learning in elementary schools.

7. Results Analysis

Based on the results of evaluation and observation, the application developed has a positive impact on the learning process. Students show increased participation as well as engagement during the use of the app.

In addition, students also show a tendency to repeat the use of the app, especially on game features, to obtain a higher score. This shows that the app not only serves as a learning medium, but also as a tool capable of increasing learning motivation.

In terms of interaction, the use of Smart Boards allows students to interact directly with the system, so that learning becomes more active and not monotonous.

8. Comparison with Conventional Methods

When compared to conventional learning methods, this app provides a more interactive learning experience. Students not only receive material, but also practice and interact in person.

This makes it easier for students to understand the material and be more interested in participating in learning.

9. Research Implications

The results of this study show that the use of technology-based applications can significantly improve the quality of learning. This application can be used as an alternative learning medium that is more interactive and interesting.

In addition, this application can also support the preservation of local culture through a modern technological approach.

10. Research Novelty

The novelty of this research lies in the integration between Smart Board technology, gamification, and interactive learning in one Sundanese script learning system.

This approach not only improves the delivery of material, but also enhances students' hands-on interaction and learning experience.

CONCLUSION

Based on the evaluation results from 50 respondents, the Sundanese script game-based learning media demonstrated a very high level of feasibility, with average scores across five assessment aspects—learning effectiveness (4.71), reading and writing skills (4.69), gamification and interaction (4.73), Smart Board utilization (4.74), and impact on grades (4.76)—all categorized as very good. These findings indicate that the application effectively enhanced students' understanding, improved their reading and writing skills, and provided a more interactive and engaging learning experience through gamification features, while the integration of Smart Boards supported a more active and participatory classroom environment. Overall, the media can be considered a highly feasible and effective innovative alternative for elementary school learning. For future development, enhancements such as more advanced levels, adaptive questioning, and interactive feedback systems are recommended to further

optimize learning experiences, while educators are encouraged to integrate the application more fully into classroom practices. Future research should expand the scope of materials, involve participants from different educational levels, and adopt mixed-method approaches combining quantitative and qualitative data (e.g., interviews and observations) to gain a more comprehensive understanding of the application's effectiveness in diverse learning contexts.

REFERENCES

Bahmanbijar, B., Nazarieh, M., Toufan, N., Dehghani, M. R., & Beigzadeh, A. (2019). Identification of the reasons behind students' lack of participation in classroom activities using a Delphi technique. *Future of Medical Education Journal, 9*(2), 10–17.

El-Sabagh, H. A. (2021). Adaptive e-learning environment based on learning styles and its impact on development students' engagement. *International Journal of Educational Technology in Higher Education, 18*(1), 53.

Feng, Z., & Xiao, H. (2024). The impact of students' lack of learning motivation and teachers' teaching methods on innovation resistance in the context of big data. *Learning and Motivation, 87*, 102020.

Hidayat, T., & Syarif, M. (2023). The effectiveness of PBL gamification in regional language learning in elementary schools. *Journal of Elementary Education (JPD).*

Insani, N. H., & Kholiq, Y. N. (2025). Exploring learning difficulties and causal factors in Javanese scripts: Student and teacher perspectives in Indonesian high school. *Jurnal Pemberdayaan Masyarakat, 4*(3), 642–662.

Istiq'faroh, N. (2024). Educational games as learning media in the 21st century. *Elementary Journal.*

Lestari, D. A., et al. (2025). Integration of smart board and web-based learning: Transforming cultural literacy in modern elementary schools. *Journal of Instructional Technology.*

Lu, B., & Hanim, R. N. (2024). Enhancing learning experiences through interactive visual communication design in online education. *Eurasian Journal of Educational Research (EJER), 109.*

Meşe, E., & Sevilen, Ç. (2021). Factors influencing EFL students' motivation in online learning: A qualitative case study. *Journal of Educational Technology and Online Learning, 4*(1), 11–22.

Nugraha, S. (2022). Kinesthetic interactivity in touchscreen-based learning media for early childhood. *Journal of Educational Innovation.*

Nurajizah, S., et al. (2021). Designing web-based Sundanese script interactive learning media applications. *Journal of Equator Informatics.*

Omoseebi, A., Ben, A., & Andy, W. (2024). *Institutional challenges in accommodating diverse learning styles.*

Peláez, C. A., & Solano, A. (2023). A practice for the design of interactive multimedia experiences based on gamification: A case study in elementary education. *Sustainability, 15*(3). https://doi.org/10.3390/su15032385

Ramadhan, A., & Herlawati. (2022). Implementation of the MDLC method in the development of interactive learning media to know local culture. *Journal of Informatics Engineering (JTI).*

Syakur, A., Sudrajad, W., Winurati, S., & Tilwani, S. A. (2023). The motivation of students and their exposure to learning loss after the pandemic. *Studies in Learning and Teaching, 4*(3), 622–633.

Twiningsih, A., Gunarhadi, & Musadad, A. A. (2024). Gamification-based mobile learning media to improve learning outcomes. *Journal of Educational Technology Letters.*

Wardani, A. R., et al. (2022). Utilization of smart whiteboard media in elementary school learning.

Wijaya, K. (2021). Application of gamification elements in elementary education: A systematic literature review. *Journal of Educational Technology.*

Wisnu, I. B. M. W. P. (2025). Who benefits from gamification? The role of web-based learning in elementary education. *Journal of Elementary School Science.*

Yang, C. (2025). Adapting teaching methods to accommodate diverse learning styles in education. *Journal of Higher Education Research, 5*(6), 3382. https://doi.org/10.32629/JHER.V5I6