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Traditional dance preservation model through mobile game design: a case study of Riau Malay persembahan dance

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ABSTRACT

The rapid erosion of intangible cultural heritage, exemplified by the declining engagement of youth with the Riau Malay Persembahan Dance, poses an urgent challenge to the continuity of regional identity and values. This research responds by developing a mobile game designed to preserve and revitalize this traditional dance through digital media. The study employs a structured Research and Development (R&D) methodology integrated with the Game Development Life Cycle (GDLC), ensuring both scientific rigor and authentic cultural representation. Game design and development involved iterative prototyping, expert validation, and user testing, with data collected via structured surveys, interviews, and direct observation. The game was evaluated by 35 participants from diverse backgrounds, whose feedback demonstrated high levels of engagement and cultural appreciation. Statistical analysis using a chi-square test ($\chi^2=399.25$, $df=3$, $p<0.0001$) confirmed overwhelmingly positive reception, with 85% of participants reporting increased interest in Riau Malay culture after gameplay. Despite limitations such as platform exclusivity and a narrow cultural focus, the results underscore the game's effectiveness as an educational tool and its potential for broader implementation. This research contributes a replicable model for digital cultural preservation, demonstrating that interactive media can significantly enhance the transmission and appreciation of intangible heritage among younger generations.



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1. Introduction

The Riau Malay Persembahan Dance is a traditional dance and iconic cultural expression deeply embedded in the identity of the Riau Malay community. This dance is traditionally performed as a welcoming gesture at important ceremonies and events, symbolizing hospitality, honor, gentleness, and courtesy, core values upheld by the Riau Malay people [1]. Each movement, including the use of betel leaves, floor patterns, traditional music, and attire, carries profound symbolic meanings that reflect the community's beliefs, philosophy, and social values [2] [3]. Persembahan Dance is characterized by graceful and elegant movements that emphasize beauty and aesthetics, reflecting the cultural values and traditions of the Riau Malay community [4]. The dance not only serves as artistic entertainment but also functions as a vital medium for transmitting cultural heritage and sustaining community identity across generations. Despite its cultural significance, the Riau Malay Persembahan Dance faces considerable challenges in

engaging younger generations. The pervasive influence of modernization and digital technology has shifted youth interests toward digital entertainment, making traditional cultural practices less accessible and appealing to them. Moreover, limited formal education and exposure to the dance contribute to a low level of awareness and appreciation among young people, even within communities that hold the tradition [5]. Scholarly literature and cultural studies emphasize that these challenges are not unique to the Riau Malay Persembahan Dance but reflect broader issues faced by Malay culture in Riau. Recent search underscores the low digital literacy among local communities and the overshadowing of local cultural content by global media, which further diminishes the visibility and relevance of Malay cultural expression [6].

Recognizing these issues, the Riau government's vision emphasizes cultural preservation as a strategic priority, advocating for sustainable development and revitalization programs that foster youth engagement and cultural character building [7] [8]. In this context, digital media, particularly educational and interactive games, have emerged as promising tools for cultural preservation. Research shows that game-based learning environments can effectively engage learners, enhance knowledge acquisition, and promote cultural heritage appreciation among younger audiences [9] [10]. The study conducted by Kara [11] shows the long-term effect of serious games on cultural heritage learning, and also, cultural heritage content within the game had a positive impact on learning experiences. Digital games, through immersive and interactive experiences, allow users to explore and connect with traditional arts in ways that align with their digital-native lifestyles [12]. There are previous studies that are related to this research paper. First is "Effects of Game-Based Teaching on Primary Students' Dance Learning: The Application of the Personal Active Choreographer" [13]. The results from this research show that using games can make teachers and students more engaged in dance activities. However, the study only focusing on teaching choreography and movement accuracy without deeply addressing cultural preservation on the integration of symbolic cultural narratives within the game.

The study entitled "Game Development Software Engineering: Digital Educational Game Promoting Algorithmic Thinking" [14] focuses on the use of game development and software engineering principles to create digital educational games that foster algorithmic thinking. There is gap in the study, first the algorithmic thinking study focuses on abstract skills like logic and problem solving, but does not address the authenticity of cultural elements such as traditional dance, music, and narratives into gameplay. Next, the study conducted by Bahtiar and Gustalika [15] focuses on using the System Usability Scale (SUS) to evaluate the usability of a mobile application designed to gamify the learning of Indonesian dance. This research demonstrates the effectiveness of digital gamification in introducing and preserving traditional dance among students, achieving high usability scores and positive user feedback. However, while SUS provides a reliable measure of usability, it does not assess cultural authenticity or the educational impact on cultural awareness. Lastly, the study conducted by Chiotaki et al., "Adaptive Game-Based Learning in Education: A Systematic Review" [16] highlights that adaptive Game-Based Learning (GBL) approaches, where game content and experiences are personalized based on learner profiles, significantly improve student performance, motivation, engagement, and self-confidence across various educational contexts. The study emphasizes learning outcomes such as performance and motivation, but often overlooks cultural engagement and awareness.

This research makes several significant scientific contributions to the field of digital cultural heritage preservation and game-based learning. First, it introduces an innovative approach to game design by authentically embedding the symbolic movements, traditional music, and cultural narratives of the Riau Malay Persembahan Dance within an interactive digital game. Second, the research methodologically innovates by applying the Game Development Life Cycle (GDLC) to the domain of cultural heritage preservation, integrating cultural validation at each stage and setting a new standard for the development of culturally themed educational games. Finally, the study empirically demonstrates that digital games, when designed with authentic cultural content and rigorous evaluation, can significantly enhance cultural awareness and engagement among younger generations. Fig. 1 is a research roadmap.



