GAME-BASED LEARNING ON GAMELAN MUSICAL INSTRUMENT

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ABSTRACT

Gamelan is a local art form primarily linked to the Hindu-Buddhist civilization that ruled early Indonesia. In 1811, it was transported from Riau-Lingga to Malay culture through a Royal marriage. Since then, it has been played by locals for ages. However, analysis in this study shows the absence of more engaging learning tools for traditional instruments like Gamelan. Therefore, this study initiates a project to develop Game-Based Learning (GBL) applications on Gamelan musical instruments for young children. The main objective of this project is to design and develop the GBL application of Gamelan musical instruments and to evaluate the User Experience (UX) of the application. This objective is aligned with the purpose of this project which is to transfer knowledge about Gamelan instruments to the younger generations more engagingly and enjoyably. Engagement and enjoyment factors are covered in the UX evaluation. Development Lifecycle (GDLC) is adopted as a development methodology for this project to ensure a systematic process in this work. UX questionnaire is used as a data collection strategy to gain feedback from respondents. This study's efforts to create an interactive learning platform for Gamelan have yielded promising results, with positive user feedback. The mean score for positive UX is 88.68% indicating that most of the respondents are engaged and enjoy the application. Unifying innovative approaches such as GBL to traditional cultural heritage potentially facilitates the preservation of our nation's art. The uniqueness of the culture must be preserved and shown in future generations so that it is not swallowed by time.

Keywords: *Gamelan, Game-Based Learning (GBL), Engagement, Enjoyment, Traditional Musical Instruments, User Experience, Cultural Heritage.*

Introduction

Gamelan is a local art form primarily linked to the Hindu-Buddhist civilization that ruled early Indonesia. In 1811, it was transported from Riau-Lingga to Malay culture through a Royal marriage. The distinctive Gamelan tunes that may still be heard today are a direct, nearly pure descendant of the perished Majapahit period's music (Harnish, 2021). Even while Gamelan's instruments and distinctive identity have persisted to this day, the music has changed and diversified into other genres. A variety of compositions, variations, and new musical elements have been incorporated into the genre by successive generations of performers. On the other hand, the most significant characteristic of Asian music is the use of pentatonic scale and gong chimes, also used in Western music along with other instruments. This describes the relationship between Asian and Western music (Batubara, 2017). This heritage is beautiful and should be preserved for the young generation.

Lack of documentation on traditional musical instruments contributes to the factors of being forgotten by the new generation nowadays (Raja Zulkarnain, 2017). We took this as a point of departure to come up with the idea of documenting Gamelan through our way – by using technology. To be precise, we developed an application that can be played, especially by the younger generation, which is a GBL on Gamelan. Technology allows for extremely quick information transmission. Regardless of age, individuals appear to be dependent on technology for many aspects of everyday life, including employment, entertainment, business, learning settings, and even household duties. Little ones are included in this. At a young age, they have cell phones at their disposal. According to Auxier et al., over one- third of parents with children under 12 report that their kids started using smartphones before they turned five. In short, the goal of this project is to use the advantages of technology to create a Game-Based Learning application that will educate youngsters about Gamelan musical instruments.

Problem Statement

The two main application gallery which is the Apple app and Google Play are used to search for the keyword Gamelan Game, Gamelan Musical Instrument, and Indonesia Gamelan. Table 1 is the output of the analysis to identify a lack of GBL applications on Gamelan especially for children. Search results indicate that GBL on Gamelan is not present in the list.

Table 1 Results of Information Retrieval Traditional Musical Instrument Game.

No.	Store	Keyword	Hit	Result/Name of Game
1.	Apple Store	Gamelan Game	1	Baliphone
		Gamelan musical instrument	2	Gamelan saron Gamelan saron xylophone
2.	Google Play Store	Gamelan Game	9	E-Gamelan Gamelan Jv

			Gamelanku Gamelan Bali Degung Gong Kebyar Bali Gamelan Gender Lite Kendang Jaranan Pro Asli Keylimba
	Gamelan Musical Instrument	0	None

Based on the hit obtained, none of the applications that introduce young children detail information about Gamelan musical instruments. Based on the result and the premise of the lack of GBL on Gamelan for children, there is a significant need to build one.

