EARLY CHILDHOOD INTERACTIVE EDUCATION MEDIA: PenguinPlayground Edu

By

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A Report

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I also want to thank for my friend always support me during doing this project. Finally, I must say thanks to my parents and my family for their love, support, and continuous encouragement throughout the course.

ABSTRACT

This study presents a comprehensive mobile application multimedia kindergarten learning platform that integrates digital technologies into the educational domain. The platform utilizes the immersive potential of multimedia and mobile applications to create a dynamic and engaging learning environment specifically for kindergarten-aged children. The main motivation behind the platform is the urgent need to bridge the gap between traditional pedagogy and the vast potential offered by digital advancements. Furthermore, this study aims to address the inherent shortcomings of current multimedia kindergarten learning platforms. By integrating interactive multimedia content, the platform facilitates rich educational journeys that inspire curiosity, creativity and personalized learning experiences. The platform works to redefine the way children interact with educational resources, providing accessibility, adaptability, and engagement in a variety of learning environments. Overall, this research has pioneered a transformative approach to early childhood education that promotes a holistic and engaging learning experience. By combining cutting-edge technology with pedagogical expertise, the Multimedia Kindergarten Learning Platform for Online/Offline/Mobile Applications aims to empower parents, educators and early childhood learners, ultimately shaping the future of early childhood education.

Area of study (Minimum 1 and Maximum 2): Educational Technology with a focus on Early Childhood Education

Keywords (Minimum 5 and Maximum 10): Mobile application, Multimedia learning, Kindergarten education, Digital learning platform, Interactive content, Creative and engaging learning

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

SDLC	Software Development Lifecycle
UI	User Interface
IDE	Integrated Development Environment
API	Application Programming Interface
ERD	Entity Relationship Diagram
CRUD	Create, Read, Update, Delete
SQL	Structured Query Language

CHAPTER 1: PROJECT BACKGROUND

1.1 Introduction

A mobile application is a software program created especially to be used on wireless, small-screen devices, including tablets and smartphones. As the changes of the times, a new platform and pedagogy for learning have been made possible by mobile technologies [1]. Due to the widespread use of mobile devices in today's digital culture, more and more instructors and students are using them as information access tools [2][1]. Technology integration is becoming a key component in determining how education is delivered and received. These mobile devices are also being used in the classroom to support learning in novel and creative ways, as well as to reorganize administration [1].

One common justification for introducing new technology to kids at a young age is the increasing prevalence of it in workplaces, factories, homes, and educational institutions [3]. New learning approaches for all age groups have emerged because of technological advancements. E-learning is the most popular mode among them and become one of the most often utilized techniques in the process of learning in education [4]. It has unquestionably made it possible for instructors, children, and toddlers to have better learning experiences. To guarantee the children's maximum participation, the kindergarten M-learning content is presented in the form of several presentations, including voiceovers, images, animations, and text [3].

By leveraging the power of multimedia, this platform seeks to captivate young minds through interactive videos, games, audiovisual aids, and hands-on activities, creating an enriching educational journey that sparks curiosity and creativity [5]. For instance, devices like tablets and smartphones allow children to better visualize natural scientific phenomena while combining gaming and learning [6].

The aim of the project is to develop a comprehensive and engaging kindergarten learning application that leverages interactive elements and multimedia like text, audio and images. This application will provide a diverse range of learning modules and games covering subjects, also focusing on the emotional and moral development of young learners. By integrating technology

with educational content, the project seeks to create an immersive learning experience that is accessible, user-friendly, and adaptable to the needs of both children.

1.2 Problem Statement

1. **Engaging Early Learning**

   Many children in early years' education are unable to deal with even the most basic levels of literacy and numeracy because of the absence of motivating and engaging learning items. Traditional teaching methods does not address the comfort and interest of different types of kindergarten learners, will make students perceiving the learning process is boring. As a result, their motivation and learning rates may decrease and result in the decline of students' absorption rate.

2. **Lack of Interactive Elements**

   Students lose their attention by a shortage of interactive elements to engage with in learning materials. These traditional teaching methods, where students are required to sit still, listen and take in information have been shown time and again to lead to low retention rates or increase dropout numbers [7], [8]. Mobile learning environment which exclusively delivers traditional methods could lead to student disengage from the course and active learning due to constant and boring content. Interactive elements can attractive the students allowing them to learn better and with a clearer interest about any topic for an educational application.

3. **Enhancing Moral Education and Engagement**

   In lecturing or simple storytelling, moral education may not seem relevant to the experience and challenge posed by daily life. If children are surrounded by more entertaining content devoid of ethics and it has replaced educational resources that instill values such as honesty, empathy, kindness and so on. Which are necessary for their personal growth like social interactions or their future responsible citizenship in society.

1.3 Motivation

On-line/Off-line/Mobile applications multimedia kindergarten learning platform are driven by awareness of how education environment is changing and how crucial early childhood development is. It is imperative to close the gap between traditional pedagogy and the enormous potential provided by digital advances as technology continues to permeate every aspect of daily life. To provide a smooth, interesting, and flexible learning environment, the platform leverages the immersive qualities of multimedia, online, offline, and mobile applications. This empowers of young learners. The platform's motivation is to transform early childhood education by offering a thorough and engaging learning environment that not only accommodates the changing needs of contemporary learners but also helps parents and educators provide a comprehensive and memorable educational experience for kindergarten-aged kids.

1.4 Project Objectives

1. **To Implement More Interactive Elements**

   To ensure that kids become interested in learning, the proposed system will include more interactive components. The present application will be a livelier experience for children by integrating assorted multimedia elements such as audio, animations, images and so on. This technique is meant to encourage learning through mobile devices by making it more interesting to the kids looking for something new. Literature confirms that physical engagement and sound are good means of getting attention. This application gives ability to children, which is not limited by watching during activities by providing some interactive features, which aims to make them more focused on learning. This type of learning which is interactive unlike traditional ways of learning makes sure the child does not get bored and generates a greater willingness to exert effort to seek the information if they find it very interesting [9].

2. **To Develop and Integrate Mini Games for the Learning Module**

   Gamification will be used in the proposed system to maintain user motivation and boost their interest in the application's learning features. The present application will implement gamification elements such as progress tracking, tasks, quizzes and levels to enhance user

learning experiences and motivation in more enjoyable and interactive [10]. These features aim to create a stimulating, dynamic learning environment that encourages a positive and optimistic approach to learning.

3. **To Create an Innovative and Interactive Storytelling Module for Teaching Moral Values to Children**

   The present application will create an innovative and interactive storytelling module to address the need for engaging moral education for children. This platform will offer a wide variety of stories along with captivating narratives that provide moral lessons with age appropriate. These lessons will be reinforced through interactive exercises, games, and facilitated discussions which will promote moral judgment and critical thinking. The purpose is to make moral education enjoyable and memorable, as it will promote social development, emotional intelligence, empathy, and a lifelong interest in the storytelling module.

1.5 Project Scope and Direction

The scope of the mobile applications multimedia kindergarten learning platform project includes a comprehensive effort to create a multipurpose, adaptable educational tool specifically for kindergarten children. The goal of the project is to develop a multifaceted platform that offers a comprehensive learning experience for young children and mobile applications to provide interactive educational content. This include implement interactive elements, develop games learning module and create education moral values by storytelling.

Two main areas will be developed in this project for the project scope, which are learning area and fun area. Each designed to complement and enhance the educational experience. There are a few modules such as letter learning, number learning, color learning and others will be conducted inside the learning area. This will include the elements of images and voice teaching way for each module to facilitate an engaging and effective learning process. Learners will hear the clear pronunciation by clicking to the images to make learners can learn in easily and quickly. This method ensures that users will be able to learn concepts efficiently and form a strong foundation in these core subjects.

While for the fun area, that was the derivative of the learning module. The fun area will provide a playful extension of the learning area. It was including the mini games derived from the learning module, enabling users to test and apply their newly acquired knowledge in an enjoyable and interactive way. Users can go through to this section after completing lessons from the learning module. The creation of this area was aims to test for the users' knowledge after learning finish from the learning area. In addition to being entertaining, these mini games also evaluate the users' understanding by generating scores based on their performance.

Combination of these two areas will make the kids interested and attractive them to use for the application. By integrating interactive elements and gamified assessments, the project seeks to motivate users to explore, learn, and retain information more effectively while having fun.

1.6 Contribution

The Multimedia Kindergarten Learning Platform Mobile Applications makes a significant contribution to the field of early childhood education by integrating various learning modalities into one cohesive and functional educational tool. Its primary contribution is to offer a thorough and flexible learning environment that is especially designed to meet the adaptive of children between the ages of 5 to 7. Through the smooth integration of mobile apps, the platform offers options for continuous learning that transcend the limitations of traditional education environment. By bridging the gap between traditional pedagogical approaches and the current technology environment, this contribution hopes to empower parents, kids, and educators to all benefit from the transformative potential of multimedia resources. Furthermore, at this crucial time of development, the platform's adaptability enables a customized learning experience that fosters the development of individualized skills and improves the entire educational journey. In the end, this contribution helps to transform early childhood education by guaranteeing accessibility, interaction, and efficacy, establishing the groundwork for an all-encompassing education for young learners.

1.7 Report Organization

The research results have been organized in each chapter of this report. Chapter 1 introduces the project, including the background, problem statement, motivation, goals, contributions and scope. Chapter 2 reviews the relevant applications, determines their advantages and disadvantages, and puts forward suggestions for improvement. Chapter 3 explains the methods used, supported by system design, architecture, use cases and activity diagrams, as well as the FYP2 timeline. Chapter 4 presents the system design, including block diagrams, flowcharts, ERDs and wireframes. Chapter 5 introduces the implementation details, such as system requirements, Settings, operations and challenges. Chapter 6 discusses system evaluation, test results, project challenges and objective evaluation. Finally, Chapter 7 summarizes the report and offers the final comments and suggestions for future enhancements.

CHAPTER 2: LITERATURE REVIEW

2.1 Review of Existing Application in Strength and Weaknesses

The current array of available kindergarten learning programs possesses numerous advantages that significantly bolster their capacity to support early childhood education. These applications serve as invaluable resources, fostering a positive learning environment and actively engaging young learners. The purpose of this project is to develop a creativity Kindergarten Learning Mobile Application for kids learning to enhance their interest in learning and creativity. A few of kid learning mobile applications will be conduct in the project research, and their strengths and weaknesses will be examined.

A. Lingokids

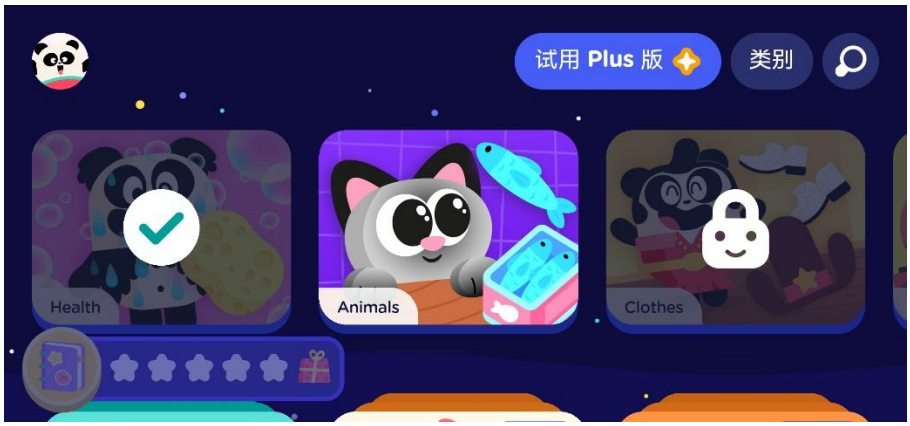


Figure 2.1 Main Page of Application Lingokids

Lingokids is an educational app designed specifically for young children, offering an entertaining and interactive approach to acquire important skills through plays [11]. The platform offers a wide range of educational resources, including games, songs, and videos, all tailored to teach subjects like language skills.

Figure 2.2 Disciplines and Skills Category in Lingokids Application (Strength)

Figure 2.3 Morden Skills Category in Lingokids Application (Strength)

A wide range of learning categories are available on Lingokids to meet different learning styles and needs. The app's content is wide ranging, covering everything from traditional academic subjects like reading, geography, history, and literacy to contemporary skills like creativity, critical thinking, social skills and so on. This wide variety guarantees that kids are not only developing essential foundational skills but are also exposed to a wide curriculum that encourages growth and knowledge in all areas. Lingokids is a comprehensive educational tool that supports the development of both cognitive abilities and practical life skills by offering content that touches on multiple learning areas.

Figure 2.4 Parent Area by Filling In the Birth Date

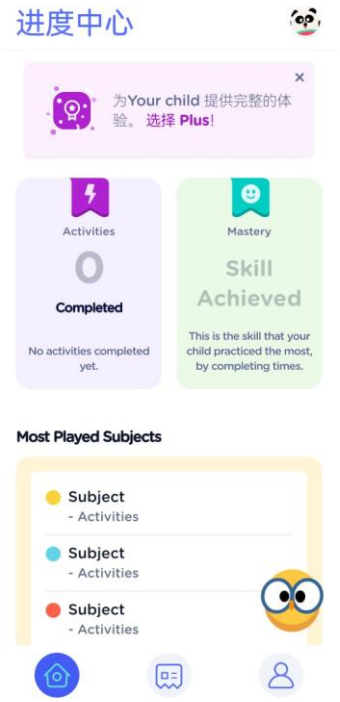


Figure 2.5 Providing Parent Area in Lingokids Application (Strength)

Apart from its wide range of learning categories, Lingokids also features a parent zone that only can be accessed through password-protected that created by parents. This feature enables parents to actively participate in their child's learning journey by monitoring progress and gaining insights into the child's strengths and areas for improvement. The parent area helps to create a cooperative and encouraging learning environment that keeps kids motivated and interested in

their education by encouraging parental involvement. This feature not only provides transparency for parents but also gives them ways to help their child learn better.