Fig. 1.Research Rodamap

This research introduces several innovative dimensions to the field of digital cultural heritage preservation and game-based learning. In terms of game design, it moves beyond conventional gamification by authentically embedding the symbolic movements, traditional music, and cultural narratives of the Riau Malay Persembahan Dance directly into the game mechanics and storyline, creating an interactive and immersive experience that encourages active participation and deeper engagement with cultural content. The integration of cultural elements is notably advanced through the inclusion of symbolic and narrative depth, ensuring that the dance is represented not just as a series of steps but as a living tradition with meaningful context, while also involving iterative feedback from cultural experts and community members to guarantee accuracy and respect. The research makes important theoretical contributions by offering empirical evidence that digital games can significantly enhance cultural engagement and awareness among younger generations, as demonstrated by the high percentage of participants reporting increased interest in Riau Malay culture. This research collaborates with Mr. O.K. Nizami Jamil, a prominent Riau Malay cultural figure and expert in Riau Malay culture, particularly in traditional dance. His expertise has been invaluable in the development of this project, as he is the creator of standardization for the Riau Malay Persembahan Dance. Through a Research and Development (R&D) methodology, this study employs the Game Development Life Cycle (GDLC) to create an interactive digital experience that not only preserves but also promotes the cultural significance of the Persembahan Dance. By integrating qualitative feedback from participants and leveraging Mr. Jamil's insights, this research aims to enhance awareness and appreciation of Riau Malay culture among younger generations, ultimately contributing to the preservation of this vital cultural heritage.

2. Method

In the conducted research, the Author developed an Anrdoid – based game application with the theme of Riau Malay Persembahan Dance. The type of game developed falls under the category of educational games, where an educational game is defined as “A digital game designed for educational enrichment and used to examine the outcomes of the learning process” [17]. The research employs the Research and Development (R&D) method (Fig. 2) which is a method that involves systematic research activities and development to create new products, services, or technologies, as well as improve existing ones [18] and Game Development Life Cycle (GDLC) that a framework used to manage the entire game development process from start to finish [19].

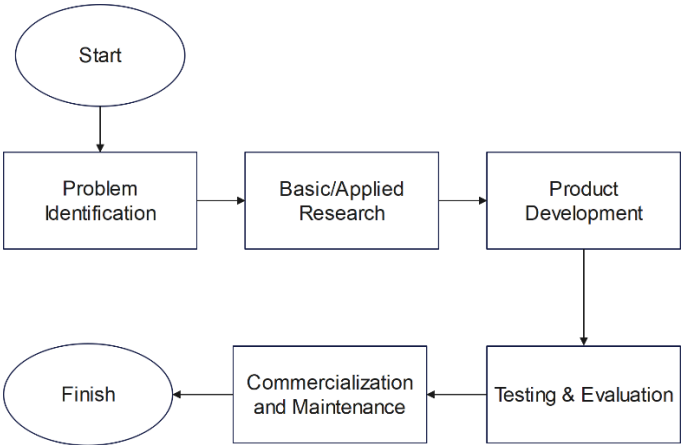


Fig. 2. Research and Development

The GDLC encompasses all stages, including initial concept, design, pre-production, production, testing, launch, and post-launch maintenance [20]. The primary objectives of the GDLC include streamlining the development process, minimizing risks, improving game quality, fostering team collaboration, efficiently allocating time and resources, and ultimately delivering a product that meets user expectations (Fig. 3).

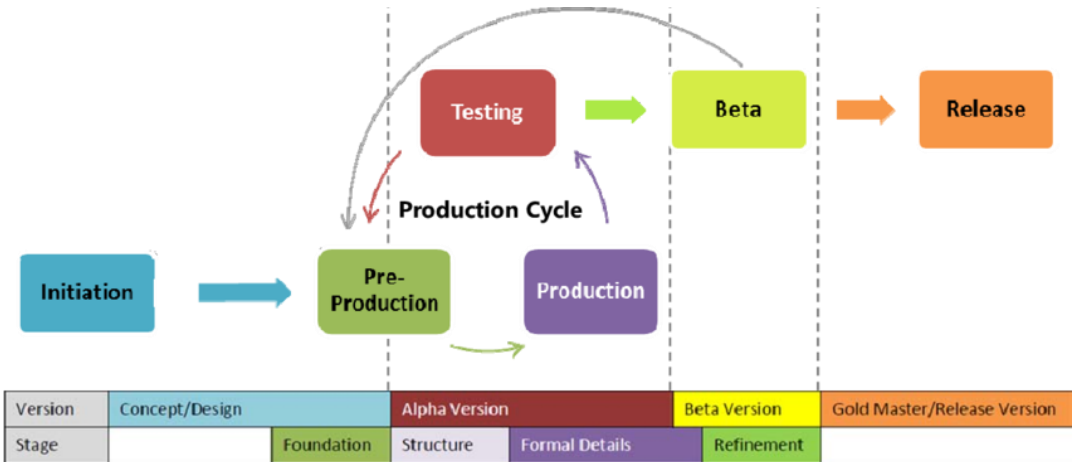


Fig. 3. Game Development Life Cycle

The research begins with a critical problem identification phase, rooted in Research & Development (R&D) methodology. Identifying a research problem is the most vital step in scientific research, akin to laying the foundation for building [21]. The result from the problem identification phase is based on the interview, and the questions from the interview can be seen in Table 1.

Table 1. Table of Interview Questions

List of Interview Questions	
Can you describe your familiarity with Persembahan Dance and its significance in Riau Malay culture?	
How do you perceive the role of Persembahan Dance in preserving Riau Malay cultural heritage?	
What challenges do you think Riau Malay traditional dances face in terms of preservation and transmission to the younger generation?	
What motivates or demotivates young people from engaging with traditional dances like Persembahan dance?	
How do you think technology, such as video games, can help in preserving traditional dances like the Persembahan dance?	

It identified that younger generations are increasingly disengaged from traditional cultural practices due to limited exposure and the pervasive influence of contemporary entertainment. Also, the traditional dance often receives limited formal education and is overshadowed by mainstream culture, leading to a loss of interest among youth. The results from the problem identification phase informed the initiation phase of the Game Development Life Cycle (GDLC). The phase involves formulating the initial game idea, including its core concept, genre, theme, and feasibility studies to evaluate technical, financial, and market potential [22]. According to Einstein, "Initiation is the preliminary process of drafting a rough game concept, encompassing decisions on the game's identity, topic, and target audience" [23]. Following problem identification, the research proceeded to basic and applied research activities, corresponding to the design and pre-production phase of the Game Development Life Cycle. The primary goal of basic research is to develop theories, advance knowledge, and satisfy curiosity [24]. During basic research, theoretical studies, and laboratory experiments were conducted to deepen the understanding of cultural preservation and digital engagement. Applied research involved the development of initial prototypes and field trials, where feedback from cultural experts and target users was incorporated to refine the game's design. The design phase from GDLC is to create a Game Design Document (GDD), which details all aspects of the game, including its narrative, gameplay mechanics, level design, and visual/audio elements [25]. The pre-production phase produces assets, storyboards, and the final intended outcomes [26].