Objective

The absence of GBL in Gamelan as discussed in the previous subsection in (Problem Statement) resulted from three main proposed objectives to tackle the issue. To establish a GBL of Gamelan, our team needs to design the structure of the game based on the methodological function. The design includes the establishment of a storyboard, flowchart of the game, and character development. The application is then evaluated using a User Experience Questionnaire (UEX) - discussed further in the research method, to collect information regarding User Experience (UX). The objectives are listed below.

1. To design a GBL application that introduces young children to traditional musical instruments in gamelan.
2. To develop a GBL application of traditional musical instruments in gamelan.
3. To evaluate the UX of the application in providing information about traditional musicals in gamelan to young children.

Research Methodology

The development of GBL is based on the Game Development Lifecycle (GDLC) methodology due to the working plan, dispute resolution, budget management, and other key advantages of this approach make it desirable. Although each phase can seem autonomous, they are all closely related. Additionally, it is closely related to a precise, first-rate layout, clear and vivid learning objectives, carefully structured evaluation, and evaluation that is closely related to the desired outcomes.

The GDLC methodology's structure essentially consists of six steps. Initiation, Pre-production, Main Production, Testing, Beta Version, and Release are the steps involved. However, the Beta and Release stages are not employed in this project; only the Testing phase is used to establish the project's conclusion.

(i) Initiation

Initiation is the first step in the GDLC methodology. The initial phase involves developing an idea for the type of game that will be built. The outcome of initiation is the game's premise and a brief description of the game. The goal of this project is to introduce young children to the Basic Gamelan Musical Instrument. Students in primary schools are the intended audience for this initiative (7 to 12 years old).

(ii) Pre-Production

The foundation for the whole project is established at this essential phase, and significant decisions are made. Before entering the full production process, pre-production includes planning, idea creation, and assembling essential resources. This stage establishes the game's vision and direction, ensuring that production proceeds quickly and effectively.

(iii) Main Production

In this stage, the application must be developed using the ideas and content concepts that were already established during the pre-production phase. Software requirements have a role in the design and development of the game. The game world will next be created and constructed using Construct 3. It has a user-friendly interface and a wide range of features, which makes it a great choice for game design. Additionally, Canva will be used to alter the animation for the project. Canva has a library with a variety of backgrounds, layouts, pictures, and fonts that provide users the freedom to get the best results. Next, ibisPaint X, a popular and functional drawing program, and Canva will be used to create the 2D characters and settings.

(iv) Testing

When an application reaches this level, it has finished developing. Construct 3 will be used to export the program, and Windows has been selected as the platform. The application will be put to the test to see if the project's goals have been met. To ascertain whether any issues occur while the program is utilized, testing is essential. If a tester discovers a fault, gap, or game that abruptly ends while playtesting, it will be noted. As part of the test scenario, users are requested to play games on laptops and provide feedback on the different components of the game, including gameplay, storyline, and control.

(v) Beta Version

In the beta testing phase, outside or impartial testers are used. Because the relevant prototypes in beta testing involve both formal details and revisions, the same testing methodologies as the previous testing strategy will continue to be used. The elementary school students that will participate in the beta testing of the gaming project range in age from seven to twelve. For this study, the sample size is 30 pupils. The tester's understanding of what a Gamelan musical instrument is is put to the test by having them play the game.

(vi) Release

The game is in its last stages of creation and is prepared for public release, but it will probably need additional work shortly. This project is still under beta testing and is not yet ready for general release.

