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# Interactive Educational Game for Cognitive and Language Development of Early Childhood Based on Android Using Construct 3

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## Abstract

This study focuses on the development of an interactive learning application based on Android for early childhood at ST. Ignatius Kindergarten in Medan. Early childhood, known as the golden age, is a crucial period for children's cognitive and language development. However, conventional teaching methods often make children passive and less engaged, which results in low reading skills. Therefore, this research aims to design and implement an application that can attract children's interest in learning through an educational game approach. In this study, the author uses Construct 3 as a tool for developing the application and applies the Black Box Testing method for system testing. Data collection methods include observation, interviews, and literature review. It is hoped that this application will not only improve children's reading skills but also enhance their involvement in the learning process. The results of this research are expected to provide insights into the effectiveness of using technology in early childhood education and contribute to the development of more innovative and engaging teaching methods.

### Keywords

Early Childhood, Android, Construct 3, Interactive Learning, Blackbox Testing

## Introduction

Early childhood is the most important period as it is known as the golden age (Dini, 2022). The Golden Age is the golden period in every human's life because during this time, children can learn new things quickly (Juniaris and Wijayaningsih, 2022). According to experts, early childhood is considered the "golden age." During this period, children develop rapidly and extraordinarily. This is called the golden era, where brain cells grow quickly from birth, forming connections between them. This approach can shape and determine experiences that will last a lifetime (Saleh, 2022). The golden age of a child is the time when the child has great potential, which is very beneficial to develop (Yusnita, Muqowim, and others, 2020).

Early childhood, in addition to being known as the golden age, is also recognized as a very critical period (critical period) and a window of opportunity in a child's development (Islamiyati, 2018). Children have special characteristics; they seem to never stop exploring and learning, especially when it comes to new things, and they are never passive like adults (Fauziddin and Mufarizuddin, 2018).

According to Law No. 20 of 2003 on the National Education System, article 1, paragraph 14 states that "early childhood education is an effort to guide children from birth to six years old through educational stimulation to help their physical and spiritual growth and development, so they are prepared to enter further education." Early Childhood Education (PAUD) is the educational level before Primary Education, an effort directed at children from birth to six years old through the provision of educational stimulation to help their physical and spiritual growth and development, so they are prepared to enter further education, which is carried out in formal, non-formal, and informal pathways (Delfia and Nurhafizah, 2019). From the opinions above, it can be concluded that PAUD is a form of educational service provided to children from birth to six years old by offering stimulation to all aspects of the child's development, including physical and non-physical aspects. Essentially, early childhood, whether in TPA educational units, Playgroups, or preschools (TK), is in a developmental process.

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# Methodology

The research methodology applied in this study includes the following steps, forming a systematic framework that guides the process of developing an Android-based Interactive Learning Application to meet the needs of preschool children at St. Ignatius Kindergarten.

1. **Identification and Initial Data Collection**
   a. Context Description: Identifying the needs and characteristics of early childhood education at St. Ignatius Kindergarten.
   b. Initial Observation: Conducting field observations to directly understand the learning process and the challenges faced by the children and teachers..
2. **Literature Study Literature Analysis**
   Researching literature related to early childhood education, interactive learning applications, and multimedia development..
3. **Interactive Learning Application Design Application Concept Design**
   Designing the concept of the application based on the results of the literature study and the characteristics of the children at St. Ignatius Kindergarten.
4. **Application Development** a. **Platform Selection**
   a. Choosing Android as the primary platform for application development
   b. Using Construct 3: Using Construct 3 for the development of animations, interactive games, and application functions
5. **Implementation and Testing**
   a. Black Box Testing: Conducting initial testing using the black box method to evaluate the overall functionality of the application.
   b. Pilot Testing at St. Ignatius Kindergarten: Implementing the application on a small scale at the Kindergarten to gather feedback from direct users.
   c. Follow-up Interviews and Observations: Conducting in-depth interviews and observations to evaluate user responses to the application.
6. **Final Evaluation**

Full-Scale Testing: Conducting a comprehensive trial of the application at St. Ignatius Kindergarten to assess its effectiveness and sustainability in real-world conditions.

# Findings

This study aims to design an Android-based interactive educational game application specifically intended for Kindergartens. The application is designed to support the learning process by providing engaging and interactive content for both teachers and children. In the development process, Construct 3 is used as the tool for creating 2D animations. System analysis is carried out by researching the context of the issues in the Kindergarten through interviews with teachers and administrators to understand the learning objectives, material needs, and features expected in the application. The results of this analysis serve as the foundation for designing a system that meets the users' needs, involving both teachers and children in testing and evaluation for refinement before implementation. This application is expected to enhance interactivity, appeal, and the effectiveness of the learning process in the Kindergarten, while also helping teachers deliver content in a creative and enjoyable manner.