The development stage of Research and Development overlapped with the production phase of the Game Development Life Cycle. The primary goal is to optimize the technology and achieve maximum potential [27]. Here, the actual creation of the game took place, with the development team programming the game logic, designing assets, integrating animations, and building the user interface. The production phase is where the development team begins creating the game's content, including programming, level design, graphics, and audio [28]. Production can also be considered the core process, revolving around asset creation, source code development, and the integration of these elements [29]. Testing and evaluation formed a critical bridge between Research & Development and the Game Development Life Cycle methodology. In this stage, the game underwent rigorous functionality testing, alpha and beta testing, and usability assessment with diverse user groups. Feedback was collected through a questionnaire and statistical analysis, which is a chi-square goodness-of-fit test required when analyzing the data. The final stage of commercialization, launch, and maintenance in Research & Development corresponded to the launch and post-launch phases of the Game Development Life Cycle. The launch phase marks the official release of the game's final version to the public through selected distribution platforms, accompanied by promotional campaigns [30]. As the concluding stage of development following rigorous testing, this phase represents the product's market debut [31]. Post-launch activities included ongoing technical maintenance, regular updates, and the collection of user data, Table 2.

Table 2. Update and Technical Maintenance

Components	Results
Organizational Structure	The technical maintenance is composed of developers and support staff who collaborate to identify and address issues reported by players.
Update Schedule	Routine updates are scheduled bi-weekly to address critical bugs and performance issues.
	Major content updates, including new DLC and expansions, are planned quarterly based on player interest and ongoing market trends.
Evaluation Methods	Post-update surveys and feedback forms are distributed to players to gather their opinions on the effectiveness of the updates and any persisting issues.
	Key Performance Indicators (KPIs), such as the frequency of bug reports and system performance post-update, are tracked to assess the impact of each release.

By structuring these processes and employing systematic evaluation methods, the author ensures that the game continually meets player expectations and enhances the experience of the Riau Malay Persembahan Dance. These sustained efforts ensure the game's longevity, maintain player engagement, and enhance the overall user experience through continuous improvements and content additions [32].

2.1. Evaluation Instruments, Data Collection, and Analysis

To ensure the effectiveness and cultural authenticity of the Riau Malay Persembahan Dance game, this study employed a comprehensive evaluation framework. Data were collected from 35 participants representing diverse age groups (18 – 45), educational backgrounds (high school to master's), and gaming experience levels (novice to expert), selected through purposive sampling to reflect the target community. Participants engaged with the game and completed a structured survey consisting of seven questions, each rated on a four-point scale (Very Good, Well, Not Good, Very Bad). The survey assessed usability, cultural information delivery, gameplay experience, and overall satisfaction. Additionally, semi-structured interviews and focus group discussions were conducted with cultural experts (Mr. OK Nizami Jamil) and community members to validate the game's cultural authenticity and gather feedback. The game's design and content were iteratively reviewed by cultural experts to ensure accurate presentation of the Riau Malay Persembahan Dance's symbolic movements, traditional music, and attire. Feedback from these experts was incorporated throughout the development process, and their input was crucial in confirming the game's alignment with Riau Malay cultural values. Quantitative data from the surveys were analyzed using a chi-square goodness-of-fit test to determine if the distribution of responses deviated significantly from a uniform distribution. Qualitative data from interviews and open-ended survey questions were analyzed using thematic analysis to identify key themes related to cultural engagement, usability, and educational impact.

3. Results and Discussion

The interview was conducted with Mr. OK Nizami Jamil as a Riau Malay cultural figure. Mr. OK Nizami Jamil is not only a Riau Malay cultural figure but also a creator of standardization from Riau Malay Persembahan Dance. Mr. OK Nizami Jamil has a view that Riau Malay Persembahan Dance is deeply rooted in Malay culture and serves as an iconic representation of the community's identity. The dance incorporates elements like *Tepak Sirih*, which holds symbolic meanings related to brotherhood, fertility, and royal power. Mr. OK Nizami Jamil also explained that

"The Riau Malay Persembahan Dance is a highly significant cultural heritage of the Riau Malay community, serving not only as a gesture of respect to guests but also as a symbol of hospitality, courtesy, and the identity of the Riau people. It is my hope that this dance will continue to be preserved and recognized as belonging to the Riau Province, both legally and culturally."

In the development of this digital game, I strongly support efforts to maintain the authenticity of the dance's movements, music, and underlying philosophy in every element of the game. This authenticity is crucial so that the younger generation can understand and appreciate the meaning behind each movement, as I have created and standardized them."

I also emphasize the importance of cultural validation by experts and practitioners of the dance, as well as involving the community in the testing process. In this way, the game will not only be visually and interactively appealing but will also be able to instill Riau Malay cultural values in the younger generation, so that they feel proud and engaged in preserving this heritage."

I believe that technology-based approaches, such as digital games, can be an effective solution to increase the interest and understanding of the younger generation toward the Riau Malay Persembahan Dance, as long as the authenticity and cultural meaning are preserved."

The result from the interview states that there is some concern from experts about the preservation of Riau Malay Persembahan Dance, especially for younger generations. Based on

this interview, the Author has a reason to develop a game to help preserve the Riau Malay Persembahan Dance.

3.1. Problem Identification and Initiation

The research commenced with a comprehensive problem identification process grounded in the Research & Development methodology. The results from the problem identification are that the younger generations exhibit declining engagement in Riau Malay Persembahan Dance due to limited exposure and the dominance of modern digital entertainment. The result from problem identification can be seen in Table 3.

Table 3. Table of Problem Identification

Aspects	Results
Cultural Challenge	The Riau Malay Persembahan Dance faces declining engagement among younger generations due to limited exposure and the influence of modern digital entertainment.
User Needs	Younger audiences prefer digital and interactive learning experiences over traditional methods.
Expert Validation	Interviews with cultural experts confirmed the need for authentic, engaging digital solutions.