Figure 2.6 Buy a Package for More Resources in Lingokids Application (Weakness)

Although Lingokids offers a series of free activities, there is a limitation in that. Parents are required to pay to unlock for more resources and contents if children want to access for additional content (Figure 2.6). For some parents, especially those who prefer free or more affordable options for their children's learning, the need for a subscription to access the entire range of content could be a barrier.

Another weakness of Lingokids is the exist of pop-up advertisement when user have using for this app. This advertisement is to promote the app's premium content and encouraging parents and children to make a purchase. This can negatively impact children's user experience, as the constant interruptions when they are playing or learning.

B. Toddler Game

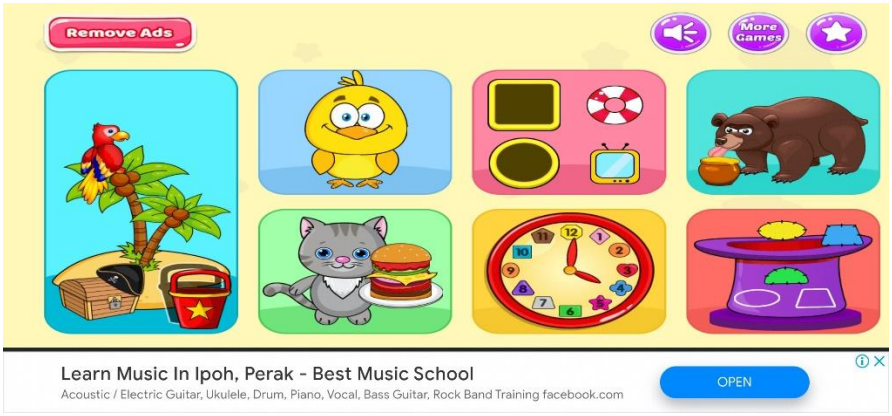


Figure 2.7 Main Page of Toddler Game

Toddler Game is an educational app designed to provide young children with a fun and interactive learning experience [12]. The app offers a variety of games and activities to helps children develop fundamental skills in areas like numbers, letters, colors, and shapes by providing with colorful graphics, engaging sounds, and easy-to-use controls.

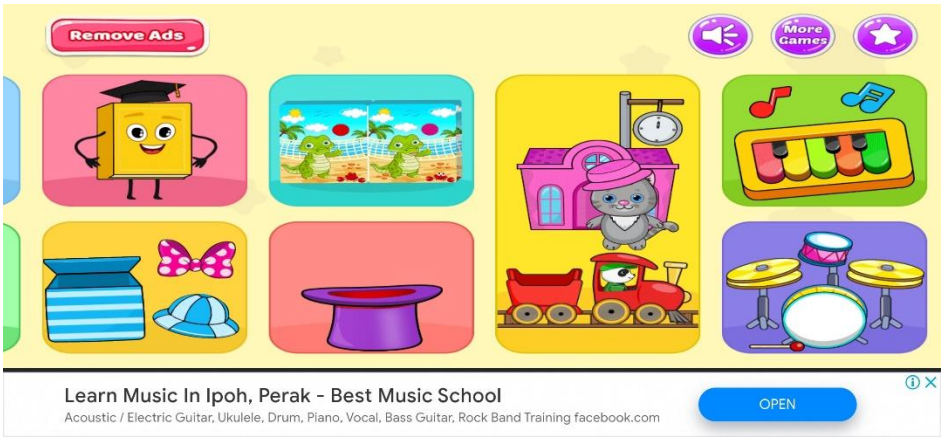


Figure 2.8 Wide Range Contents in Toddler Game (Strength)

Toddler Game provide diverse range of learning resources that address various aspects of early childhood development. The app includes a wide array of activities, including interactive games, music, dress-up scenes, and traditional teaching techniques. This variety ensures that children are touch to many forms of learning formats, which can help maintain their interest and enhance their educational experience more enjoyable.

Besides, Toddler Game is designed to be user-friendly, with content that is both concise and clear. The user-friendly interface and straightforward navigation allow children to easily interact with the app. This simplicity makes the app accessible to young children, ensuring that they can use the app to independently explore and learn at their own pace.

While for the weakness, Toddler Game is that the application does not allow users to save their progress. Children may find this frustrating because they have to start over every time when they use the app. The inability to save progress can hinder a child's learning continuity and development, as they are unable to pick up where they left off.

Additionally, Toddler Game also lack a reward system for the users. A reward system is often effective in encouraging young children to interact with educational content and complete tasks. Children may lose interest more quickly or feel less motivated to continue using the app if without rewards or incentives, which would reducing the overall effectiveness of the learning experience.

C. ABC Kids

Figure 2.9 Main Page of ABC Kids

ABC Kids is an educational application that provide the app features a variety of activities, such as tracing letters, matching games, and phonics exercises, all with the intention of making the study of letters interesting and pleasurable [13]. ABC Kids offers an effective and entertaining

platform for children to enhance their early literacy abilities and build a solid alphabet foundation through colorful animations, cheerful sounds, and intuitive controls.

Figure 2.10 Need to Fill Numbers to Provide in Text (Strength)

ABC Kids has several strengths. One of its key strengths is its security feature, users need to enter a four-digit code generated randomly by the app in text form to unlock and access to the certain sections also providing a safe learning environment for children (Figure 2.10). This feature encourages children to apply what they have learned in a controlled setting, helping to reinforce their understanding and skills.

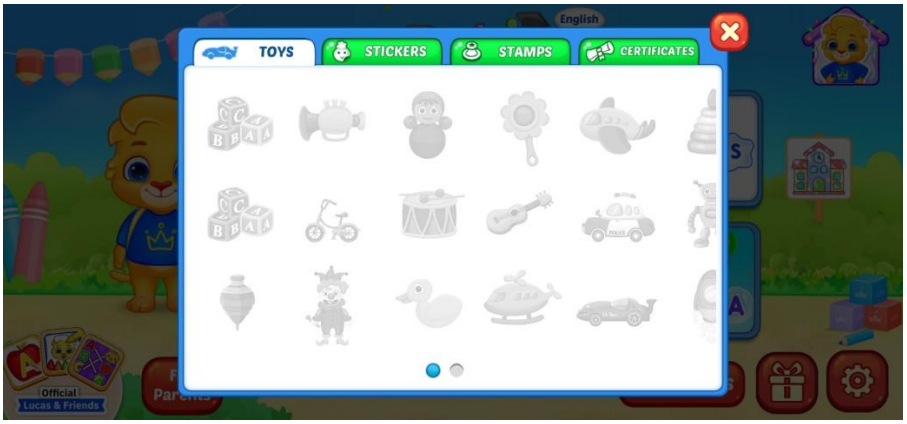


Figure 2.11 Provide Reward System (Strength)

Other than that, ABC Kids has built-in reward system to encourages children to participate in the learning activities and helps reinforce their accomplishments (Figure 2.11). By earning rewards as they progress, children are motivated to continue practicing their skills.

Figure 2.12 No Ads in Application (Strength)

Additionally, there are no advertisements on ABC Kids at all, which provides young children a continuous and distraction-free learning environment (Figure 2.12). Children can focus fully on the educational material and content without the presence of advertisements, which allowing them to engage more deeply with the activities and lessons. The ad-free nature of the app is a significant advantage for parents because it eliminates concerns about children being exposed to inappropriate or irrelevant content.

Figure 2.13 Number Kids of Application (Weakness)

ABC Kids only focuses on teaching kids one category of content within the app, which is one of its drawbacks. Although it is very useful for teaching early literacy skills, users will need to download additional apps in the series if they are looking for educational content on other topics, like colors, shapes, or numbers. Users may find this inconvenient as it necessitates

installing multiple applications on their devices in order to cover a wider range of learning topics. Having to download multiple apps can increase storage requirements and complicate learning for kids and parents, who might prefer a single, all-inclusive learning platform.

D. Kids Preschool Learning Games

Figure 2.14 Main Page of Kids Preschool Learning Games

Kids Preschool Learning Games is an application that made for 2 to 5+ preschool children [14]. This application offers a fun learning environment where kids are encouraged to play, explore, and learn at their own speed. For parents and educators looking for an engaging and interactive approach to support early childhood development, this app is perfect.

Figure 2.15 Game Activities in Kids Preschool Learning Games (Strength)

Kids Preschool Learning Games was excellent use of animation to teach kids the rules of each game is one of its main advantages. The application makes it simpler for young learners to understand how to play the game and what actions are required by including colorful and captivating animations that provide step-by-step instructions. This visual aid enhances children's learning experience overall by helping them comprehend the rules and play the games independently. Children can have a more intuitive and user-friendly gaming experience by adhering to the animated instructions, which increases their engagement and retention of the educational content.

Figure 2.16 Poor in Tracking Progress (Weakness)

However, Kids Preschool Learning Games has some weaknesses that may impact its effectiveness as an educational tool. One major drawback is how poorly progress is tracked. The app's tracking features are limited to content titles and four progress checkpoints, which give a

child's progress through the material only a cursory overview. Parents and teachers may find it challenging to obtain comprehensive understanding of a child's learning progress, pinpoint particular areas where extra help may be required, and adjust instructional strategies as a result of this inadequate progress tracking.

Another drawback is the app's limited free content. While Kids Preschool Learning Games does offer a few levels for free, access to more comprehensive and advanced content requires a paid subscription. This paywall can be a barrier for some families, as it restricts access to a broader range of educational activities and may limit the app's overall value for users who are looking for more extensive free resources. The need to purchase premium content could affect the app's accessibility and affordability, potentially impacting its appeal to a wider audience.

2.2 Limitation of Existing Kindergarten Learning Platform

Although currently available kindergarten learning applications are essential to the teaching of young children, they frequently have limitations that prevent them from offering a comprehensive and successful learning environment.

Many of the current kindergarten learning platforms have several limitations that reduce their efficacy. A lot of platforms are too focused, emphasizing primarily on core academic subjects while ignoring important inner aspects of child development like moral values and emotional awareness. Children may miss out on critical developmental opportunities that are crucial to their overall development as a result of this narrow scope.

In addition, children's attention is often attracted by the colorful user interface. Without colorful and engaging designs, these platforms may not hold children's attention or make the learning experience enjoyable and intuitive.

2.3 Proposed Solutions

Several focused solutions are suggested to improve the kindergarten learning platforms that are currently in use. These enhancements include new features that should make the proposed system easier to use and more effective.

First, the platform's appeal and usability can be greatly enhanced by designing a vibrant and captivating user interface. The system will use the elements like icons, vibrant colors and attractive images to engage young children and make learning more pleasurable and intuitive, encouraging positive engagement with the instructional material. Children will find it easier to immerse themselves in learning when interactive elements like audio playback are included, as they will receive immediate visual and auditory feedback during the interaction.

The second important step is to broaden the platform's focus to encompass not only academic subjects but also internal aspects of child development. Content about moral principles, emotional intelligence, and social skills are all included in this. In addition to academic learning, the platform can support young children's holistic development by addressing these areas and offering a more comprehensive educational experience.

Finally, adding mini games for gamified learning to the platform can improve interaction and engagement levels during the learning process. By engaging kids in enjoyable and stimulating activities, these games can support learning and keep their interest and enthusiasm for learning alive. The platform can provide a dynamic and entertaining learning experience that keeps kids actively engaged in their educational journey by fusing interactive gaming with educational content.

2.4 Comparison Between Similar Application

	Lingokids	**Toddler Game**	**ABC Kids**	**Kids Preschool Learning Games**	**PenguinPlayground Edu (Proposed system)**
Audio	✓	✓	✓	✓	✓
Login and Logout	✓	✗	✗	✗	✓
Easy to Use	✓	✓	✓	✓	✓
Free Content	✗	✓	✓	✗	✓
Available Offline	✗	✓	✓	✓	✓
Colorful User Interface	✓	✓	✓	✓	✓
Gamification Learning Styles	✓	✓	✓	✓	✓

Table 2.1 Comparison Between Similar Application

CHAPTER 3: PROPOSED METHOD/APPROACH

3.1 Methodology

SDLC is a systematic process used to develop software efficiently and effectively. It describes the steps that are involved in developing software, from the first concept to the last deployment and continuing upkeep. By offering a precise framework to direct the development process, the SDLC makes sure that projects are finished methodically and satisfy user and technical requirements.

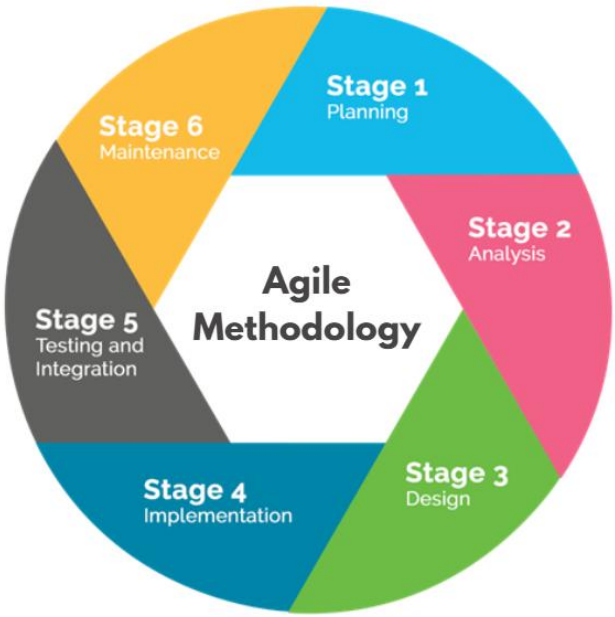


Figure 3.1 Agile Methodology

Planning Phase

The scope and goals of the project will be determined during the planning phase. Determine the intended audience and the essential features, such as engaging games and instructive activities. In order to determine the requirements of the final product, data and information will also be collected.

Analysis Phase

Research will be done by looking over several current kindergartens learning applications. The suggested system will be improved by analyzing and addressing the probs and cons of the current one.

