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RESEARCH ARTICLE

Development Of An Educational Game For Introducing Indonesian Traditional Musical Instruments Using Construct 2 At Sdn Patra Manggala 2, Tangerang Regency

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Abstract: The rapid development of information technology can be utilized as an engaging and interactive learning medium, especially for elementary school students. One effective way to introduce Indonesian culture from an early age is through digital media that presents traditional musical instruments. This study aims to develop an educational game using Construct 2 as an interactive learning medium to introduce various types of Indonesian traditional musical instruments to fourth-grade students at SDN Patra Manggala 2, Tangerang Regency. The research method used is Research and Development (R&D) with the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). The analysis stage is conducted to identify the needs of students and teachers, while the design and development stages are used to design and build the educational game. Subsequently, the implementation and evaluation stages are carried out to test the feasibility and effectiveness of the game in the learning process. The test results show that the developed game is rated as "highly feasible" based on validation from media and content experts, and received positive responses from both students and teachers. This game not only provides knowledge about traditional musical instruments but also enhances students' learning motivation through enjoyable visual, audio, and interactive approaches. Therefore, this Construct 2-based educational game can serve as an effective and engaging alternative learning medium to introduce Indonesian culture to elementary school students.

Keywords: Educational Game, Traditional Musical Instruments, Construct 2, Learning Media, SDN Patra Manggala 2

1. Introduction

Indonesia is a country rich in culture and traditional arts. One of the manifestations of this cultural wealth is traditional musical instruments found across various regions, such as the angklung from West Java, gamelan from Java and Bali, sasando from East Nusa Tenggara, and



tifa from Papua. These traditional instruments are not only a part of the nation's cultural heritage but also hold educational value that is essential to be introduced to younger generations from an early age, so they develop a sense of love and concern for local culture [1].

However, amidst the wave of globalization and the rapid advancement of technology, young people's attention to local culture is increasingly fading. Children tend to be more familiar with foreign cultures, including modern music and digital games from abroad, than with their own Indonesian culture. This condition presents a challenge for the education sector in instilling cultural values in students. The lack of knowledge about traditional musical instruments among students is caused by the absence of interactive and engaging learning media, as well as limited time for teachers to comprehensively deliver cultural content [2].

As a solution to this issue, the integration of technology into education has become a pressing necessity. One effective approach is the development of educational game-based learning media. Educational games can increase students' interest in learning by combining entertainment and educational elements into a single platform. The use of game-based media in learning significantly enhances students' understanding and motivation. A game built with Construct 2, for instance, allows developers to create interactive gameplay with appealing visuals and a simple yet educational storyline [3].

At the elementary school level in particular, a fun and interactive learning approach is essential. According to Jean Piaget's theory, children in this age group are in the concrete operational stage of cognitive development, where they tend to understand concepts and learning materials through direct experience and visualization. Therefore, delivering content about traditional musical instruments through interactive game-based media is considered more effective than conventional lecture methods [4].

SDN Patra Manggala 2, as the research site, is one of the elementary schools in Tangerang Regency that shows enthusiasm in integrating technology into the learning process. However, based on preliminary observations, the school does not yet have dedicated learning media to introduce traditional musical instruments in depth. Teachers at this school still rely on textbooks and oral explanations, which are perceived as less effective in capturing students' attention.

Based on these issues, an innovative learning solution is needed in the form of an educational game that introduces traditional musical instruments using Construct 2. This educational game is expected to serve as an effective alternative to improve students' understanding of Indonesian traditional musical instruments while also strengthening their appreciation for local cultural values.

2. Literature Review

2.1. Elementary School Students

Elementary school students are children at the initial stage of formal education, generally aged between 6 and 12 years old. This age range represents a critical phase in cognitive, social, and emotional development. At this stage, children begin transitioning from a play-oriented environment to a more structured learning setting. They are in the concrete operational stage of cognitive development, where they are able to think logically about tangible objects, although they have not yet fully developed the ability to comprehend abstract concepts deeply [5].

This period is also known as middle childhood, during which children begin to develop social skills, build self-confidence, and learn to adapt to broader social environments, such as school and peer groups. Children at this age also start to appreciate rules and understand the value of cooperation within a group [6].

According to Erik Erikson's psychosocial development theory, children aged 6–12 are in the “industry versus inferiority” stage. At this point, they seek opportunities to experience success in various learning activities. When supported and recognized by their environment, their self-confidence tends to flourish. Conversely, frequent failures without sufficient guidance may lead to feelings of inferiority or inadequacy [7].