The findings from the problem identification phase directly informed the initiation of the Game Development Life Cycle (GDLC). It involves the initial idea generation and conceptualization of the game [33]. During the initiation, the author defined the game's concept as an android-based, casual rhythm game centered on the Riau Malay Persembahan Dance, Table 4. The target audience was established as younger generations, and the game's core objectives were set to preserve and promote the dance while fostering cultural awareness and appreciation.

Table 4. Initiation Results

Components	Results
Game's Name	Persembahan Dance
Target	Younger Generation
Device	Android
Game's Genre	Casual Rythm
Game's Objectives	Preserve Malay Riau Persembahan dance
Game's Scope	Riau Malay Traditional Dance
Game's Concept	Music and Movement Combination

3.2. Basic Research and Pre-Production

The next steps after problem identification and initiation are basic research and the pre-production phase. During the basic research phase, the Author conducted a series of activities to ensure that the game would effectively preserve and promote the Riau Malay Persembahan Dance. The main results are the essential components of the Riau Malay Persembahan Dance, design principles that prioritize cultural authenticity, educational effectiveness, and user engagement, feedback loops with cultural experts and target users, and enhance cultural awareness. Pre – production is a critical phase in the game development that sets the foundation for the entire project. It involves planning, conceptualizing, and preparing all necessary elements before the actual development (production) begins. Pre – production also involves brainstorming and developing the core concept of the game, including its theme, genre, and basic gameplay mechanics [34]. Fig. 4 shows a character created in Blender, which is modeled after a real-life person. The character was created from the results of basic research. During the pre – pre-production phase, the development team laid the foundation for the game by translating research insights and design principles into actionable plans and creative assets. This phase also produced a storyboard that has the purpose of giving boundaries in the game, so the players know what they must do and what they don't. A storyboard in the game is a visualization of the idea from the application that wants to build [35].

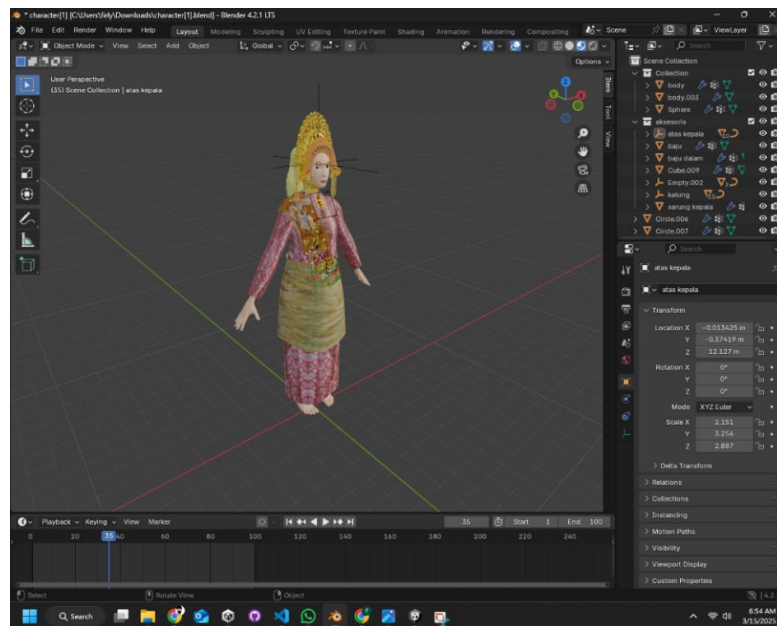


Fig. 4. Build Character in Blender

3.3. Production

The project advances to the production phase, which is the most intensive and critical stage of game development. During this phase, the actual creation of the game takes place through a series of coordinated steps designed to ensure both quality and success. First is graphic design. Graphic design in game development encompasses a wide range of styles, from abstract compositions to realistic renditions of the real world [36], Fig. 5.

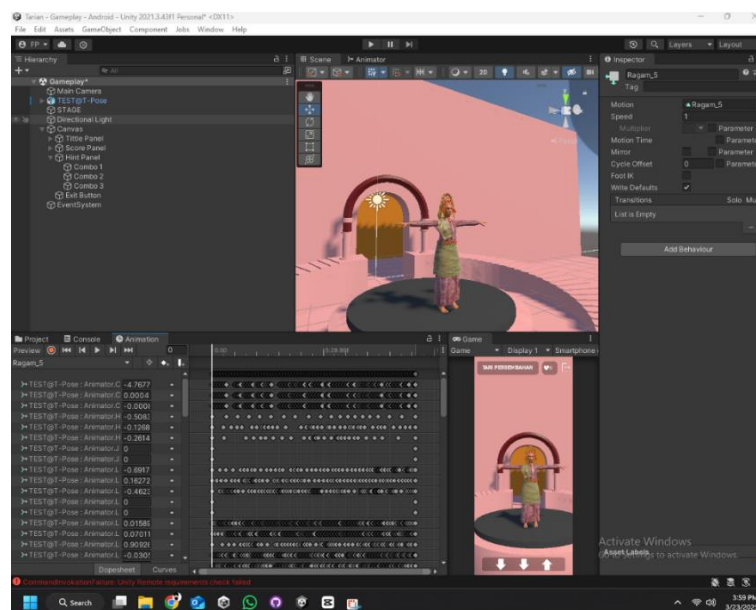


Fig. 5. Building Animation

First, there is system creation. This is the core activity of the production phase, where the game's system, mechanics, and features are developed. Then the design that created based on the initial concepts and pre-production work [37], also development that involves the actual coding and building of the game. System creation or programming focuses on implementing the dance mechanics using the Unity game engine, where developers code the interactive features, motion capture integration, and user input responsiveness to replicate the dance movement precisely. The results from the production phase can be seen in Table 5.

Table 5. Production Result			
Results	Description	Implication for Cultural Preservation	Implication for Learning Effectiveness
Asset Creation and Integration	All game assets, characters, environments, animations, music, and interface elements are created and integrated according to the finalized design.	Authentic cultural elements are faithfully implemented, preserving the Riau Malay Persembahan Dance in a digital format.	Educational content and features are fully developed and tested, supporting effective cultural learning.
Quality Assurance	Rigorous quality assurance ensures all features work as intended and the game is free of technical issues.	Cultural elements are correctly represented, and the game's narrative and mechanics align with preservation goals.	Educational content is clear, accurate, and engaging.
Content Complete	All content is implemented; the game is fully playable from start to finish.	The full cultural narrative and elements are present and accurate.	All educational content is available and integrated.