Design Phase

The system will be designed during the design phase, which also involves studying the system's scope from the first phase. Make sure to incorporate interactive elements, sounds, and animations into a design that appeals to younger audiences. At this point, the hardware and software used to design the system will also be determined. For instance, a laptop and an Android phone are needed for hardware, and Android studio are needed for software.

Implementation Phase

Write and compile code to turn the design into a working application. Create and incorporate features like games, quizzes, and learning modules while making sure all specifications are satisfied.

Testing Phase

Run a variety of tests to identify and resolve errors. Conduct unit, integration, system, and user acceptance testing to make sure the application is reliable, safe, and offers a satisfying user experience.

Maintenance Phase

Making sure the system continues to work, be updated, and satisfy user needs is a continuous process. For the project system to understand users and make the necessary improvements, it must be maintained. This is a crucial step because the system is designed to meet the needs of users and attract more people using in the learning application.

3.2 System Design Diagram/Equation

3.2.1 System Architecture Diagram

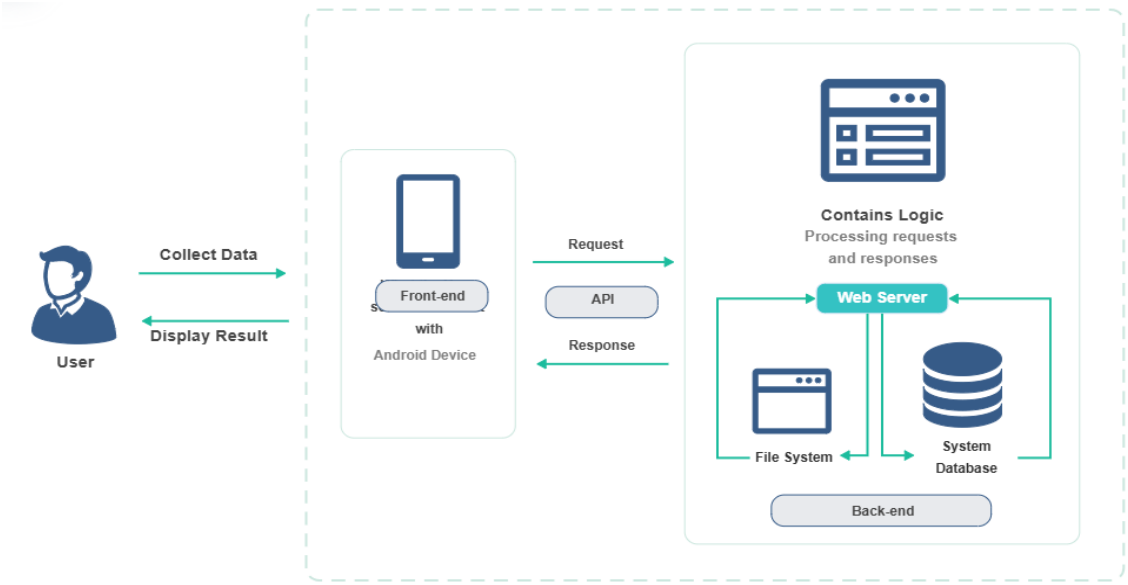


Figure 3.2 System Architecture Design of App

The project has implemented client-server architecture, illustrating how a backend system and an Android application interact. The process begins with the user collecting data from their own mobile devices and interacting with the user interface, which serves as the front-end system that implemented by using of an application. The resulting output and data input that are entered by the user will be displayed and collected by the front-end. The application sends a request to the backend through an API when the user submits data. The web server on the backend which contains the core logic, processes the request and generates appropriate responses. To retrieve or save required data, the web server communicates with other backend components such as the file system and the system database. The database function is used to store and manage information. It serves as a structured way to organize and access data. Following request processing, the web server sends a response to the Android application via the API. After receiving the response, the front-end displays the result to the user.

3.2.2 Use Case Diagram and Description

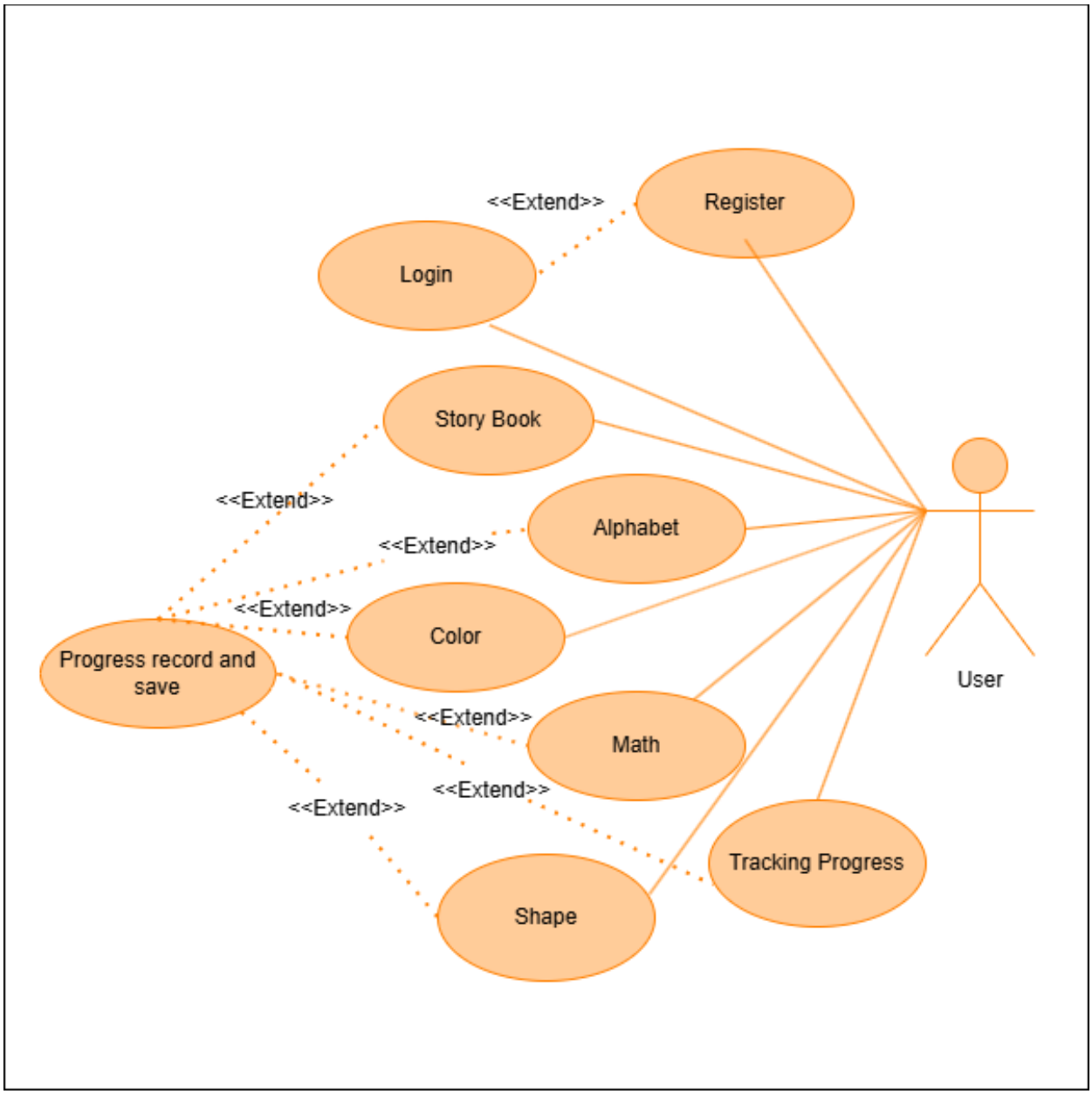


Figure 3.3 Use Case Diagram

In the application, the user becomes an active learner in the process of learning. When click into the application, the user is first directed to the login page. New users have to register by creating an account with a username, email address, and password. Upon registration, user can log in with their username and password as they have created previously. Once logged in, they are taken to the home page that contains various modules of lessons such as Colors, Math, Shapes, Alphabets,

and Storybook. Every lesson module includes an interactive learning game to assist in reinforcing concepts taught. The games offer an engaging way in which the users can refresh their memory and apply their knowledge through quizzes and challenges. The app also tracks and stores each user's learning progress in the database. Parents can therefore check up on how their child is doing using this feature and have a clear understanding of monitoring their development.

A. User Login and Registration

Name: User Login
Brief Description: Allow users register and login account to access the mobile application.
Actors: User
Type Include: Register, Forget Password
Pre-requirements: User must register an account first.
Alternative Flow: **When users click the "Login" button:** 1. Users entered their username and password. 2. The input of user will be received by system. 3. System validates the username and password. 4. Users receives a successful message. **When users click the "Forget Password" button:** 1. System will ask users to enter their email address in a form to reset their password. 2. Users need to fill in their email address. 3. Users click on submit the link of "Send Password Reset". 4. System sends the reset password link to users' email. 5. Users reset their password via the reset password link. 6. System will update the new password of user in the database. **When user click the "Register" button:** 1. The register form will display by system. 2. Users need to fill in required information.

3. Users click on register button to submit the information. 4. System will receive the user input and validate it. 5. System stores the user input into database. 6. The successful message will display to user by system.
Normal Flow Events: 1. Invalid email address 2. Incorrect user input 3. Repeated input in database
Post Conditions: 1. Users' able to login to their account. 2. New password will be updated in database when users perform reset password action. 3. Users' registration input will be stored in the database.

Table 3.1 User Login and Registration Use Case Description

B. Alphabet Module

Name: Alphabet Module
Brief Description: Describes the functionality of the Alphabet module, allowing the user to interact with alphabet learning activities and record their progress.
Actors: User
Type Include: Progress Tracking and Save
Pre-requirements: 1. The user must be logged into the application. 2. The Alphabet module is required to be accessible from the main menu.
Normal Flow Events: 1. The user selects the Alphabet module from the main menu. 2. The application presents alphabet learning activities to the user. 3. The user interacts with the activities, such as clicking on letters or completing quizzes. 4. Upon completion, the system records the user's score. 5. The score is saved to the user's database for future reference.
Exception Flows: -
Post Conditions: 1. The user's progress is successfully recorded and saved. 2. The system updates the user's progress, potentially update the user dashboard.

Table 3.2 Alphabet Module Use Case Description

C. Color Module

Name: Color Module
Brief Description: Describes the functionality of the Color module, allowing the user to engage with color-learning activities and record their progress.
Actors: User
Type Include: Progress Tracking and Save
Pre-requirements: 1. The application needs to be logged into by user. 2. The Color module is required to be accessible from the main menu.
Normal Flow Events: 1. The user selects the Color module from the main menu. 2. The application presents color learning activities to the user. 3. The user interacts with the activities, such as matching colors or identifying objects. 4. Upon completion, the system records the user's score. 5. The score is saved to the user's database for future reference.
Exception Flows: -
Post Conditions: 1. The user's progress is recorded and saved successfully. 2. The system updates the user's progress and update in user dashboard.

Table 3.3 Color Module Use Case Description

D. Number Module

Name: Number Module
Brief Description: The users engage in number learning activities and has their progress recorded.
Actors: User
Type Include: Progress Tracking and Save
Pre-requirements: 1. The application needs to be logged into by user. 2. The Number module is required to be accessible from the main menu.
Normal Flow Events: 1. The user selects the Number module from the main menu. 2. The application displays number learning activities to the user. 3. The user interacts with these activities, such as solving math questions. 4. After completing an activity, the system records the user's score. 5. The score is saved to the user's database.
Exception Flows: -
Post Conditions: 1. The progress is successfully recorded and saved. 2. The user's progress is updated and will display in user dashboard.

Table 3.4 Number Module Use Case Description

E. Shape Module

Name: Shape Module
Brief Description: To help young users recognize and understand basic geometric shapes.
Actors: User
Type Include: Progress Tracking and Save
Pre-requirements: 1. The application needs to be logged into by user. 2. The Shape module is required to be accessible from the main menu.
Normal Flow Events: 1. The user selects the Shape module from the main menu. 2. The application displays shape learning activities to the user. 3. The user interacts with these activities, such as solving learning questions. 4. After completing an activity, the system tracks the user's progress. 5. The progress is saved to the user's database.
Exception Flows: -
Post Conditions: 1. The progress is successfully recorded and saved. 2. The user's progress is updated and will display in user dashboard.

Table 3.5 Shape Module Use Case Description

F. Story Book Module

Name: Story Book Module
Brief Description: Users can access and listen to different stories
Actors: User
Type Include: -
Pre-requirements: 1. The application needs to be logged into by user. 2. The Story Book module is required to be accessible from the main menu.
Normal Flow Events: 1. The user selects the Story Book module from the main menu. 2. The application presents a list of available stories to the user. 3. The user chooses a story they are interested in. 4. Showing images and text that correspond to the story. 5. Users can click the starts button to play the selected story's audio. 6. The user can pause, resume, or stop the story at any time.
Exception Flows: 1. Fails to load due to a technical error.
Post Conditions: 1. The selected story is either played to completion or stopped based on user action. 2. The user dashboard will show the updated progress of the user

Table 3.6 Story Book Module Use Case Description

G. Progress Tracking Dashboard

Name: Progress Tracking Dashboard
Brief Description: displays each user's learning achievements, including completed lessons, quiz scores, and game performance.
Actors: User
Type Include: Progress Tracking
Pre-requirements: 1. The application needs to be logged into by user. 2. The user must have completed an activity in any module.
Normal Flow Events: 1. Upon completion of an activity, the system record the progress has been done by user. 2. The progress is recorded in the user's database. 3. The system saves the progress information for future reference and analysis.
Exception Flows: -
Post Conditions: 1. The dashboard is updated with the latest learning data after the user completes any lesson or game, ensuring accurate and real-time tracking of progress.