Project Outcome

GBL on Gamelan is the outcome of the project. The following diagrams briefly explain the scene.

i) Scene 1: Main Menu. On this page, there is one button: play. When the player clicks the play button, it will be directed to the lobby game.

Figure 1: Main menu pa

ii) Scene 2: Lobby Game. In this interface, there are four level buttons that the player needs to complete. Each level button consists of different types of games.

Figure 2: Lobby game page

iii) Level 1: Class Scene. Once the player clicks the Level 1 button in the lobby game, they will be taken directly to the class scene. This level starts with a class scene involving a teacher and her students. This scene introduces the player to the information of the Gamelan musical instrument.

Figure.3: Class scene page

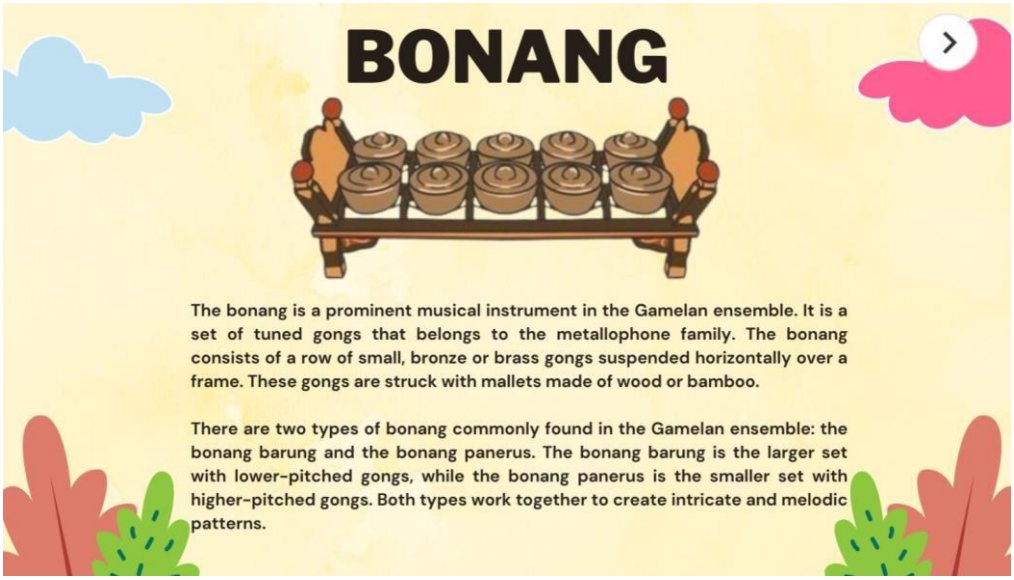

Figure 4: Gamelan instrument information page

iv) Level 1: Match Game. After the scene ends, it will be directed to the level 1 game which is a match game. In this game, the player needs to drag the box that is allocated on the left side and drop it into the empty column with the correct answer based on the picture. For this level, there are three stages to be done before playing the game in level 2.