In the production phase, there is a testing component to identify and fix bugs, ensure the game runs smoothly, and meets the desired quality standards, it called functionality testing. Functionality testing helps identify bugs and errors early in the development process, allowing developers to address these issues before the game is released [38]. Iterative functionality testing is conducted regularly with focus groups comprising cultural experts and target users to identify and resolve issues related to gameplay, accuracy, and user experience. Just like in Fig. 6 (a), Fig. 6 (b), and Fig. 6 (c). This is a testing component in the production phase, to make sure there are no problems in the game, the controller of the game, and the game runs based on the initiation and pre-production phase. Finally, cross-team coordination is managed through agile sprint cycles, facilitating continuous communication and collaboration among designers, programmers, testers, and cultural advisors. This structured approach ensures that the game development process remains efficient, culturally respectful, and aligned with project goals.

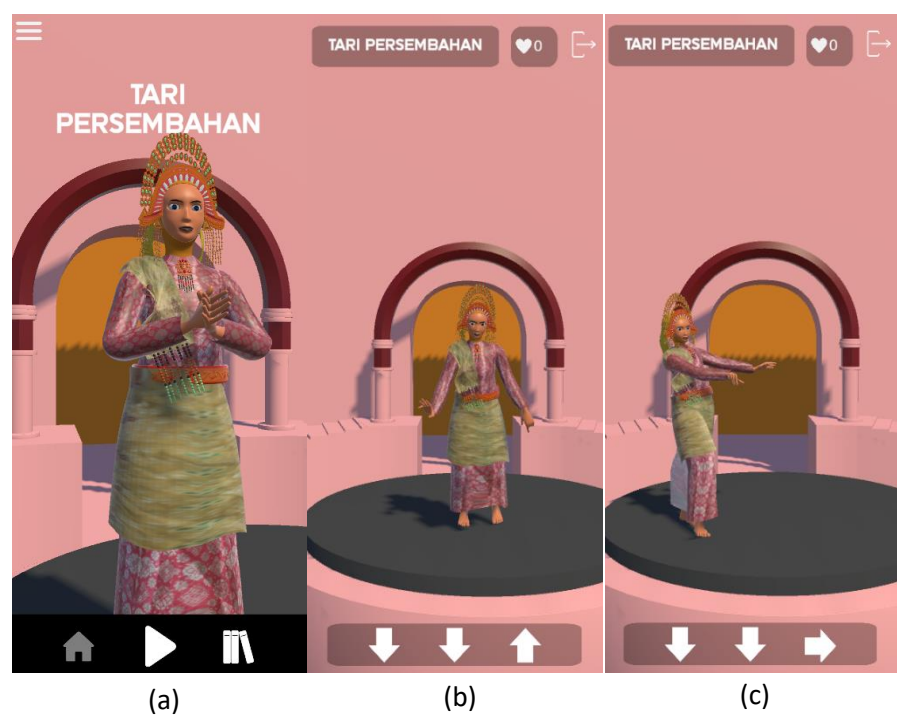


Fig. 6. (a) Main Menu, (b) Opening, (c) Gameplay

3.4. Testing

Next, there is the testing phase. The testing phase focuses on evaluating the game for quality, functionality, and user experience. Even though in the production phase, the functionality testing has been done, in this testing phase, functionality testing is still being done. The main goal of this phase is to ensure that the game performs well and meets the design specifications established during the pre-production and production phases. The respondents came from different backgrounds, including various age groups (18-25, 26-35, and 36-45). Younger participants (*e.g.*, 18-25) may be more tech-savvy and familiar with gaming mechanics, while older participants (*e.g.*, 36-45) may have deeper cultural knowledge or different perspectives on cultural preservation. Besides the various age groups, the participants were selected from different education levels (high school, bachelor's degree, and master's degree). Including respondents with different education levels ensures that the game is understandable and engaging for a broad audience. And the last criterion selected respondents are from their gaming experience (novice, intermediate, and expert). There is a reason behind it: testing with diverse gaming backgrounds helps identify usability issues and balance the game's difficulty and learning curve to accommodate all users [39]. Each respondent was given the opportunity to play the game, after which they answered a set of questions related to their gameplay experience. The results, shown in Table 6, summarize the responses. Based on the calculations, the value for "very good" was 195, "well" was 43, "not good" was 7, and "very bad" was 0.

Table 6. Testing Results

Questions	Respondents'			
	Very Good	Well	Not Good	Very Bad
Does the game run smoothly and display the desired result	30	5	0	0
Do you think the game already gives you the information about the Malay Riau Persembahan Dance	33	2	0	0
What do you think about the gameplay from the game, so you can understand about Riau Malay Persembahan dance	22	11	2	0
After you played the game, do you understand the movement in the Riau Malay Persembahan dance	25	10	0	0
From your point of view, can you describe and explain all the movements from the Riau Malay Persembahan dance	25	7	3	0
Is the game useful for all the users and lives up to your expectations	30	3	2	0
What do you think about the development of this game by adding more traditional dance, changing the game concept, and also the traditional dance comes from another province	30	5	0	0
Total	195	43	7	0

The evaluation of the Persembahan Dance game was conducted using responses from 35 participants across seven survey questions, yielding a total of 245 individual responses categorized into four levels: Very Good, Well, Not Good, and Very Bad. The distribution of responses was notably skewed, with 195 (79.59%) marked as "Very Good", 43 (17.55%) as "Well", 7 (2.86%) as "Not Good", and none as "Very Bad", Table 7. To statistically assess whether this distribution significantly deviates from an equal distribution across categories, a Chi-square goodness-of-fit test was performed. Since there are 245 total responses and 4 categories, the expected count per category under uniform distribution is:

$$E = \frac{245}{4} = 61.25 \quad (1)$$

Table 7. Observed (O) and Expected (E) counts

Category	Observed (O)	Expected (E)	(O - E) ² / E Calculation
Very Good	195	61.25	$\frac{(195 - 61.25)^2}{61.25} = 283.68$
Well	43	61.25	$\frac{(43 - 61.25)^2}{61.25} = 5.44$
Not Good	7	61.25	$\frac{(7 - 61.25)^2}{61.25} = 48.88$
Very Bad	0	61.25	$\frac{(0 - 61.25)^2}{61.25} = 61.25$