Table 3.7 Record Score and Save Use Case Description

3.2.3 Activity Diagram

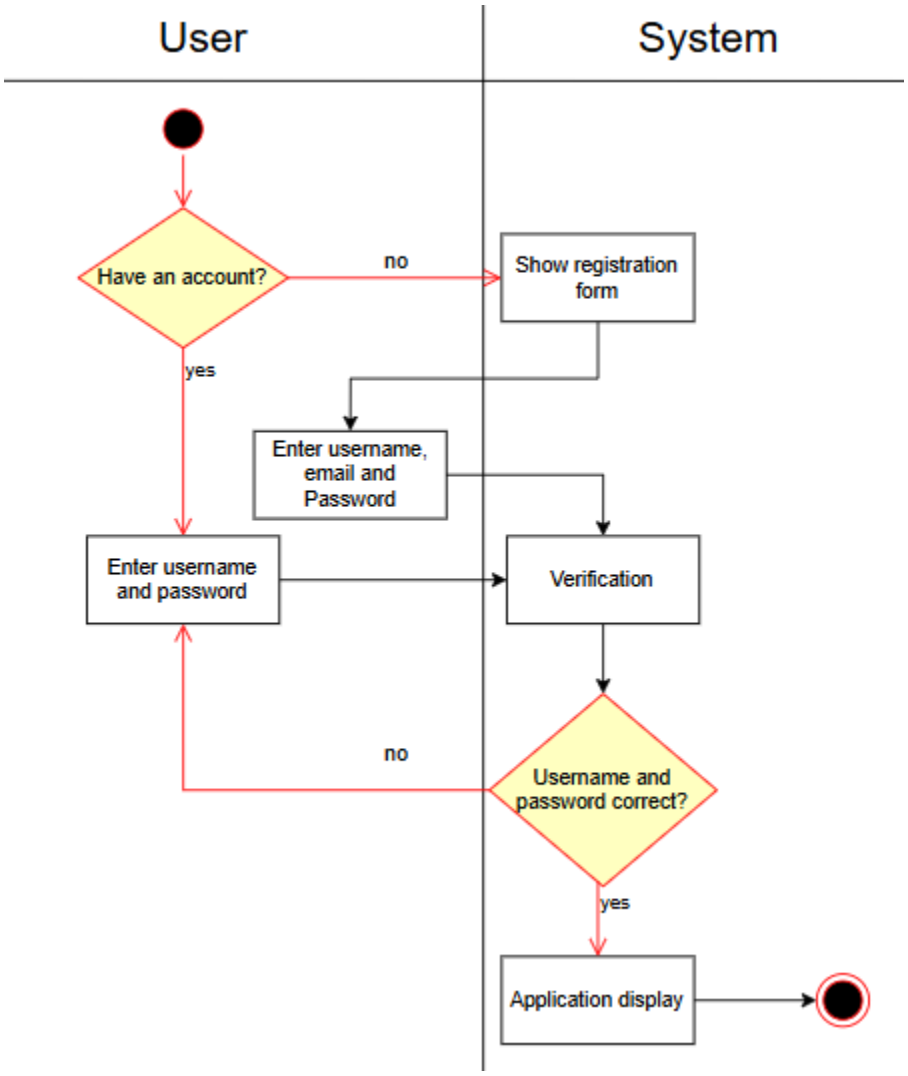


Figure 3.4 User Registration and Login Activity Diagram

This activity diagram in Figure 3.4 prompts the user to indicate whether they have an account for the program. If the user doesn't already have an account, they will be directed to the registration page where they must enter their email address and password to establish one that will be stored in the database. Users can log in to the program while they have accounts registered. When users enter their email address and password, the system will verify them. The user can access the application if verified success has been attained.

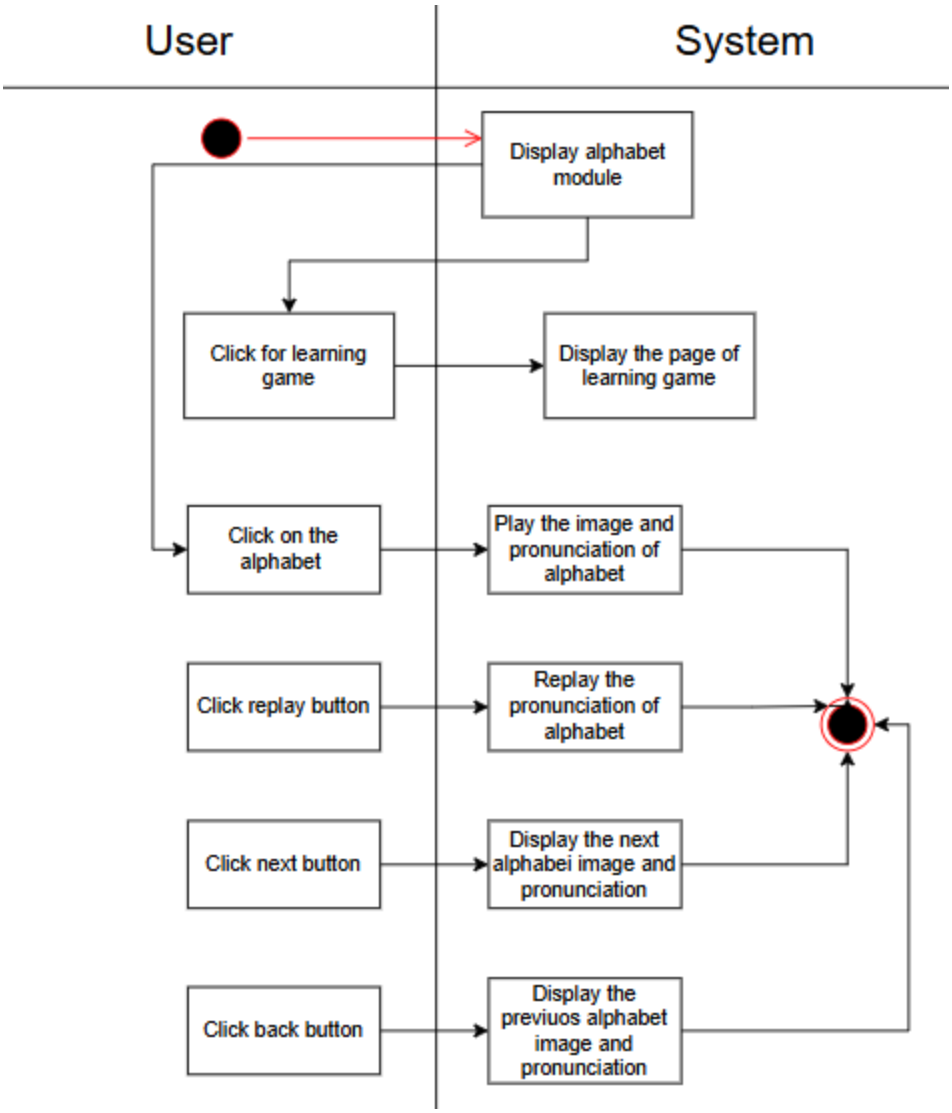


Figure 3.5 Alphabet Module Activity Diagram

The activity diagram for the alphabet module can be seen in Figure 3.5. Users can start their alphabet learning journey or access a variety of learning games with this module. When a user clicks on a color, the name and pronunciation of that color are displayed. The module shows the 26 alphabet letters from A to Z. Upon clicking on each alphabet, the user will see the text and an example object associated with that alphabet. Clicking on the repeat button will allow the user to hear the pronunciation again.

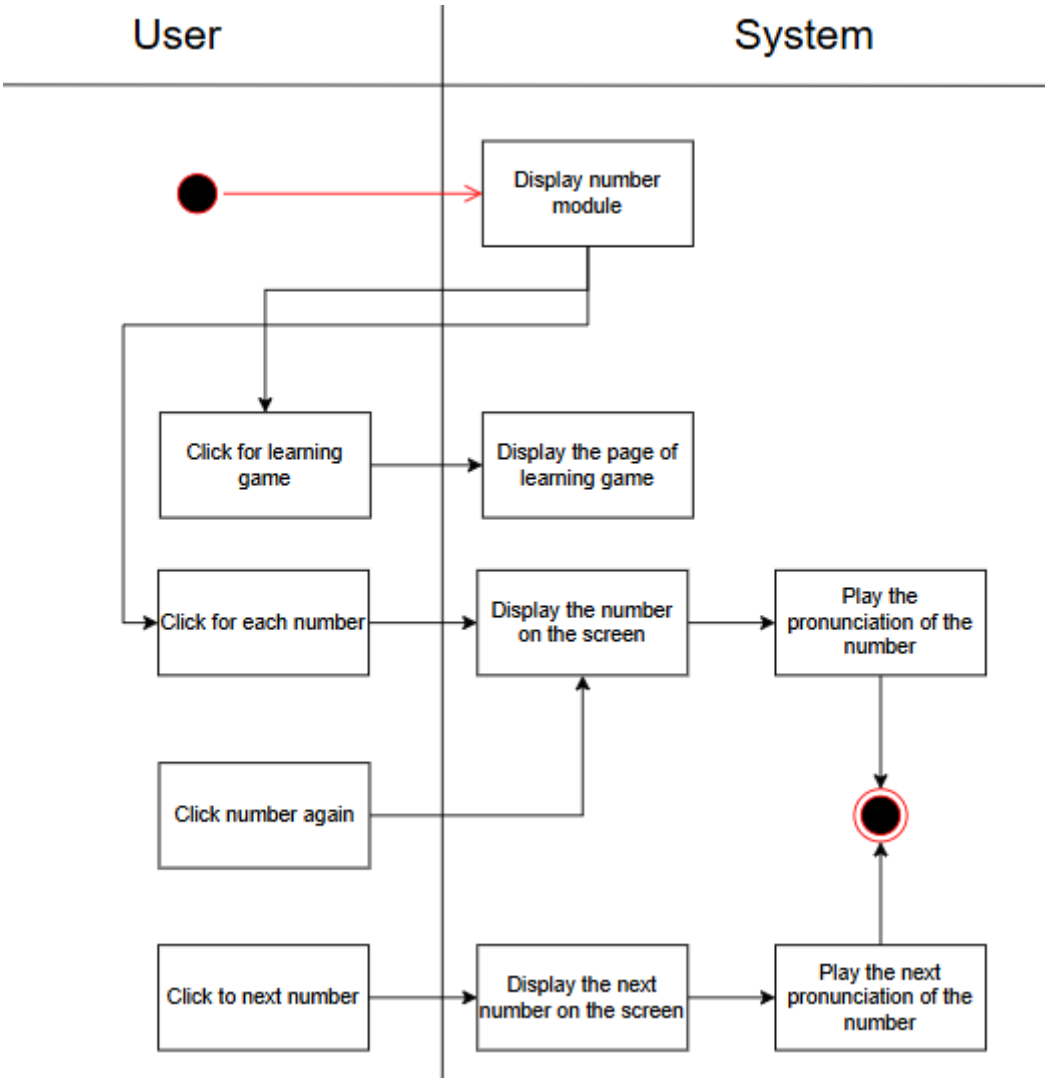


Figure 3.6 Number Module Activity Diagram

The number module's activity diagram is displayed in Figure 3.6. Users can start their learning journey or access a variety of learning games through this module. The module shows the numbers 1 through 20, with the name and pronunciation displayed when the user clicks on the number. The user only needs to click on the number once more to hear the pronunciation aloud.

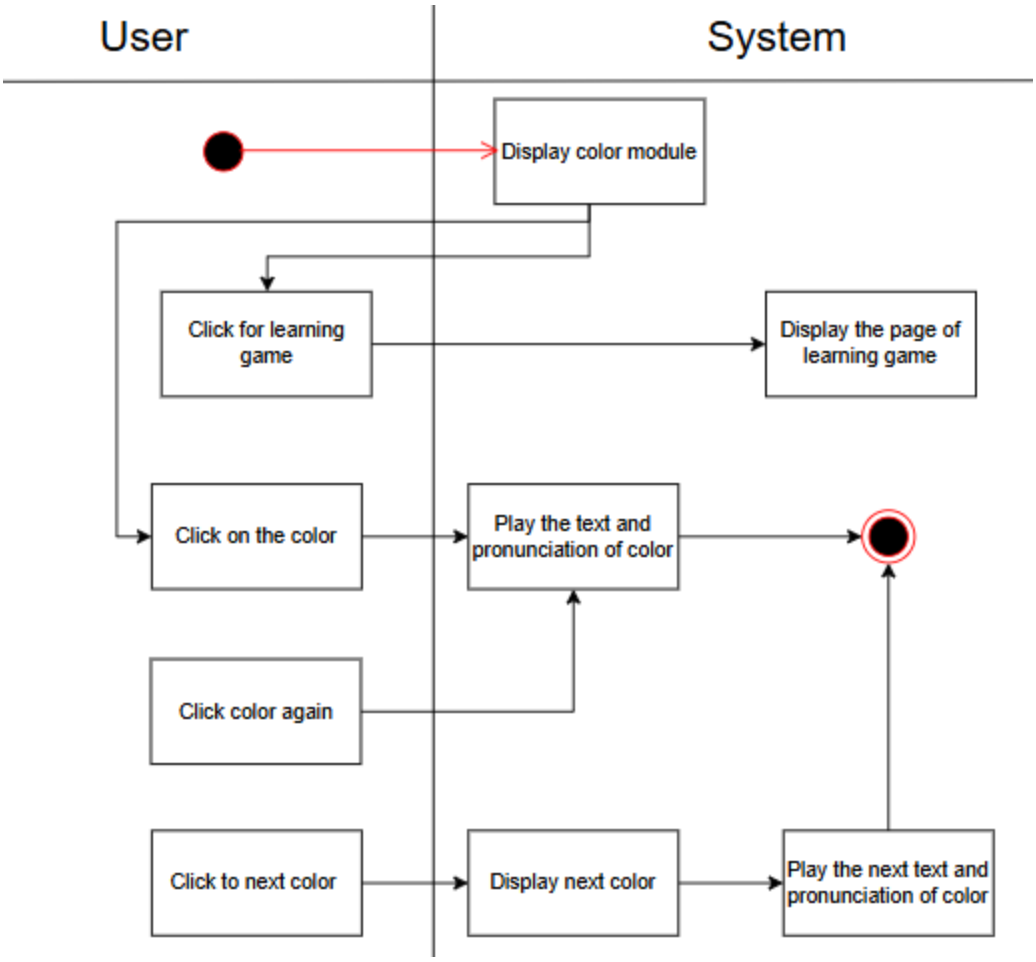


Figure 3.7 Color Module Activity Diagram

Figure 3.7 shows the activity diagram of the color module. Through this module, users can access learning games or begin their color learning journey. The module displays different colors, and when a user clicks on a color, its name and pronunciation are shown. If the user wants to hear the pronunciation again, they can simply click on the color once more.