2.2. Learning Media

Learning media refers to anything that can be used to deliver messages and stimulate students' thoughts, emotions, attention, and abilities to encourage the learning process. This includes various forms such as visual aids, audio, audiovisual tools, and interactive multimedia, all aimed at facilitating students' comprehension of lesson material [8].

Learning media act as intermediaries that help teachers deliver educational information effectively to students. They serve as a bridge between educators and learners in transferring knowledge, making the learning process more engaging, efficient, and meaningful [9].

Learning media is defined as anything that can stimulate students' minds, emotions, attention, and abilities during the teaching-learning process. It is not limited to technological tools but also includes non-technological resources such as pictures, diagrams, and real-life objects [10].

Furthermore, learning media serve as teaching aids used to clarify messages, enhance students' learning motivation, and overcome limitations of time and space. When used appropriately, learning media can significantly improve the effectiveness of the learning process [11].

2.3. Musical Instruments

A musical instrument is an object created or modified to produce sound and is used in musical activities. In the context of Indonesian culture, musical instruments are not only entertainment tools but also carry profound historical, social, and spiritual values. Traditional musical instruments are widespread across Indonesian regions, each with distinct characteristics, forms, and sounds—such as the angklung from West Java, gamelan from Java and Bali, tifa from Papua, and sasando from East Nusa Tenggara [12].

Traditional musical instruments play a significant role in strengthening local cultural identity, fostering social cohesion, and accompanying various traditional ceremonies and community events. Therefore, preserving traditional musical instruments is essential, especially in today's globalized era where popular culture and modern music dominate [13].

2.4. Construct 2-Based Educational Applications for Musical Instruments

Educational applications developed using Construct 2 serve as an effective interactive learning medium to introduce traditional musical instruments to elementary school students. Construct 2 is a 2D game engine that allows users to create educational applications without writing complex code. Its drag-and-drop features, intuitive visual interface, and support for animation and audio make it a practical tool for building game-based learning media.

In the context of traditional musical instrument education, Construct 2-based applications can be designed to display instrument images, play authentic sounds, and provide information on the instrument's origin and cultural function. For example, students can click on an image of the angklung to hear its sound and simultaneously read a brief description of its history and usage. This approach enables students not only to read the material but also to see, hear, and directly interact with the learning media.

The use of Construct 2-based applications in cultural arts education can significantly enhance students' motivation and learning outcomes. This method is more engaging than conventional approaches, encouraging students to be more active and curious in exploring the application, thereby making the learning process more meaningful [14].

3. Research Method and Materials

3.1. Type and Approach of Research

This research is categorized as applied research with a developmental (R&D) approach. The purpose of this study is to develop a multimedia-based interactive application using Construct 2. The approach used focuses on system design, implementation, and testing using the MDLC (Multimedia Development Life Cycle) method to produce a practical and applicable digital product.

3.2. User Analysis

The primary users of this application are elementary school students aged between 6 and 12 years. At this age range, children are still in the early stages of understanding basic concepts of musical instruments. Therefore, a learning medium is needed that can capture their attention, is easy to understand, and provides an enjoyable learning experience.

The main needs of students in this age group include visual and interactive learning media. Children are generally more interested in engaging images, bright colors, pleasant sounds, and game-like activities. In addition, the application must be designed with a simple and intuitive interface so that it can be used easily without intensive guidance from adults.

Aside from students' needs, teachers and parents also expect the application to serve as an effective tool in the learning process. Therefore, beyond its entertainment aspects, the application must also offer clear educational value—such as a comprehensive and enjoyable introduction to various traditional musical instruments.

3.3. Requirements Formulation and Solutions

In the development process of the educational game introducing traditional musical instruments using Construct 2, it is crucial to formulate the requirements that must be fulfilled so the application can function optimally and support learning objectives. These needs are divided into functional and non-functional aspects that serve as the foundation for designing and building the game.

(1). Functional Requirements

- (a). The game must display various types of traditional Indonesian musical instruments, along with their images and authentic sounds.
- (b). It must include interactive features such as quizzes or games that test students' understanding of traditional instruments.
- (c). The game interface must be designed to be child-friendly, visually appealing, and suitable for elementary students.
- (d). The application should run smoothly on standard computers or laptops typically available in schools.
- (e). The game must provide immediate feedback to users as part of the learning evaluation.