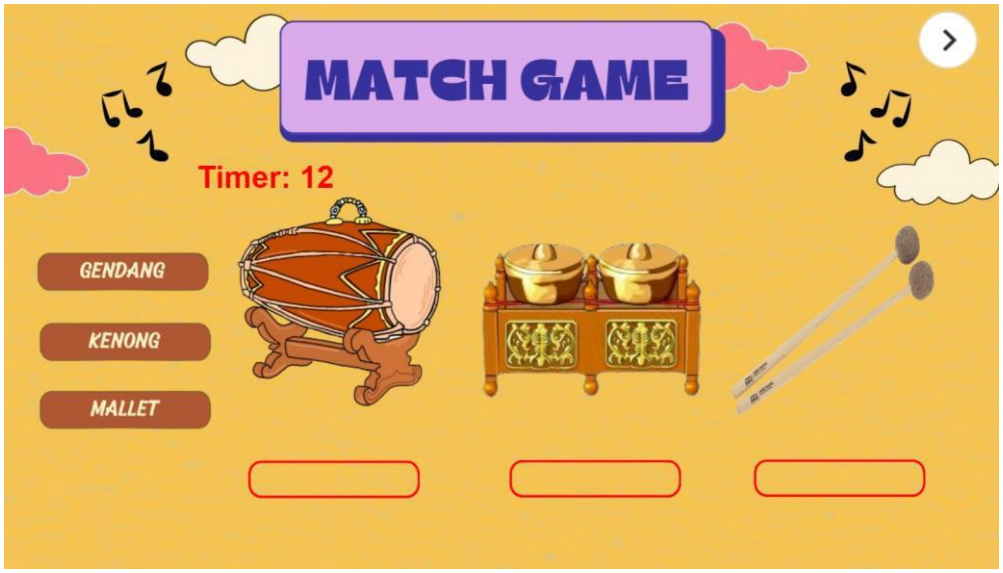

Figure 5: Level 1 Match game page

v) Level 2: Drag & Drop Game. For level 2, the game that will be displayed is drag & drop game. In this game, the player needs to arrange the alphabet to the correct word based on the picture given on the left side. For this level, there are three stages to be done before playing the game in level 3.

Figure 6: Level 2 Drag & Drop game page

vi) Level 3: Memory Card Match. For level 3, the game that will be displayed is a memory card game. In this game, the player needs to find the same partner of the Gamelan musical instrument's image. For this level, there are three stages to be done before playing the game in level 4.

Figure 7: Level 3 Memory card game page

vii) Level 4: Quiz. For level 4, there is a quiz about history, musical instruments, and tools that are used in Gamelan. There are five different questions regarding Gamelan to be done by the player to finish the game.

Figure 8: Level 4 Quiz game

Findings

User experience (UX) evaluated by using UEQ. A total of 30 respondents participated in the experience testing for this project. Participants were aged 8 to 12 years old, and a survey was conducted using Google Forms. Results were divided into demographic and experiential findings.

Table 2 showcases the results of the respondent's demographic data. Most of the participants were female with a total of 17 (56.7%) and the rest were male with a total of 13 (43.3%). The majority were aged 10 years old (40.0%). Most of the responses came from students in grades four, three, and two.

Table 2 Respondent's Demography

Question	Range	Frequency (n)	Percentage (%)
Gender	Male	13	43.3
	Female	17	56.7
Age	7	3	10
	8	8	6.7
	9	9	16.7
	10	10	40
	11	3	10
	12	5	16.7

The User Experience Questionnaire (UEQ) was employed in the experiment to evaluate how well a gaming application conveyed information about the Gamelan musical instrument. The questionnaire consisted of ten items describing user experience with 30 responses. The results were presented as tabular data, with the value of each result based on its standard score grading. The efficiency of the application in offering a user experience of a gaming application in giving information was evaluated using the questionnaire.

Table 3 User Experience Questionnaire

Code	Factor	Questions
E1	Learning Motivation	This application can increase knowledge about Gamelan musical instruments.
E2	Learning Motivation	I got to know Gamelan musical instruments and modern musical instruments after playing
E3	Enjoyment	Have you enjoyed playing this game?
E4	Enjoyment	Would you suggest this game to a friend?
E5	Immersion	I really get into the game.
E6	UX	This game was well-designed.
E7	Usability	The game's interface's parts are simple to recognize and Provide examples of the functions they carry out, for
E8	Immersion	I lost track of time while playing this game.
E9	UX	This application is quite creative.
E10	Usability	The instruction in the application is very clear and easy to understand.

The findings of the evaluation survey for the application reveal how the participants perceived their experience while playing the game in terms of learning motivation, enjoyment, immersion, learning UX, and usability. The goal of this assessment was to determine whether the application gave users adequate experience using the UEQ by Álvarez- Xochihua (2017). Each question requires respondents to rate their experience on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree).