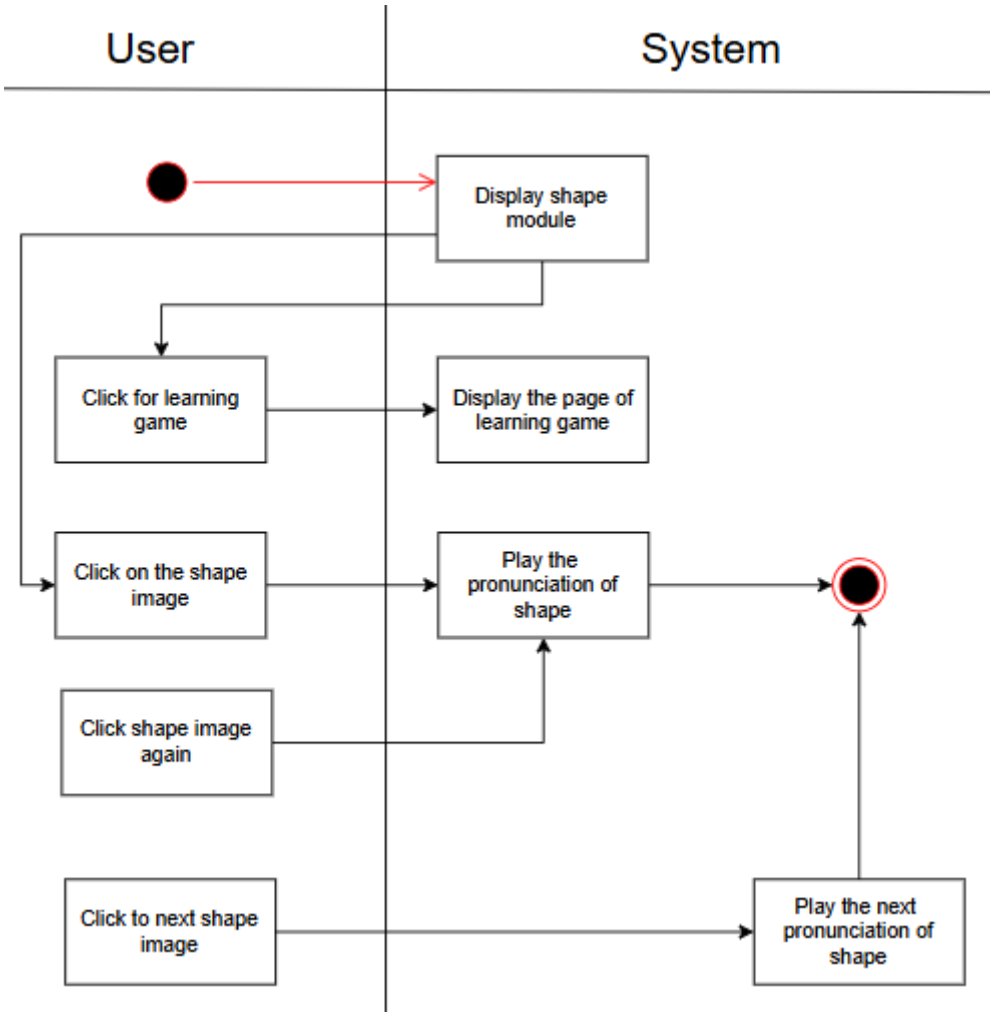


Figure 3.8 Shape Module Activity Diagram

Shape module activity diagram has been shown in figure 3.8. This module allows users to access learning games and begin their shape learning adventure. When a user clicks on one of the various shapes the module shows, its name and pronunciation are displayed. The user only needs to click on the shape image one more to hear the pronunciation again.

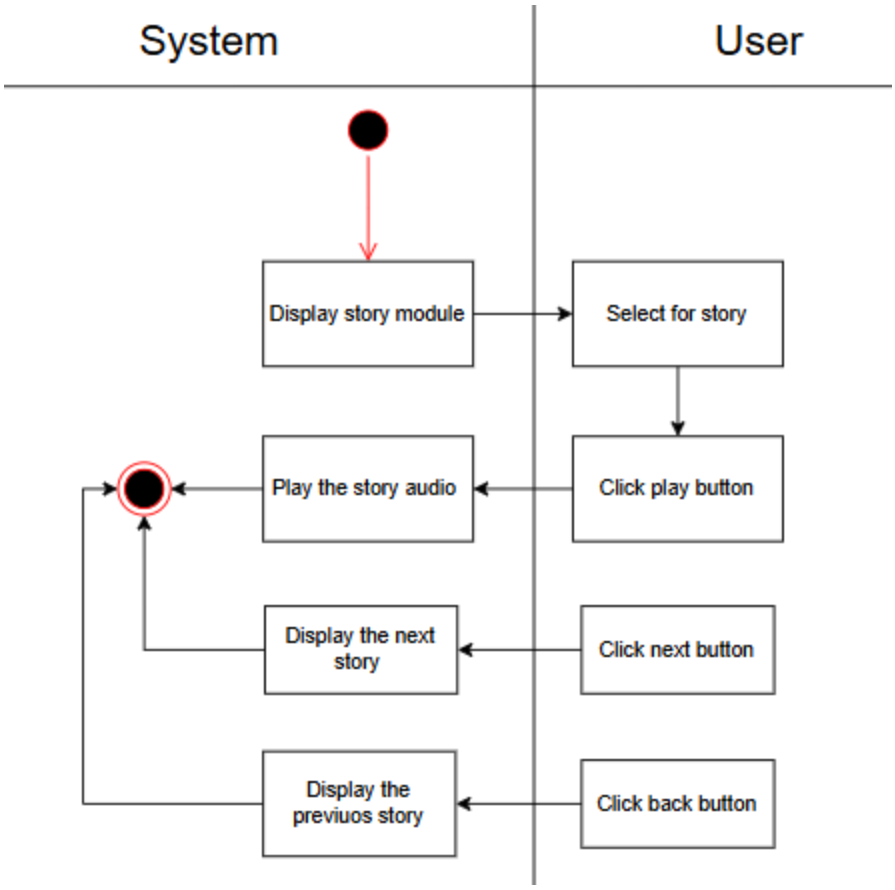


Figure 3.9 Story Book Module Activity Diagram

Figure 3.9 shows the activity diagram of the storybook module. In this module, users can choose a story they are most interested in to begin listening to it. The module displays a selection of stories, and when a user selects a story, the narration begins. As the story progresses, the text is highlighted to match the narration, enhancing the reading experience. If the user wants to hear a part of the story again, they can simply click the play button to repeat the narration.

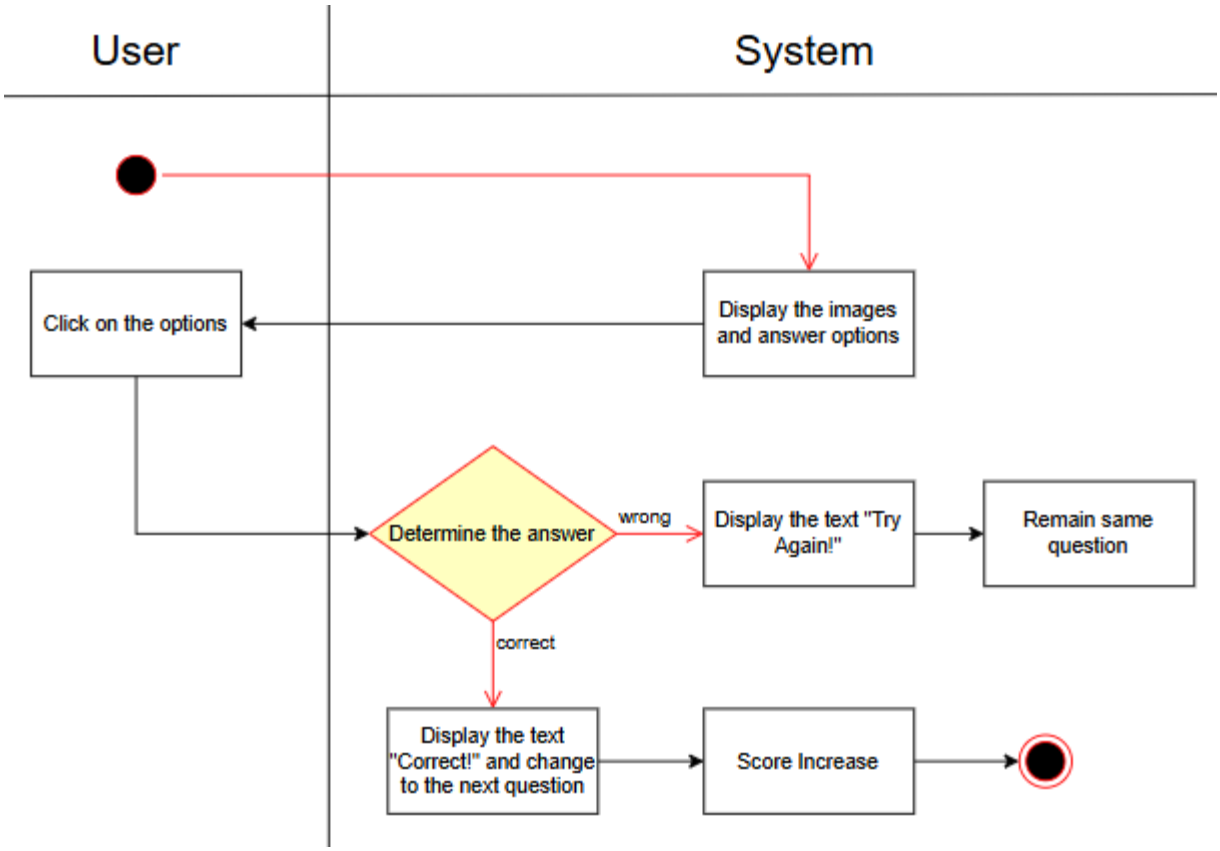


Figure 3.10 Color Learning Game Activity Diagram

Figure 3.10 shows the activity diagram of the color learning game module. Users can access this learning game through the lesson module. It will display the question image and a few of answer option in this to let users choose for the related answer. The user may be required to click on the appropriate response depending on the question when the activity presents questions with color-coded options. If the user selects the correct response, the question and their score will be updated.

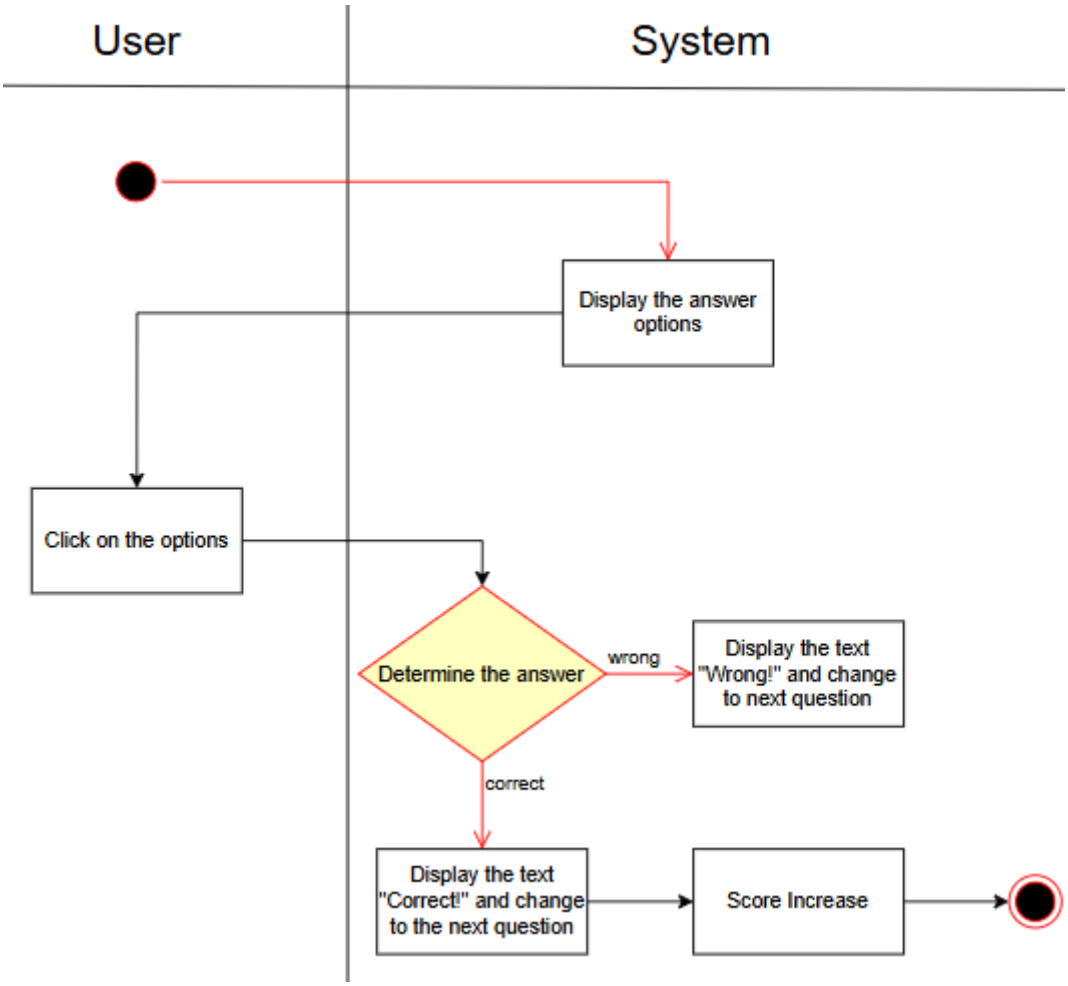


Figure 3.11 Math Learning Game Activity Diagram

The activity diagram for the math learning game module is displayed in Figure 3.11. This educational game is accessible to users via the lesson module. To allow users to select the appropriate response, it will show the question image along with a few possible answers. When the activity displays questions with a few of options, the user might have to select the correct answer based on the question. The question and the user's score will be updated if they choose the right answer.

