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Development of an Interactive Educational Mobile Application Using Flutter for Early Childhood Learning Age 3 to 5 "Senang"

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Abstract - Early childhood education plays an important role in shaping a child's knowledge foundation and character. With the advancement of technology, interactive educational mobile applications provide an innovative solution to support children's learning processes. This study aims to develop an interactive educational application using Flutter, specifically designed for early childhood learners. The application combines visual, audio, and simple interaction elements to enhance children's interest in learning. The research method follows the Research and Development (R&D) model with the ADDIE approach (Analysis, Design, Development, Implementation, and Evaluation). Testing results show that the application has an attractive interface, is easy for children to use, and significantly increases interest in learning content.

Keywords: Educational Application, Flutter, Early Childhood, Mobile Learning, Interactive Learning

I. INTRODUCTION

Information technology has significantly influenced the education sector, including early childhood education (ECE). According to the Ministry of Education and Culture, ECE aims to foster holistic development in children — cognitive, affective, and psychomotor aspects.

Gadgets have become a medium that is very often played by children, even those who are still toddlers (under five years old), if gadgets are used incorrectly, they can have negative effects, such as following what is watched and also health, one of which is eye health.

Modern children are increasingly familiar with digital devices such as tablets and smartphones, which can be leveraged as fun and effective learning tools. However, many existing educational apps are not age-appropriate, lack pedagogical grounding, or feature poor design usability for young learners.

Flutter, as a modern cross-platform development framework, offers the ability to create engaging and responsive mobile apps. This research focuses on developing an educational mobile app tailored for children aged 3 to 5, featuring foundational topics such as letters, numbers, colors, and shapes.

II. RESEARCH METHODOLOGY

This study applies the **Research and Development (R&D)** method using the **ADDIE** model, which consists of five phases: Analysis, Design, Development, Implementation, and Evaluation.

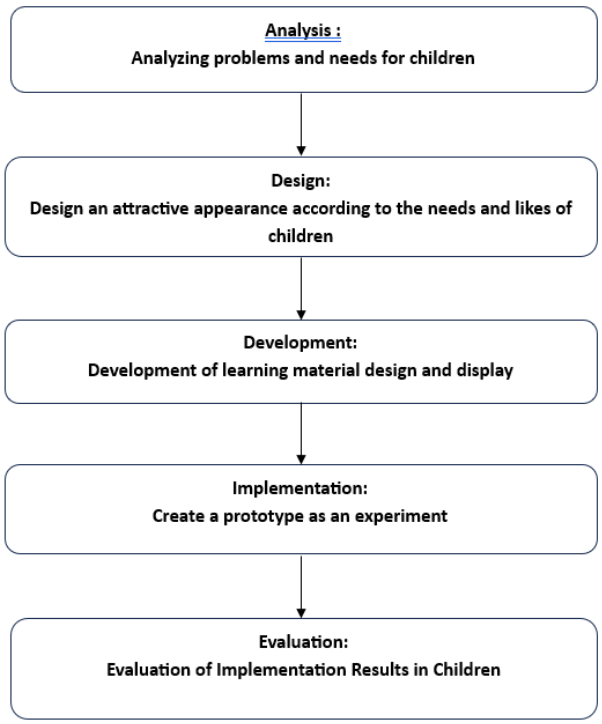


Figure 1.2

A. Analysis

Needs analysis was conducted through observations and interviews with early childhood educators and parents. Key topics identified as important include letter recognition, basic numbers, colors, and shapes.

B. Design

The app was designed with child-friendly user interfaces: colorful themes, large buttons, intuitive icons, and minimal text. Each element was complemented by sound and animation to maximize engagement.

C. Development

The application was developed using Flutter and Dart. Major features included:

- Interactive letter and number learning modules with voice guidance
- Simple educational mini-games (e.g., matching shapes, recognizing colors)
- A reward system (stars, badges) to encourage repeated usage

D. Implementation
A prototype of the app was tested by 10 children aged 3–5 years at a local. Each session lasted 5 to 10 minutes under supervision.
E. Evaluation
Evaluation was conducted through behavioral observation and interviews with teachers and parents. User engagement and comprehension improvements were tracked during and after app usage.

III. RESULT AND DISCUSS

From the results of the implementation design and discussions that have been carried out in making this application, the following conclusions can be drawn: Children can play and learn at the same time. This app helps them recognize pictures and pronounce them. Parents will find this engaging letter recognition app helpful, with pictures of animals that begin with each letter.
The developed application successfully fulfilled user expectations for content, accessibility, and interactivity. Children showed high engagement levels, with 85% able to use the app independently after two sessions.
Educators noted increased interest in learning letters and numbers, as children perceived the activities as games rather than formal lessons. Teachers reported improved concentration and participation in related classroom topics.
Some technical limitations were noted, such as device compatibility and performance on low-end smartphones. These can be addressed in future updates through optimization and wider testing.
The use of Flutter proved effective for rapid development and visual consistency across devices. The inclusion of audio feedback and gamified interactions made the learning process enjoyable and immersive.

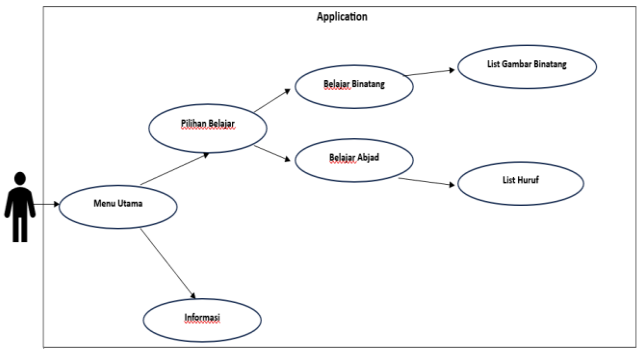
IV. CONCLUSIONS

This research demonstrates that an interactive mobile app developed with Flutter can enhance early childhood education through playful learning. The app effectively improves children's motivation and cognitive engagement, especially in recognizing letters, numbers, and basic concepts.

For future development, it is recommended to:

- Expand learning materials to include English and basic arithmetic
- Integrate parental control features and progress tracking
- Enhance accessibility for children with special needs
- Conduct broader testing across different schools and demographics

4.1 Use Case Diagram



4.2 Display

(a)

(b)

(c)

(d)

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