(2). Non-Functional Requirements

- (a). The application must perform quickly and stably without lags or crashes.
- (b). The visual and audio elements must be attractive and reflect Indonesian cultural nuances.

- (c). All content in the game must be safe and age-appropriate for children.
- (d). The game file size should be lightweight to allow easy download, installation, and operation on school devices.

(3). Solutions to Identified Needs

To accommodate these requirements, several solutions are implemented, including:

- (a). Utilizing Construct 2 as the development platform, which supports the creation of interactive games with drag-and-drop features and simple scripting.
- (b). Incorporating high-quality, authentic images and sounds of traditional musical instruments to provide an engaging and genuine learning experience.
- (c). Designing a colorful, straightforward user interface with easily recognizable icons and navigation suited for young learners.
- (d). Conducting performance tests on devices available at SDN Patra Manggala 2 to ensure the game runs smoothly and is compatible with school infrastructure.
- (e). Providing evaluation features such as interactive quizzes that give immediate feedback to help users assess their understanding of the material learned.

4. Results and Discussion

4.1. Software Specifications

Table 2. Software Specifications

No	Software Name	Function
1	Construct 2	Main tool for building and structuring
2	Adobe Photoshop	Editing and optimizing visual content
3	Audacity	Editing and processing voice narration
4	Web Browsers (Chrome, Edge)	Preview and testing of the web-based virtual tour
5	VLC Media Player	Multimedia compatibility testing
6	FileZilla	Uploading project files to the university's hosting server

4.2. System Specifications

The development and rendering process for the virtual tour application was carried out on a system with the following specifications:

Table 3. System Specifications

Component	System Name	Function
Processor	Intel Core i5 or equivalent	Intel Core i7-11700H
RAM	8 GB	16 GB DDR4
Storage	256 GB SSD	512 GB SSD
VGA/GPU	NVIDIA GTX 1050 or equivalent	NVIDIA RTX 3060
Operating System	Windows 10 or macOS High Sierra	Windows 11 Pro
Monitor Resolution	Minimum 1366×768	1920×1080 Full HD

4.3. Application Usage Guide

User Interface (UI) Design

User Interface (UI) design is a stage in designing the visual appearance and interactions within an application. The main objective is to create an interface that is user-friendly, visually appealing, and easy for users to understand. The general stages in the UI design process, especially for an educational application introducing traditional musical instruments, can be described as follows according to the flow in the previous flowchart:



Figure 3. Menu UI

The image above shows that there are several buttons, including exit, materials, quiz, and profile. The next section is the Materials UI:



Figure 4. Materials UI

The image above shows that there are several buttons, including back and next, and there is a panel to display the material that will be discussed in the application. The next section is the Quiz UI:

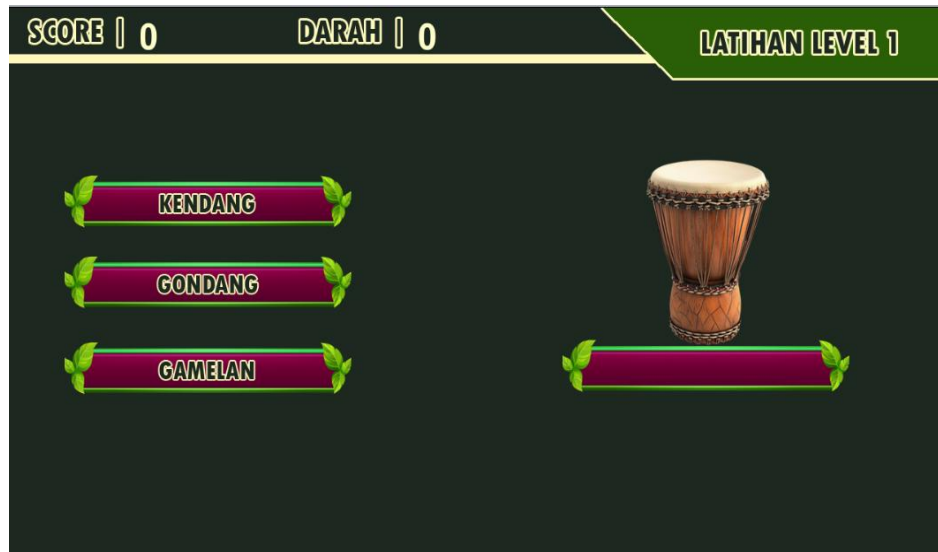


Figure 5. Quiz UI

The image above shows that there are several buttons, including drag and drop answers, and displays for score and health.