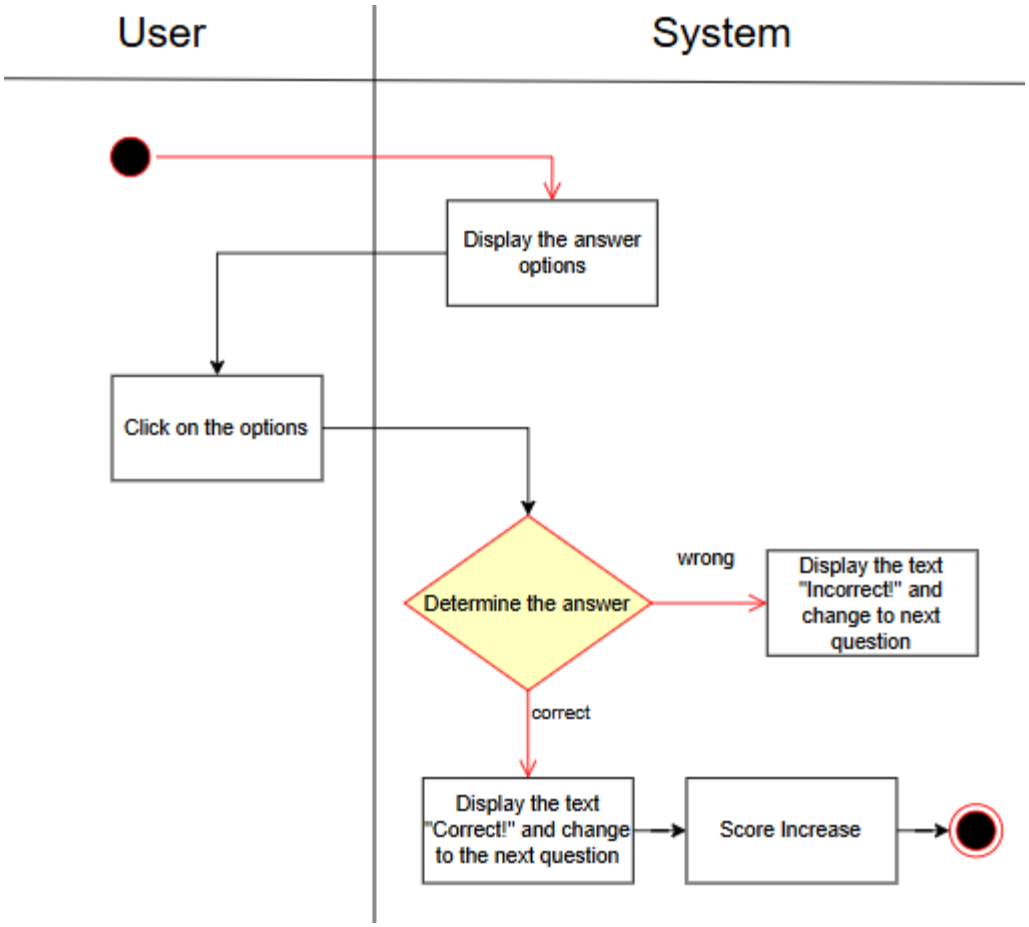


Figure 3.12 Alphabet Learning Game Activity Diagram

The alphabet learning game module's activity diagram is displayed in Figure 3.12. Through the lesson module, users can access this educational game. Users will be able to select the appropriate response by viewing the question image along with a few related answer options. In cases where the activity displays questions with the options, the user might be asked to select the correct answer. The question will be updated along with the user's score if they choose the right answer.

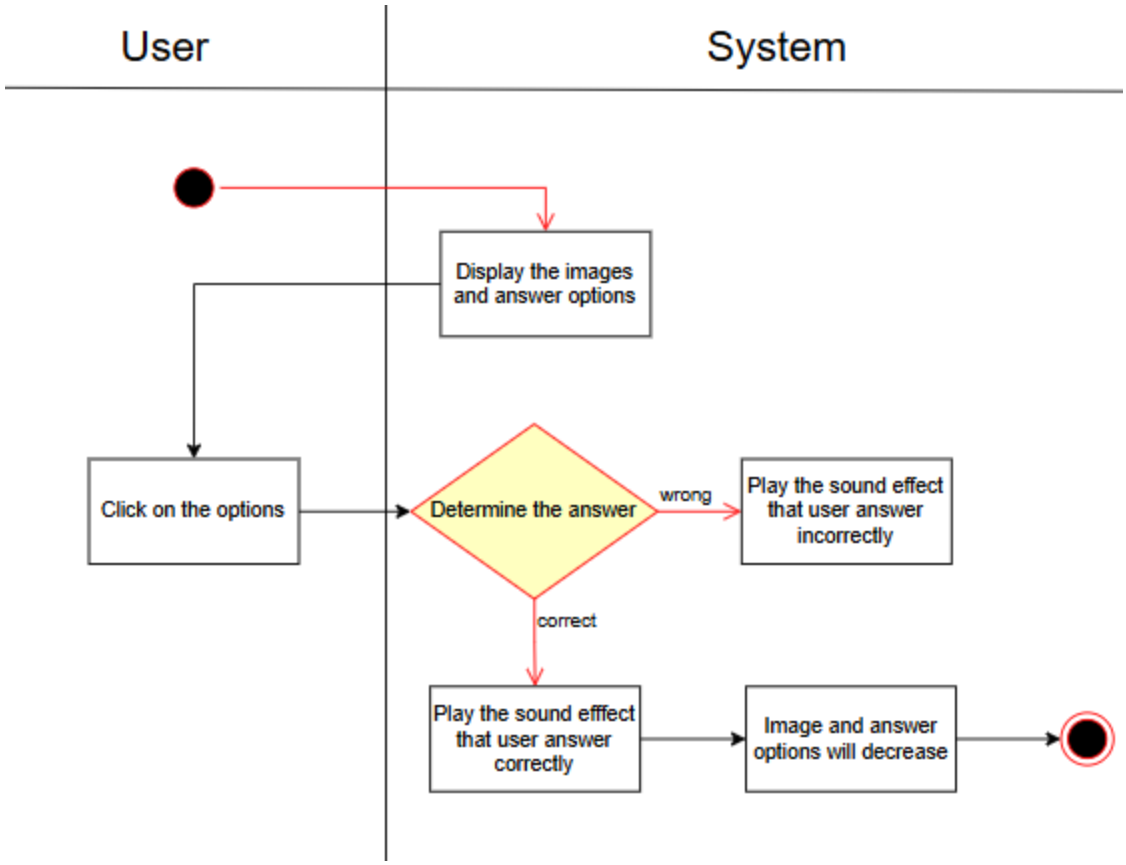


Figure 3.13 Shape Learning Game Activity Diagram

Figure 3.13 shows the activity diagram for the shape learning game module. Users can access this instructional game via the lesson module. The user can select the right answer by looking at the question picture and some related answer options. If the user selects the correct answer, the associated question pictures and answer options are reduced.

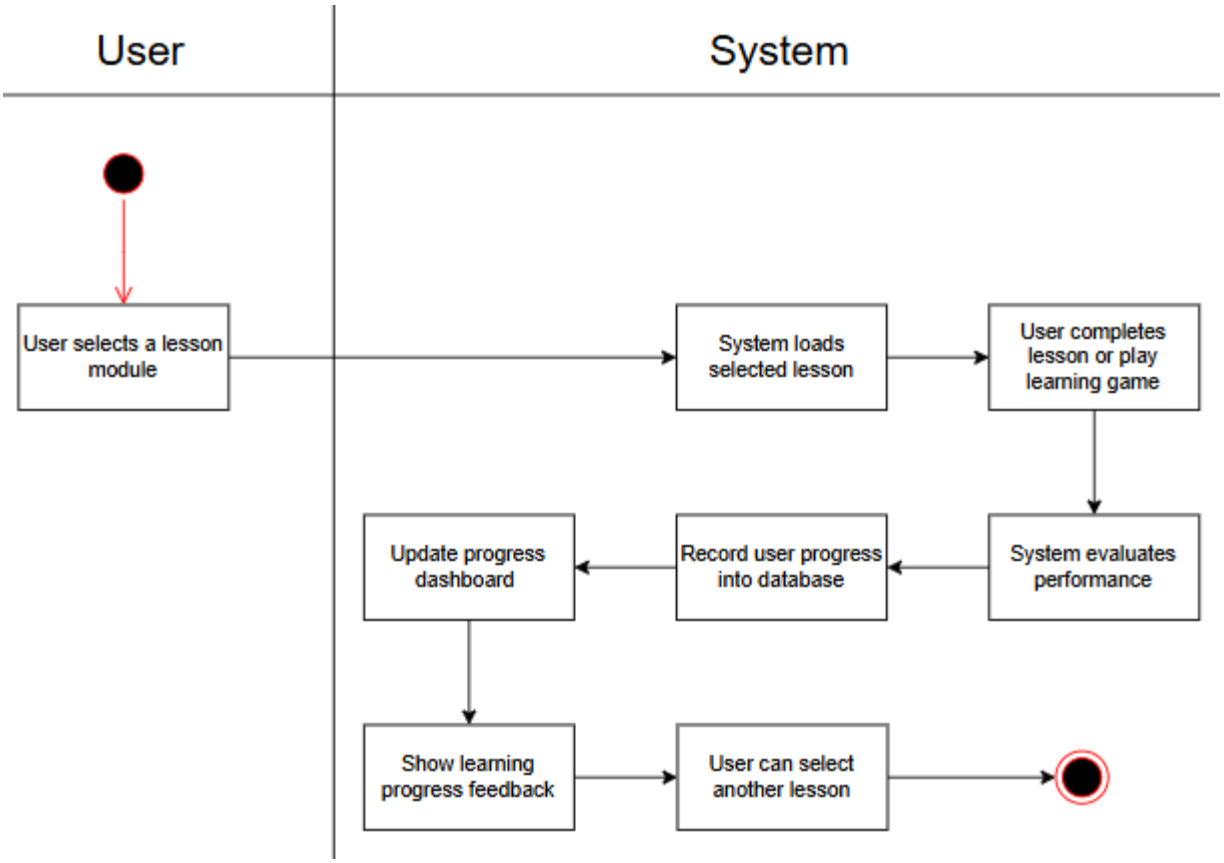


Figure 3.14 Learning Progress Tracking Activity Diagram

The activity diagram for the Learning Progress Tracking System in Figure 3.14 presents the operation flow for progress recording. Progress can be recorded by choosing course modules such as Colors, Numbers, Shapes, Letters or Storybook. When a lesson or quiz is completed, the system evaluates the user's performance and updates the outcome in the database. Recent progress is indicated to users and parents to monitor progress in learning. This cycle is repeated when the user selects a new lesson.