The results from the observed and expected can be counted to find the chi-square test statistic, which the form of calculation is:

$$X^2 = 283.68 + 5.44 + 48.88 + 61.25 = 399.25 \quad (2)$$

399.25 is the result for the chi-square test statistic. After that, the next step is to find degrees of freedom by using:

$$df = k - 1 \quad (3)$$

df stands for degrees of freedom, *k* represents the number of categories or groups, and the formula means subtract 1 from the total number of categories, which results in 4 subtract 1 is 3. The null hypothesis assumed a uniform distribution of responses, expecting approximately 61.25 responses per category, Fig. 7. The calculated Chi-square test statistic was exceptionally high at $X^2 = 399.25$ with 3 degrees of freedom, resulting in a p-value less than 0.0001. This highly significant result strongly rejects the null hypothesis, indicating that the respondents overwhelmingly rated the game positively. These findings provide robust statistical evidence supporting the game's effectiveness in delivering an engaging and informative experience about the Riau Malay Persembahan Dance. The positive reception suggests readiness for broader implementation and further development of the game.

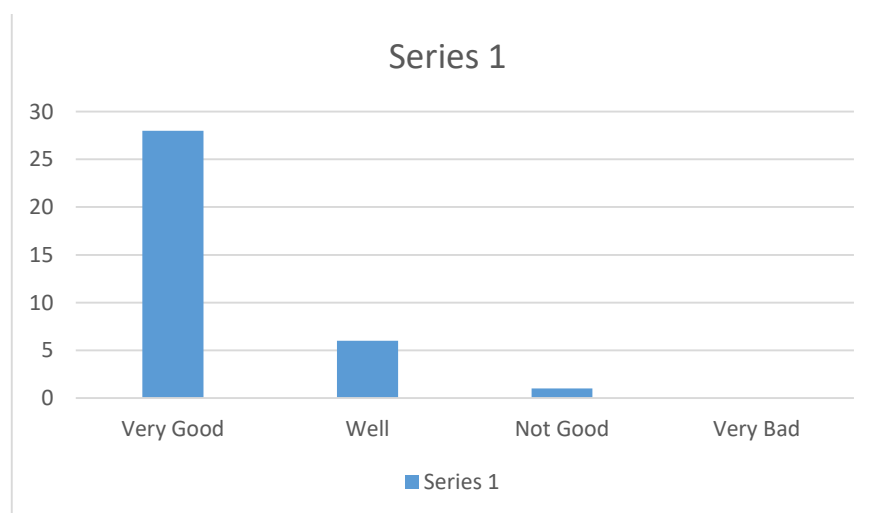


Fig. 7. The Bar Chart for Response Distribution

4. Conclusion

The development of the Riau Malay Persembahan Dance game in this study is deemed successful based on clearly defined criteria, including the game's stable performance on Android devices, positive user feedback, and statistically significant acceptance by the Riau Malay

community. Success was measured through a structured testing methodology involving 35 participants who evaluated the game's usability, cultural authenticity, and overall experience. The Chi-square goodness-of-fit test provided quantitative evidence supporting the acceptance of the game, reinforcing the validity of the findings. Despite these achievements, the study recognizes several limitations that impact the game's reach and cultural representation. The exclusive availability on Android devices restricts access for users on other platforms such as iOS, potentially limiting the game's audience. Additionally, the game currently features only the Riau Malay Persembahan dance, which narrows the scope of cultural exposure and may reduce user engagement over time. The absence of online multiplayer or interactive features further limits the potential for community interaction and sustained interest. To address these limitations, future development should prioritize expanding platform compatibility to include iOS and possibly web-based versions, thereby broadening accessibility. Incorporating a wider variety of traditional dances from the Riau Malay culture would enhance cultural richness and user appeal. Furthermore, integrating online multiplayer capabilities and interactive elements could foster greater user engagement and community participation. Future research could also explore the educational impact of the game on cultural preservation, assessing how gamification strategies influence cultural awareness and learning outcomes over extended periods. Overall, this project contributes significantly to the digital preservation and promotion of Riau Malay culture by leveraging interactive media. It demonstrates the potential of culturally focused games to raise awareness and appreciation of traditional arts within and beyond the target community. By addressing current limitations and pursuing recommended enhancements, the game can evolve into a more comprehensive and impactful tool for cultural education and engagement.

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Declarations

- Author contribution** : PRS, S: research idea, analyzed the data, and wrote the article; MH, RW: analyzed the data.
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References

- [1] M. Rahul, I. D. N. Supenida, and M. Zulfahmi, "Komposisi musik 'titian muhibah', terisnpirasi dari permainan melodi pendek lagu melayu makan sirih, dalam pendekatan garap world music," *Jurnal Musik Etnik Nusantara*, vol. 3, no. 1, pp. 89–100, 2023. doi: [10.26887/jmen.v3i1.3824](https://doi.org/10.26887/jmen.v3i1.3824)
- [2] S. Syefriani and F. Kurniati, "Eksistensi Tari Persembahan Di Kumpulan Seni Seri Melayu Pada Masa Pandemi COVID-19," *KOBA*, vol. 9, no. 1, pp. 37–51, 2022. doi: [10.25299/koba.2022.12561](https://doi.org/10.25299/koba.2022.12561)
- [3] P. Dwianggini and Martono, "The Symbolic Meaning, Educational Value of the Offering Dance in Natuna Regency, Riau Islands in the Semiotic Perspective of Roland Barthes," *IJMMU*, vol. 11, no. 8, pp. 730–742, Aug. 2024, doi: [10.18415/ijmmu.v11i8.6149](https://doi.org/10.18415/ijmmu.v11i8.6149).
- [4] I. A. Nurjanah, "The Function of Persembahan Dance in Malay Weddings in Kampung Besar Seberang Village," *Avant-garde: Jurnal Ilmiah Pendidikan Seni Pertunjukan*, vol. 1, no. 1, pp. 76–86, 2023. doi: [10.24036/ag.v1i1.9](https://doi.org/10.24036/ag.v1i1.9)
- [5] W. M. Wan Isa, N. A. Mat Zin, F. Rosdi, and H. Mohd Sarim, "Digital Preservation of Intangible Cultural Heritage," *IJECS*, vol. 12, no. 3, p. 1373, Dec. 2018, doi: [10.11591/ijeecs.v12.i3.pp1373-1379](https://doi.org/10.11591/ijeecs.v12.i3.pp1373-1379).
- [6] S. Febriyani, H. Riadi, and W. Azman, "Malay Culture in Welcoming the Century of Artificial Intelligence Excellence," 2025. doi: [10.46843/jpm.v4i1.375](https://doi.org/10.46843/jpm.v4i1.375)