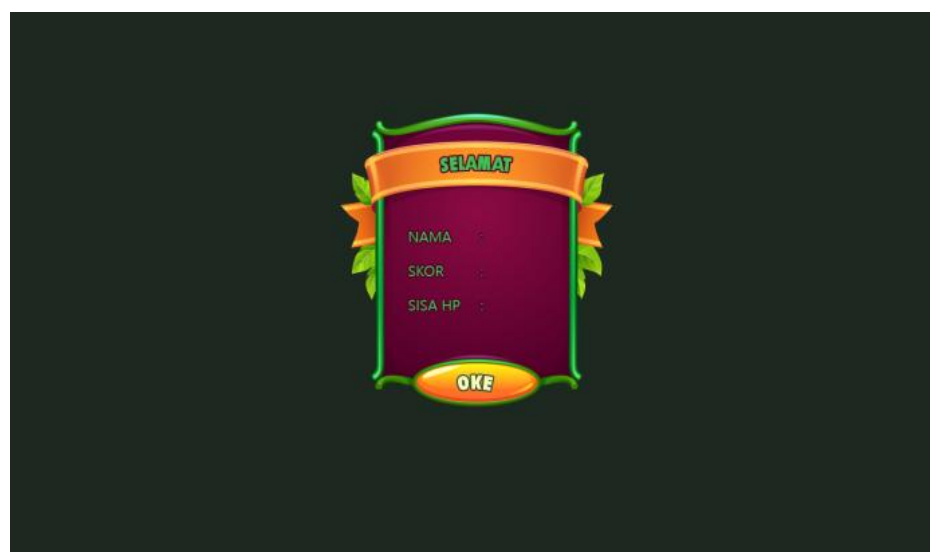


Figure 6. Score UI

The image above shows that there are several buttons, including return to menu, and there is a panel to display the quiz score answered by the user. The next section is the Profile UI:



Figure 7. Profile UI

The image above shows that there are several buttons, including return to menu, and there is a panel to display the developer's profile.

4.4. Black Box Testing

Black box testing is conducted by running the application with the intention of identifying errors and verifying whether the system functions properly as intended. The following table presents the black box testing results for the main menu of the game:

Table 4. Black Box Testing

No	Component Tested	Testing Scenario	Expected Result	Test Result
1	Close Icon	Select the Close icon provided in the main menu	Exit the application	Success
2	Music Icon (Mute/Unmute)	Select the On/Off icon in the main menu	Turn background music on and off	Success
3	Material Button	Select the Material button in the main menu	Enter the learning material section	Success
4	Quiz Button	Select the Quiz button in the main menu	Navigate to the Quiz menu	Success
5	Profile Button	Select the Profile button in the main menu	Navigate to the developer profile page	Success
6	Instruction Button	Select the Instruction button in the main menu	Navigate to the Application Usage Instructions page	Success
7	Next Button	Select the Next button in the main menu	Proceed to the next slide	Success

5. Conclusion

Based on the results of the research and the development process of the Construct 2-based educational application for introducing fruits to first-grade students at SDN Kaligantu, several conclusions can be drawn as follows:

- (1). The developed educational application has proven effective in helping students recognize various types of fruits in an interactive and enjoyable way.

- (2). The use of Construct 2 as a development platform has demonstrated its effectiveness in creating applications that are visually appealing, easy to operate, and interactive for elementary school-aged children.
- (3). This application contributes to increasing students' learning interest, as the material is delivered through games and engaging audio-visual media.
- (4). The application received positive responses from both teachers and students due to its simplicity and relevance to the learning needs of first-grade students.

Based on the discussion and conclusions described earlier, the author offers the following suggestions:

- (1). This application can be further developed by adding an evaluation feature in the form of a quiz at the end of the learning session to measure students' understanding of the delivered material.
- (2). Teachers are encouraged to use this application as a supplementary learning medium to make the learning process more engaging and varied.
- (3). Schools are advised to consider the broader implementation of digital learning media like this across various subjects, in line with technological advancements in the field of education.
- (4). Future researchers are encouraged to conduct a quantitative evaluation of the application's effectiveness by comparing students' learning outcomes before and after using the application.

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