E1 shows that 53.3% the number of the 16 respondents chose to agree with the question. This application can increase knowledge about Gamelan musical instruments while 46.7% of respondents strongly agree. Next, for E2 a number of 15 respondents, which carried 50% agreed that they know Gamelan musical instruments and modern musical instruments after playing this game while others with a percentage 46.7% chose strongly to agree and 3.3% chose neutral. Other than that, 46.7% of respondents chose to agree with the statement E3 which is whether they enjoy it or not the game. 40% of respondents strongly agree and 13.3% chose neutral with the statement.

For E4, there were a total of 22 respondents which carries 73.3% chose agreed with the statement to suggest this game to friends and the rest chose strongly agreed with the percentage of 26.7%. Next, for E5 a total of 46.7% chose to agree with the statement get into the games. While the rest of the respondents with a percentage 36.7% chose strongly to agree and 16.7% chose neutral. E6 sections gained 63.3% with a total of 19 respondents agreeing with the statement the game is well-designed, 33.3% chose strongly to agree and 3.33% chose neutral.

53.3% of respondents strongly agree that the game's interface's parts are simple to recognize and provide examples of the functions they carry out (e.g.: buttons, images,

animation), while 46.7% of respondents agree with the statement of E7. Next, a total of 53.3% of respondents chose to agree with the statement in E8 which is I lose track of time while playing this game.

The remaining 46.7% strongly agree with it. As for E9, 60% of respondents agree that the game is quite creative, followed by 36.7% strongly agree and 3.3% chose neutral. Lastly, for code E10, a total of 53.3% of respondents agree with the statement that the instruction in the

application is very clear and easy to understand and the rest strongly agree. Table 4 below show the mean score and frequency for the UEQ.

Table 4 Mean score and frequency for UEQ

Code	SD	D	N	A	SA	Mean
E1	0	0	0	16	14	4.67
E2	0	0	1	15	14	4.43
E3	0	0	4	14	12	4.27
E4	0	0	0	22	8	4.27
E5	0	0	5	14	11	4.20
E6	0	0	1	19	10	4.30
E7	0	0	0	14	16	4.53
E8	0	0	0	16	14	4.67
E9	0	0	1	18	11	4.33
E10	0	0	0	16	14	4.67
TOTAL MEAN						4.43

There is a unique set of values for each criterion that was obtained from the Google Form results. The overall average for this measure of game participation reveals how agreeable each feature is. Scores for the engagement survey range from 1 to 5, with 1 denoting "Strongly Disagree," 2 denoting "Disagree," 3 denoting "Neutral, "4 denoting "Agree," and 5 denoting "Strongly Agree." Table 5 displays the total overall mean for the user experience questionnaire survey.

Table 5 Total Overall Mean

Experience Category	Total Mean Average
Learning Motivation	4.55
Enjoyme	4.67
Immersio	4.43
User Experience (UX)	4.32
Usabilit	4.60
Overall Mean	**4.43**
Percentage (%)	**88.6**

The study's findings illustrate how well the application is for kids. After the gaming experiment was finished, users were given the User Experience Questionnaire; this covered both responders and players.

CONCLUSION

This application is intended to design a Two-Dimensional (2D) GBL application that introduces young children to traditional musical instruments in Gamelan and evaluates the user experience in providing information about traditional musical instruments in Gamelan via Game-Based Learning. A 2-D GBL on a Gamelan musical instrument was intended to introduce players to the instrument by providing information in a visually appealing manner. Aside from that, the game's development goal was to expose the primary school children to Gamelan musical instruments as a part of the national heritage. The applications used to develop this application are Construct 3, Canva, and ibis Paint X. By using these applications, it is inexperiencedly challenging. On the other side, the developer might manage the issue up until the work is complete while maintaining a positive user experience.

Conflicts Of Interest

The manuscript has not been published elsewhere and is not under consideration by other journals. All authors have approved the review, agree with its submission and declare no conflict of interest on the manuscript.

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