-
- [7] S. A. Afandi, M. Afandi, R. Erdayani, and R. Lestari, "Mapping study: Analysis of the Riau vision 2025 research," *Int. J. on Social Sci, Econ and Art*, vol. 12, no. 4, pp. 189–199, Feb. 2023, doi: [10.35335/ijosea.v12i4.120](https://doi.org/10.35335/ijosea.v12i4.120).
- [8] S. Sutrisno, H. Faizah, E. Rahman, M. Jais, and R. E. Pohan, "Riau malay cultural character education in economic learning: bibliometric analysis," *ICMS*, vol. 1, no. 1, pp. 9–20, Dec. 2023, doi: [10.33373/icms.v1i1.3](https://doi.org/10.33373/icms.v1i1.3).
- [9] J. L. Plass, B. D. Homer, and C. K. Kinzer, "Foundations of Game-Based Learning," *Educational Psychologist*, vol. 50, no. 4, pp. 258–283, Oct. 2015, doi: [10.1080/00461520.2015.1122533](https://doi.org/10.1080/00461520.2015.1122533).
- [10] M. Holly, S. Brettschuh, A. S. Tiwari, K. K. Bhagat, and J. Pirker, "Game-Based Motivation: Enhancing Learning with Achievements in a Customizable Virtual Reality Environment," in *30th ACM Symposium on Virtual Reality Software and Technology*, Trier Germany: ACM, Oct. 2024, pp. 1–11. doi: [10.1145/3641825.3687741](https://doi.org/10.1145/3641825.3687741).
- [11] N. Kara, "A Mixed-Methods Study of Cultural Heritage Learning through Playing a Serious Game," *International Journal of Human-Computer Interaction*, vol. 40, no. 6, pp. 1397–1408, Mar. 2024, doi: [10.1080/10447318.2022.2125627](https://doi.org/10.1080/10447318.2022.2125627).
- [12] R. Tan, B. Jiang, S. Liu, and J. Zhang, "Game Engine Technology in Cultural Heritage Digitization Application Prospect-Taking the Digital Cave of the Mogao Caves in China as an Example," in *Virtual, Augmented and Mixed Reality*, vol. 14708, J. Y. C. Chen and G. Fragomeni, Eds., in Lecture Notes in Computer Science, vol. 14708, Cham: Springer Nature Switzerland, 2024, pp. 170–188. doi: [10.1007/978-3-031-61047-9_11](https://doi.org/10.1007/978-3-031-61047-9_11).
- [13] Y. Wang and Q. Liu, "Effects of Game-Based Teaching on Primary Students' Dance Learning: The Application of the Personal Active Choreographer," *International Journal of Game-Based Learning (IJGBL)*, vol. 10, no. 1, pp. 19–36, 2020. doi: [10.4018/IJGBL.2020010102](https://doi.org/10.4018/IJGBL.2020010102)
- [14] K. Sungkaew, P. Lungban, and S. Lamhya, "Game development software engineering: digital educational game promoting algorithmic thinking," *International Journal of Electrical and Computer Engineering (IJECE)*, vol. 12, no. 5, pp. 5393–5404, 2022. doi: [10.11591/ijece.v12i5.pp5393-5404](https://doi.org/10.11591/ijece.v12i5.pp5393-5404)
- [15] A. R. Bahtiar and M. A. Gustalika, "Penerapan Metode System Usability Scale dalam Pengujian Rancangan Mobile Apps Gamification Tari Rakyat di Indonesia," *Jurnal Media Informatika Budidarma*, vol. 6, no. 1, pp. 491–499, 2022. doi: [10.30865/mib.v6i1.3510](https://doi.org/10.30865/mib.v6i1.3510)
- [16] D. Chiotaki, V. Pouloupoulos, and K. Karpouzis, "Adaptive game-based learning in education: a systematic review," *Frontiers in Computer Science*, vol. 5, p. 1062350, 2023. doi: [10.3389/fcomp.2023.1062350](https://doi.org/10.3389/fcomp.2023.1062350)
- [17] Q. J. Adrian, "Game edukasi pembelajaran matematika untuk anak SD kelas 1 dan 2 berbasis Android," *Jurnal Teknoinfo*, vol. 13, no. 1, pp. 51–54, 2019. doi: [10.33365/jti.v13i1.159](https://doi.org/10.33365/jti.v13i1.159)
- [18] O. Okpatrioka, "Research and development (R&D) penelitian yang inovatif dalam pendidikan," *Dharma Acariya Nusantara: Jurnal Pendidikan, Bahasa dan Budaya*, vol. 1, no. 1, pp. 86–100, 2023. doi: [10.47861/jdan.v1i1.154](https://doi.org/10.47861/jdan.v1i1.154)
- [19] A. Wahyudinata and H. B. Dirgantara, "Pengembangan Gim Edukasi 2D Pemilahan Sampah Daur Ulang Berbasis Android," *MATRIK: Jurnal Manajemen, Teknik Informatika dan Rekayasa Komputer*, vol. 20, no. 1, pp. 129–138, 2020. doi: [10.30812/matrik.v20i1.860](https://doi.org/10.30812/matrik.v20i1.860)
- [20] F. Amin, M. Fhadli, A. Arief, and Y. Muin, "Dungeon Code: Educational Game For Algorithm and Data Structure Courses by Applying The Game Development Life Cycle Method," 2023, Accessed: Feb. 10, 2025.
- [21] Z. Bahadoran, P. Mirmiran, and A. Ghasemi, "Biomedical Research: The Research Problem Matters," *Addict Health*, vol. 17, p. 1542, Feb. 2025, doi: [10.34172/ahj.1542](https://doi.org/10.34172/ahj.1542).
- [22] K. S. Tekinbas and E. Zimmerman, *Rules of play: Game design fundamentals*. MIT press, 2003. Accessed: Feb. 10, 2025.
- [23] J. Enstein, V. R. Bulu, and R. L. Nahak, "Pengembangan media pembelajaran game edukasi bilangan pangkat dan akar menggunakan Genially," *Jurnal Jendela Pendidikan*, vol. 2, no. 01, pp. 101–109, 2022. doi: [10.57008/jjp.v2i01.150](https://doi.org/10.57008/jjp.v2i01.150)
-