3.3 Timeline

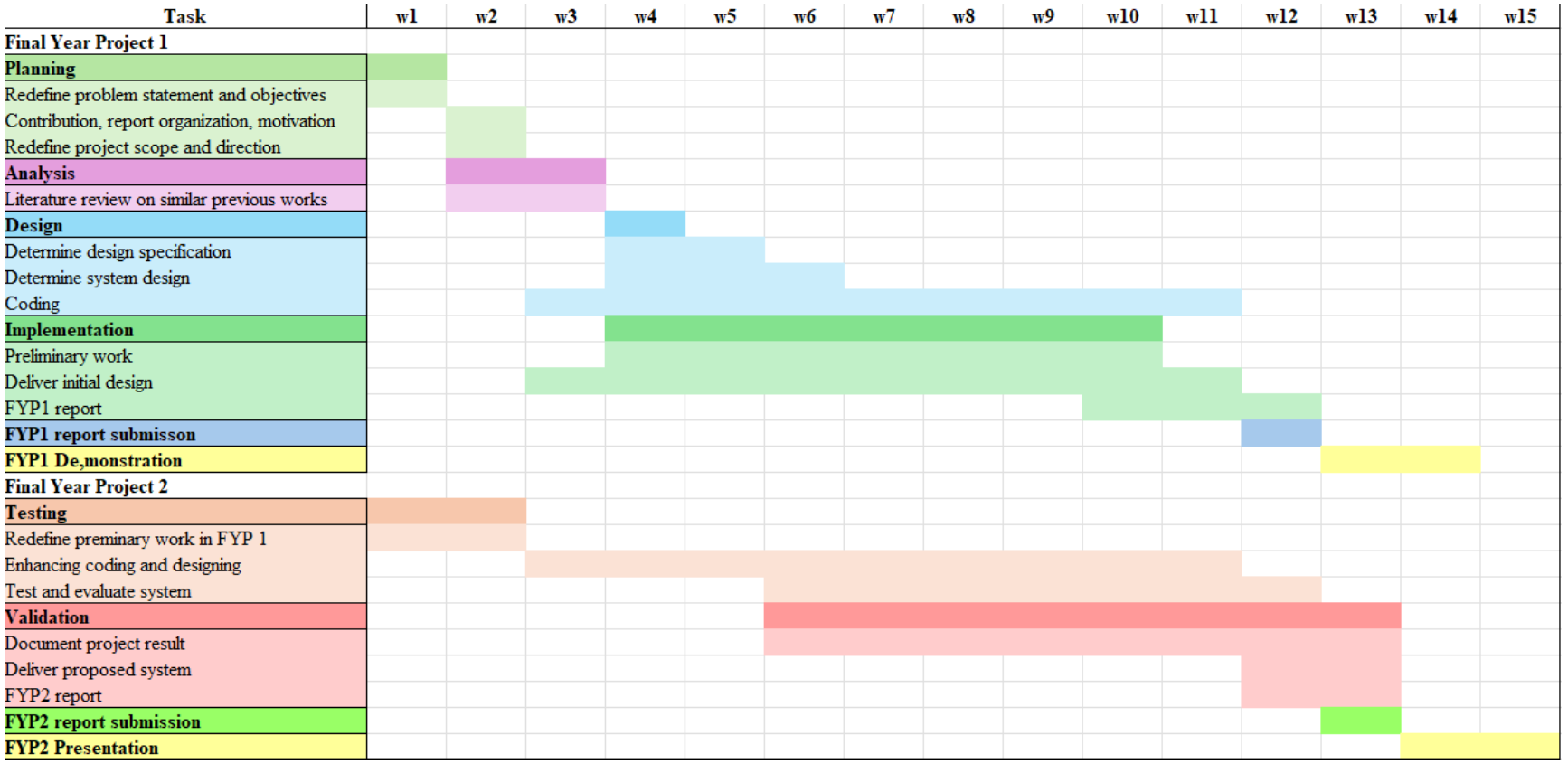


Figure 3.15 Timeline of project

Chapter 4 System Design

4.1 System Block Diagram

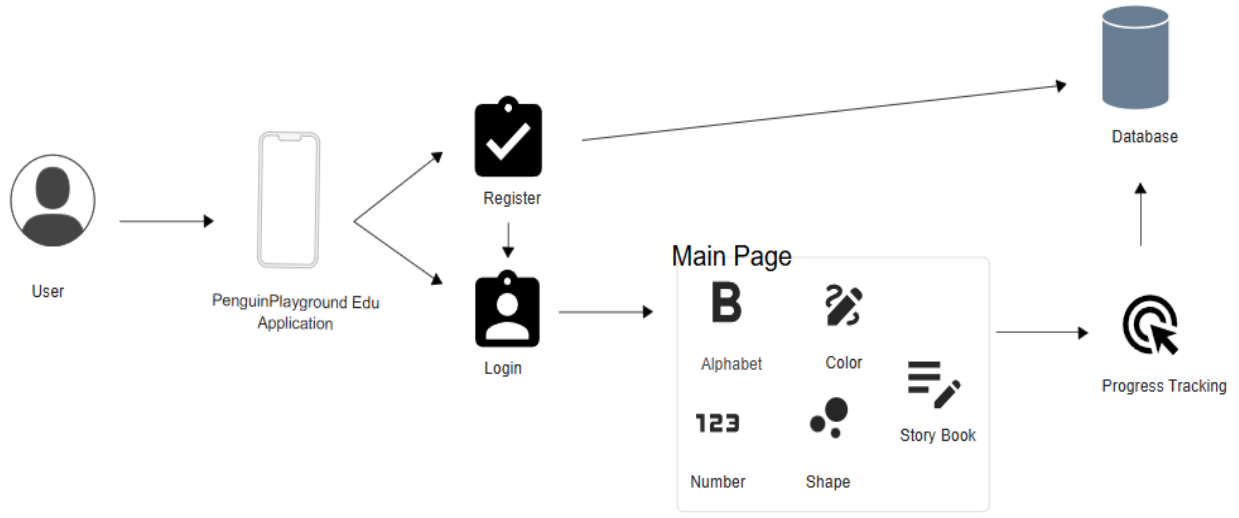


Figure 4.1 System Block Diagram

This block diagram illustrates the process flow of the entire system of kindergarten learning application designed to make learning easier for kids and tracking their progress. The system begins with the User, either registering a new or logging into an existing account. Upon successful login, the user is sent to the main page of the learning application, which serves as the main navigation center for all the learning modules.

Through the main page, there are five main learning modules accessible to the user which are Alphabet, Color, Math, Story Book, and Shape. Each module has interactive learning content, activities, and learning games to support the learning and interest of the child in that specific topic. The modules are designed to be both entertaining and educational so that learning is productive and enjoyable for child users.

After the user has interacted with a module, the system automatically sends performance data to the progress tracking component. The system component monitors and evaluates the learning activity of the user, such as game completion and lesson time spent. The collected progress data is stored in the database, which stores learning records securely and retrievable at

any given time. This structure enables the system to provide real-time response as well as long-term learning progress monitoring.

4.2 Flow Chart Diagram

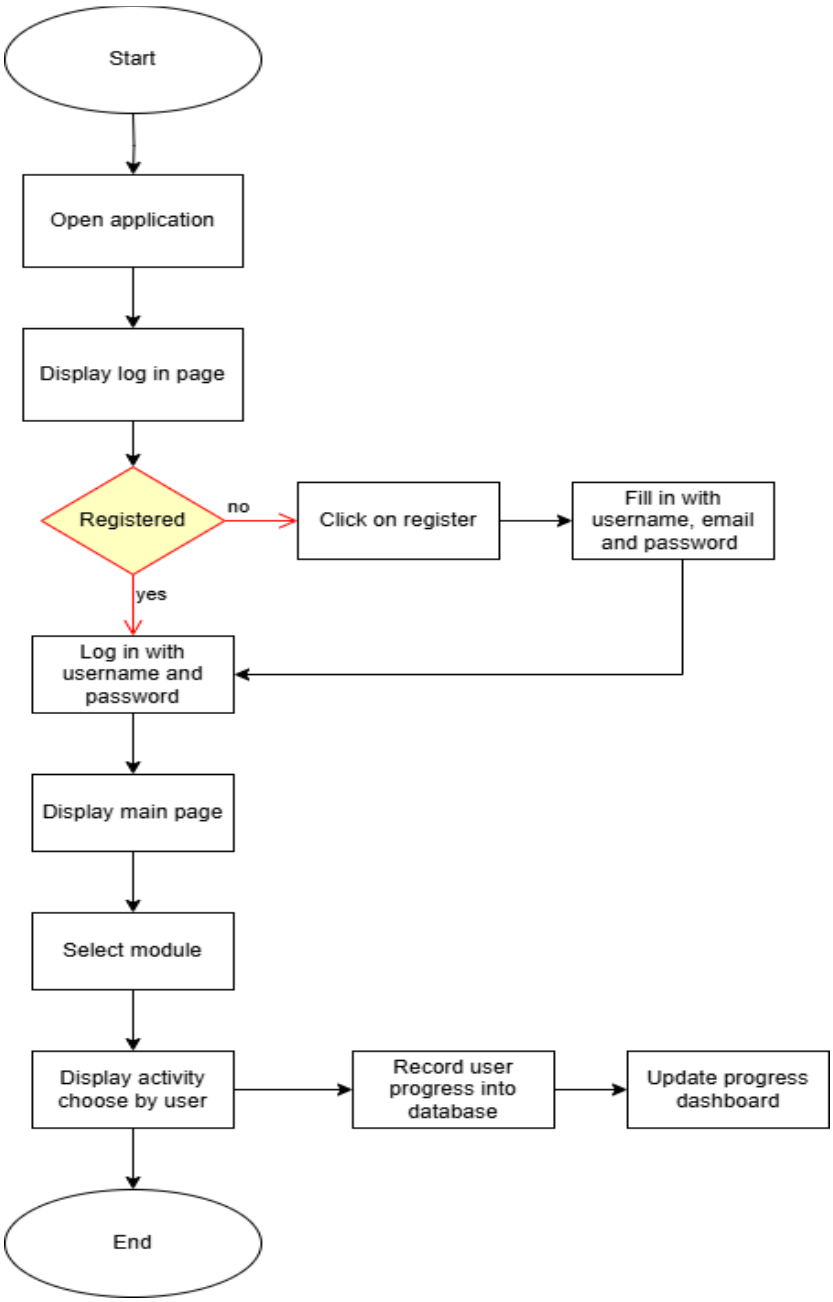


Figure 4.2 Overall Flowchart

The diagram shows the overall flowchart of the kindergarten learning application. The first thing users will see when they open the app will be the login page. Those who already have an account will be able to log in directly by entering their username and password, while for new users who don't have an account will need go to the register page to sign up an account to get access to the application. The username, email and password were created by users will be stored in the database once they register successfully.

Besides, the system checks that the information is accurate when a user inputs their username and password. If they are incorrect, the system will not allow the user to access the application. The application main page will be the first thing the user sees after successfully access into their account. They can select different lesson module who interested in, such as Color, Math, Shape, Alphabet, or Story Book. After selecting a module, the system will display the activity selected by the user. The user's progress is automatically tracked in the database as they complete the learning task. Users will be able to follow progress over time and assess learning results thanks to the progress dashboard being updated with the recorded data.

4.3 Entity Relationship Diagram

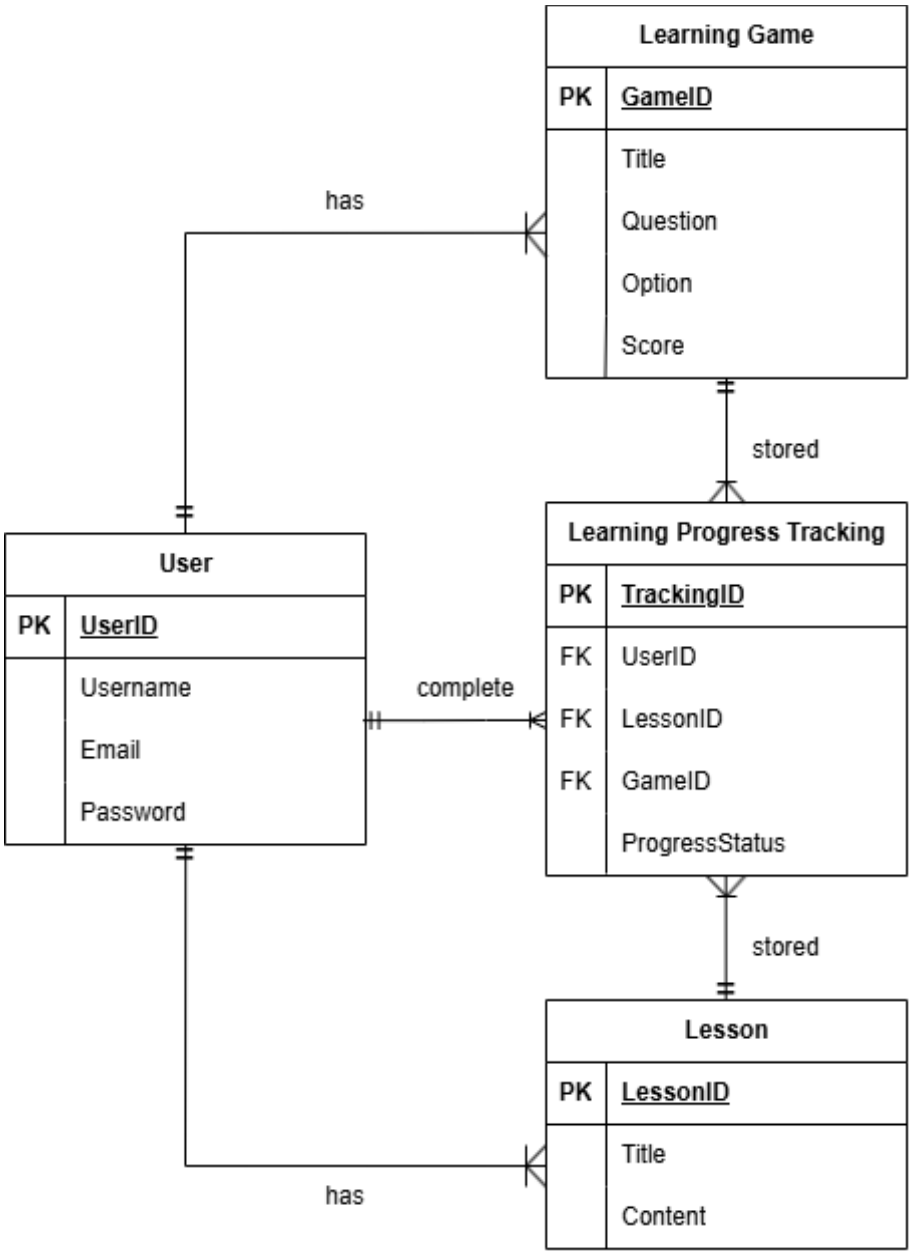


Figure 4.3 Entity Relationship Diagram

The Entity Relationship Diagram (ERD) shows the structure of the kindergarten learning application and highlights the relationships between its main entities. Users must create an account with a unique user ID, and the same user can participate in multiple learning activities. Their individual progress is monitored via the learning progress tracking entity. Courses are addressed by unique course IDs for different learning module. A course can be accessed by more than one

user. Learning games are associated with courses and consist of questions, choices and scoring criteria intended to strengthen the learning material. Every game is addressed by a GameID and can be played by more than one user.

Learning progress tracking entity acts to bridge the gap between game, user, and course and maintains basic information such as courses completed, games played and current status of progress. ERD connection is primarily 'one-to-many', a learning game will have multiple records of progress, a course might have several records of progress associated with it, and a user will have multiple records of learning progress. This architecture allows the system to effectively manage and monitor the learning activities, game play, and educational progress of every user.

4.4 Wireframe

Wireframes act as the basic plan for designing the interface of the kindergarten learning app. They map out the structure, layout, and features that will show up on each page of the system. This step plays a key role to picture how users will interact and move around the system. Also, wireframes help to line up the design with what the system aims to do making sure all planned features are thought about. Below was the current wireframe of my project application.