**1. Problem Analysis**

a. Limitations in Preparing Learning Materials Teachers at Kindergartens struggle with creating engaging learning themes that meet the Merdeka curriculum standards due to limited experience in designing multimedia content and time constraints for preparation.
b. Lack of Interactive Educational Applications There is no available application for classroom use that supports multimedia-based learning on Android, tablets, or laptops, limiting the use of technology for interactive learning.
c. Children’s Preference for Creative Learning Children prefer varied, creative, and engaging learning methods. Monotonous lessons lead to boredom and loss of interest, making it crucial to design fun and interactive content.
d. Challenges in Delivering Basic Materials Kindergarten children need simple, engaging content to maintain their interest in learning. This calls for more interactive and creative approaches.
e. Need for an Engaging Learning Application There is a need for an application that delivers engaging learning materials and quizzes, both in the classroom and at home, to help children stay engaged and interact more deeply with the content.

**2. Design Analysis**

The design analysis in this study aims to develop an Android-based interactive educational game application specifically designed to support the learning process in Kindergartens using the Merdeka Belajar method. The application is designed to be engaging and interactive by providing learning materials aligned with the curriculum, featuring visual illustrations and animations that encourage creative interaction for children. For its design, software such as Adobe Illustrator and Photoshop is used to create visual elements, while Construct 3 is used for building animations and gameplay. The system is designed to help teachers present materials and provide

interactive quizzes, both in class and outside of school hours, effectively enhancing children's creativity and interest in learning.

UML (Unified Modeling Language) is a standard language used in application design to visually depict, analyze, and design systems. Its function is to provide consistent notation and methods for describing the structure, behavior, and interactions between components in an application. By using UML, developers can visualize and communicate the design of the application more clearly and effectively, facilitating understanding and identifying potential errors or issues before the actual implementation takes place. In the application design, there are two use cases as follows:

a. **Use Case Developer**
   The Game Developer for the educational application for children in Kindergarten is responsible for creating and managing the games within the app. The primary tasks include designing and developing educational, interactive, and engaging games tailored to the learning needs of children. The developer ensures the games are easy to understand and use by young children. After the game is developed, the developer is also responsible for maintaining it, including fixing bugs, updating content, and ensuring optimal performance. The goal is to provide a fun and effective learning experience for early childhood education (PAUD) children.
b. **Use Case Player**
   The Player Use Case describes the capabilities of users (children) in using the application. It involves tasks like starting the game, playing, selecting stages, reading game instructions, continuing, or exiting stages. Additional features include options to exit the game, control sound, reset data, or continue a previous game.

## 3. System Implementation

System implementation is the stage where the designed or developed system is applied so that the system can be operated and used optimally according to the requirements. In addition to the implementation stage, testing is conducted on the new system to identify any shortcomings in the application for further system development.

**a. System Interface**
The definition of a User Interface (UI) is a communication mechanism between the user and the system. The user interface can receive information from the user and provide information to the user to help guide the problem-solving process until a solution is found.

**b. Implementation of User Interface**
The user interface of the Interactive Educational Game for Cognitive and Language Development in Early Childhood is designed to provide an enjoyable and interactive learning experience. This system consists of several main menus that facilitate navigation and usage, including: Splash Screen, which is the initial display when the system starts, Main Menu, which serves as the central hub to access all features, and Game Selection Menu, where users can choose the type of game they want to play. Additionally, there is a Quiz Menu that provides interactive quizzes to enhance the child’s abilities, a Help Menu that offers guidance on how to use the system, and a Competency Menu that displays the child's developmental progress. Other features include the Developer Profile

Menu, which provides information about the developers, the References Menu, which presents the sources used in the development of the system, Number Learning Interface, which teaches numbers in a fun way, and Number Video Player, which shows educational videos about numbers. Also available is the Letter Learning Interface to help children recognize letters, followed by the Letter Video Player, which presents educational videos about letters. The images below illustrate the other menus, providing a complete visual overview of this system.

**Figure 1**. Implementation Results of the User Interface of the Interactive Educational Game for Cognitive and Language Development in Early Childhood Based on Android Using

# Conclusion

The conclusion of the development of the Interactive Educational Game for Cognitive and Language Development of Early Childhood Based on Android shows that mobile technology, particularly the Android platform, can be effectively utilized to support the learning process of young children. The interactive educational game developed not only attracts children's attention but also provides an opportunity for them to enhance their cognitive and language skills through fun and educational play. The use of this game has the potential to accelerate children's understanding and mastery of language as well as thinking skills, as it can be tailored to their developmental stages. With the right design and relevant material, this educational game becomes an efficient tool to support early childhood development, providing positive stimulation for their brains, and assisting parents and educators in improving the quality of learning outside the school environment. As technology advances, this Android-based educational game can continue to be developed and adapted to meet the needs and characteristics of children's development, making it an effective tool in creating a fun and beneficial learning experience.

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