-
- [24] F. Hachtmann, "Basic research," in *Encyclopedia of Sport Management*, P. M. Pedersen, Ed., Edward Elgar Publishing, 2024, pp. 82–83. doi: [10.4337/9781035317189.ch48](https://doi.org/10.4337/9781035317189.ch48).
- [25] T. Fullerton, *Game Design Workshop-A Playcentric Approach to Creating Innovative Games*. Elsevier, 2008.
- [26] R. A. Krisdiawan, M. F. Rohmana, and A. Permana, "Pembuatan Game Runaway From Culik Dengan Algoritma Fuzzy Mamdani," *Buffer Informatika*, vol. 6, no. 1, pp. 38–46, 2020. doi: [10.25134/nuansa.v14i1.2442](https://doi.org/10.25134/nuansa.v14i1.2442)
- [27] G. Vekinis, "Research and Development," in *Mastering Technology Transfer: From Invention to Innovation*, in *Studies on Entrepreneurship, Structural Change and Industrial Dynamics*, Cham: Springer Nature Switzerland, 2023, pp. 91–105. doi: [10.1007/978-3-031-44369-5_10](https://doi.org/10.1007/978-3-031-44369-5_10).
- [28] J. Novak, *Game development essentials: an introduction*. NOVY PUBLISHING, 2022. Accessed: Feb. 10, 2025.
- [29] R. A. Krisdiawan, "Penerapan Model Pengembangan Gamegdlc (Game Development Life Cycle) Dalam Membangun Game Platform Berbasis Mobile," *Teknokom*, vol. 2, no. 1, pp. 31–40, 2019. doi: [10.31943/teknokom.v2i1.33](https://doi.org/10.31943/teknokom.v2i1.33)
- [30] H. M. Chandler, *The game production handbook*. Jones & Bartlett Publishers, 2009. Accessed: Feb. 10, 2025.
- [31] S. Wahyu, "Penerapan Metode Game Development Life Cycle Pada Pengembangan Aplikasi Game Pembelajaran Budi Pekerti," *SKANIKA: Sistem Komputer dan Teknik Informatika*, vol. 5, no. 1, pp. 82–91, 2022. doi: [10.36080/skanika.v5i1.2904](https://doi.org/10.36080/skanika.v5i1.2904)
- [32] C. W. Totten, *Architectural Approach to Level Design*. CRC Press, 2019. doi: [10.1201/9781351116305](https://doi.org/10.1201/9781351116305)
- [33] R. Ramadiani *et al.*, "The Development of Borneo Wildlife Game Platform," *IJACSA*, vol. 12, no. 10, 2021, doi: [10.14569/IJACSA.2021.0121061](https://doi.org/10.14569/IJACSA.2021.0121061).
- [34] R. E. Sánchez, N. Zagalo, and S. C. Gómez, "Creative Process of Pre-production of Video Games: Multidisciplinary Model Approach of Historical Imaginary that Contributes to Generate Engagement," in *Interactivity and Game Creation*, vol. 367, A. Brooks, E. I. Brooks, and D. Jonathan, Eds., in *Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering*, vol. 367, Cham: Springer International Publishing, 2021, pp. 198–211. doi: [10.1007/978-3-030-73426-8_11](https://doi.org/10.1007/978-3-030-73426-8_11).
- [35] A. Vickro, N. Safaat H, M. Irsyad, and P. Pizaini, "Perancangan Storyboard Pada Game Edukasi Kerajaan Siak Sri Indrapura dengan Genre RPG Menggunakan Metode Balanced design," *Jurnal Pendidikan dan Teknologi Indonesia*, vol. 3, no. 1, pp. 13–24, Jan. 2023, doi: [10.52436/1.jpti.266](https://doi.org/10.52436/1.jpti.266).
- [36] V. Wattanasoontorn, M. Theppaitoon, and A. Bernik, "A Classification of Visual Style for 3D Games," in *2019 23rd International Computer Science and Engineering Conference (ICSEC)*, Phuket, Thailand: IEEE, Oct. 2019, pp. 12–17. doi: [10.1109/ICSEC47112.2019.8974729](https://doi.org/10.1109/ICSEC47112.2019.8974729).
- [37] D. P. Kristiadi, F. Sudarto, D. Sugiarto, R. Sambera, H. L. H. S. Warnars, and K. Hashimoto, "Game Development with Scrum methodology," in *2019 International Congress on Applied Information Technology (AIT)*, Yogyakarta, Indonesia: IEEE, Nov. 2019, pp. 1–6. doi: [10.1109/AIT49014.2019.9144963](https://doi.org/10.1109/AIT49014.2019.9144963).
- [38] R. Coppola, T. Fulcini, S. Manzi, and F. Strada, "How to Measure Game Testing: a Survey of Coverage Metrics," in *Proceedings of the ACM/IEEE 8th International Workshop on Games and Software Engineering*, Lisbon Portugal: ACM, Apr. 2024, pp. 15–19. doi: [10.1145/3643658.3643920](https://doi.org/10.1145/3643658.3643920).
- [39] M. L. Ohlms and K. G. Melchers, "Are Games Always Fun and Fair? A Comparison of Reactions to Different Game-Based Assessments," *Int J Selection Assessment*, vol. 33, no. 1, p. e12520, Feb. 2025, doi: [10.1111/ijsa.12520](https://doi.org/10.1111/ijsa.12520).