A. Login Page

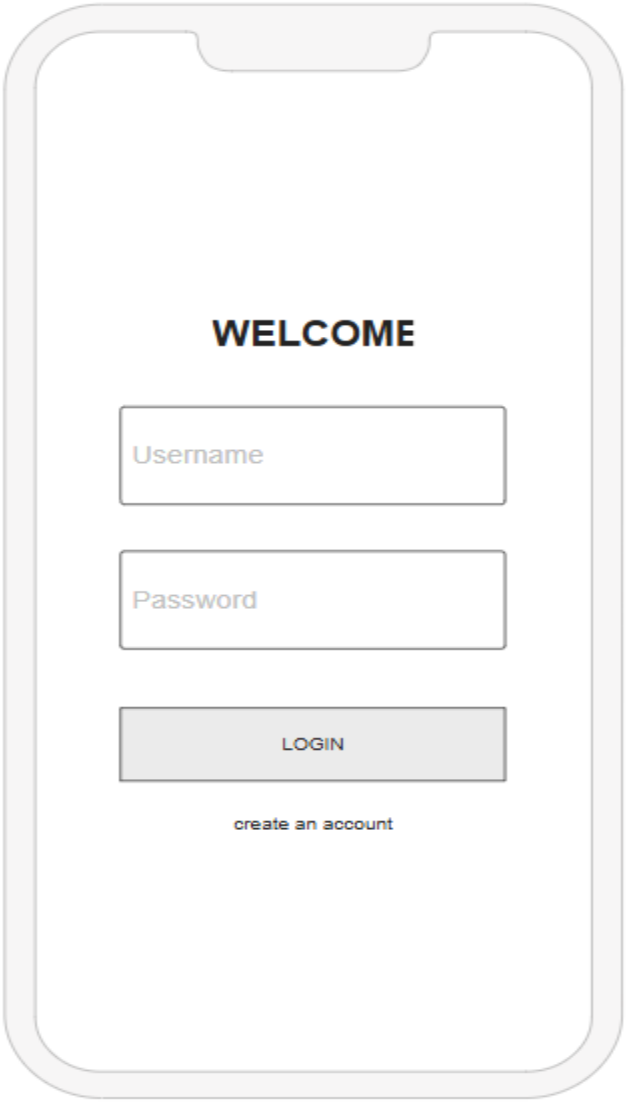


Figure 4.4 Login Page Wireframe

B. Register Page

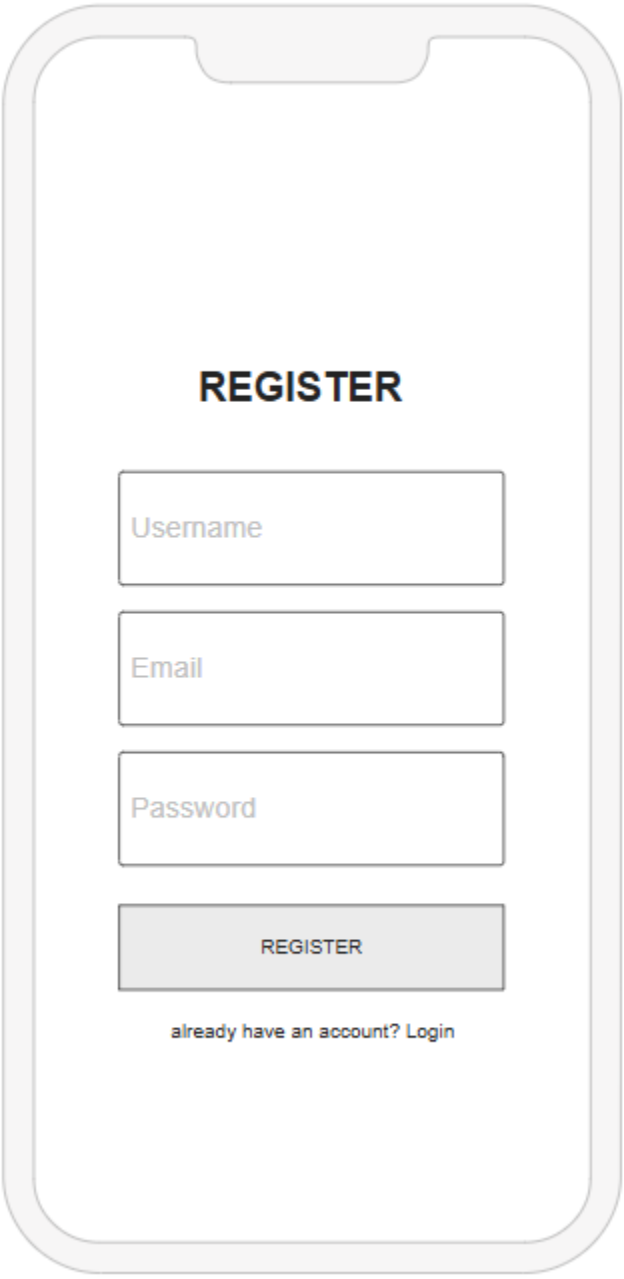


Figure 4.5 Register Page Wireframe

C. Main Page

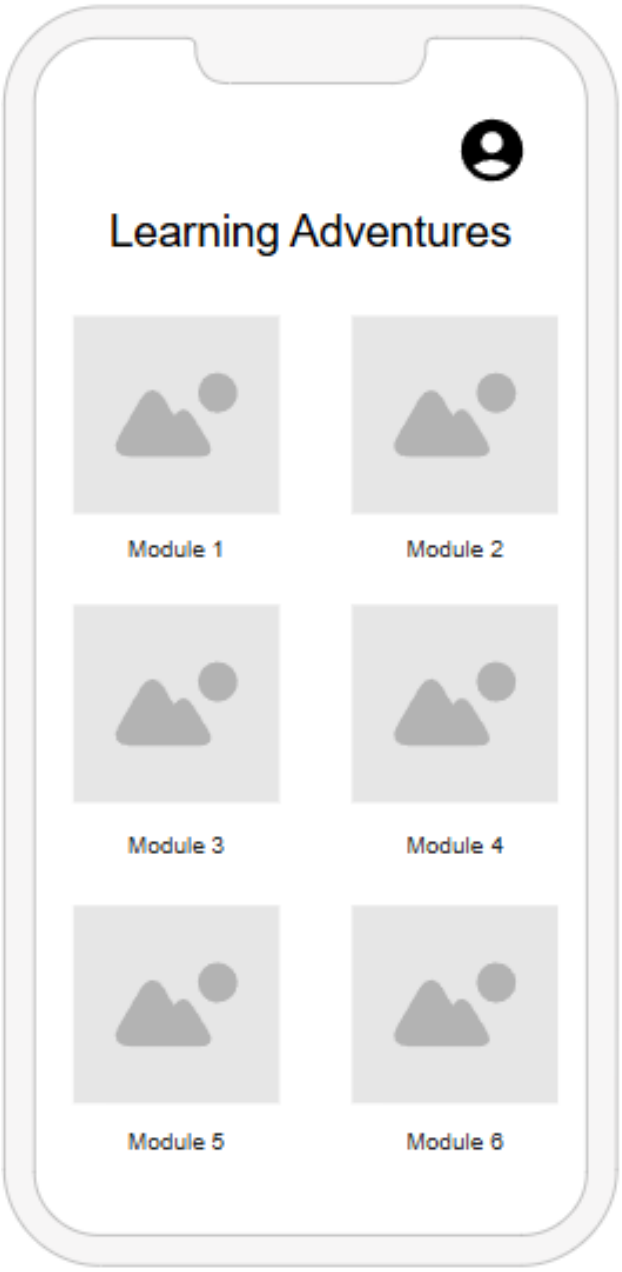


Figure 4.6 Main Page Wireframe

D. Alphabet Lesson Module

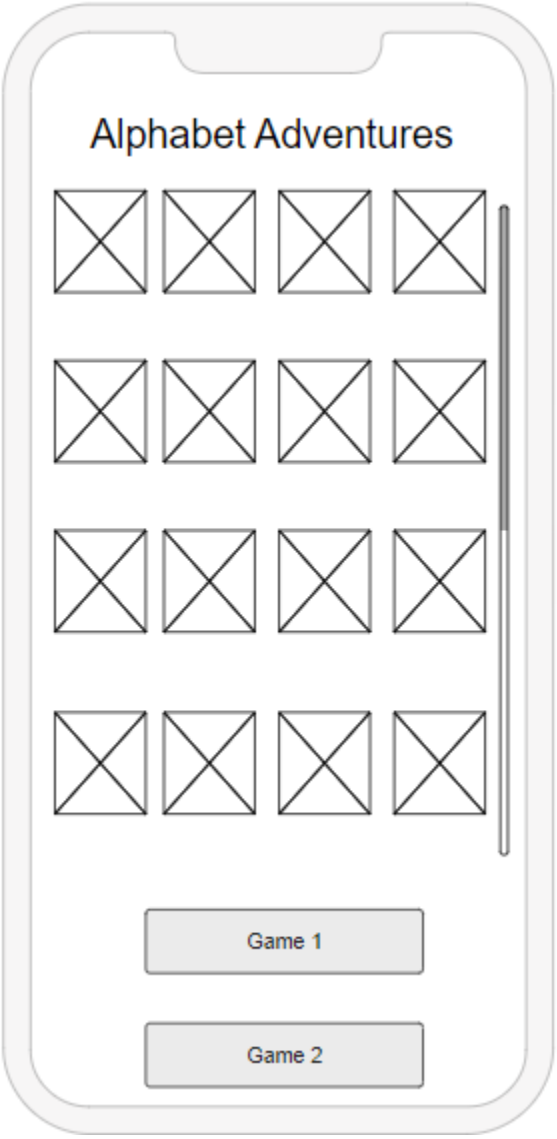


Figure 4.7 Alphabet Lesson Module Wireframe

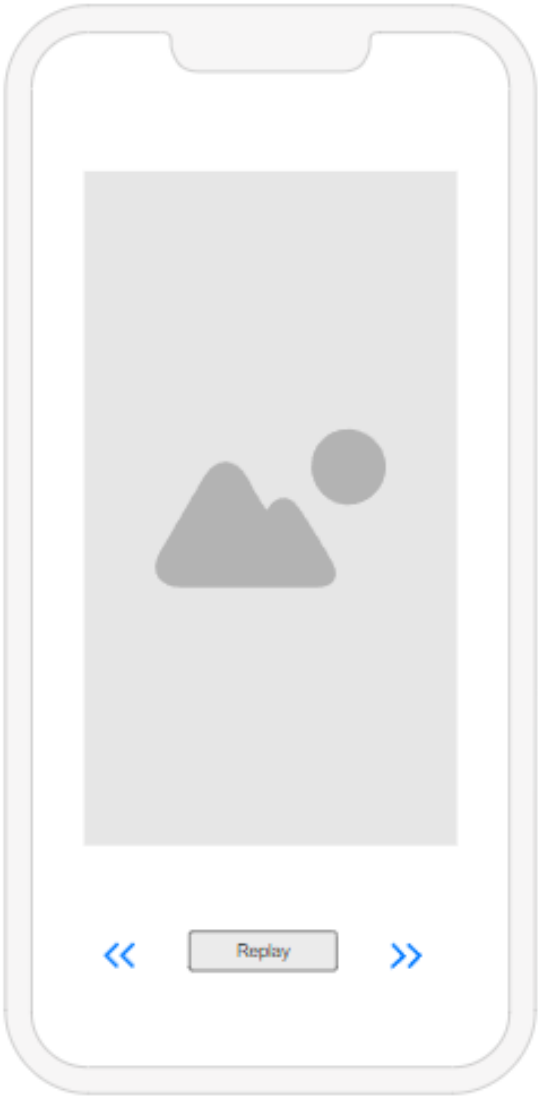


Figure 4.8 Image Display in Alphabet Lesson Module

E. Alphabet Learning Game Module

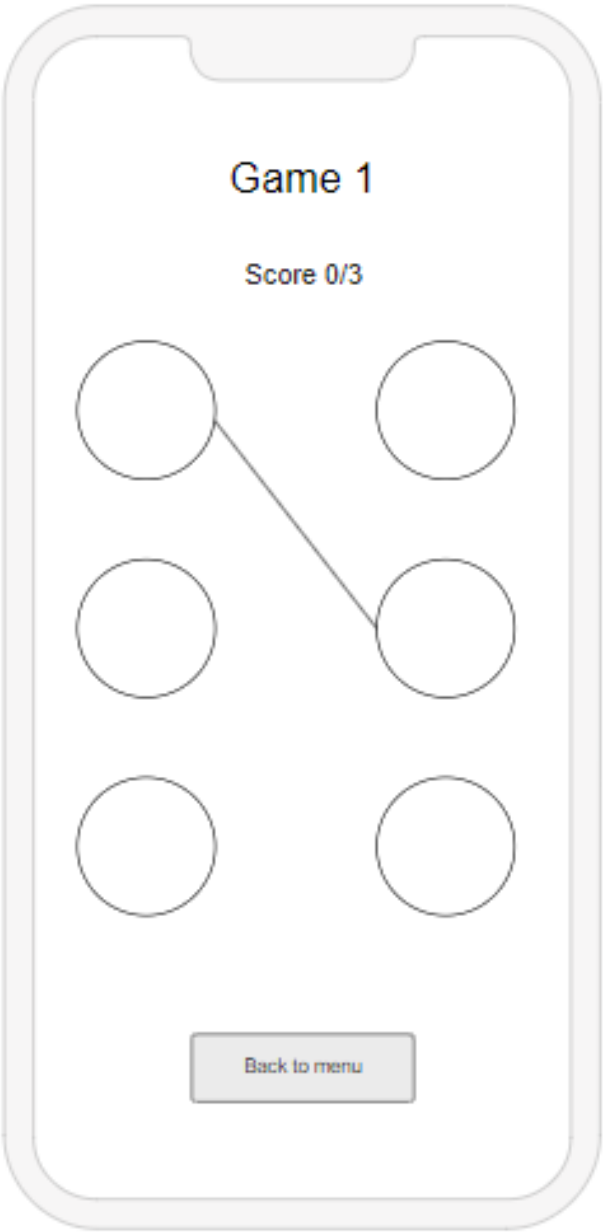


Figure 4.9 Alphabet Learning Game 1 Module Wireframe

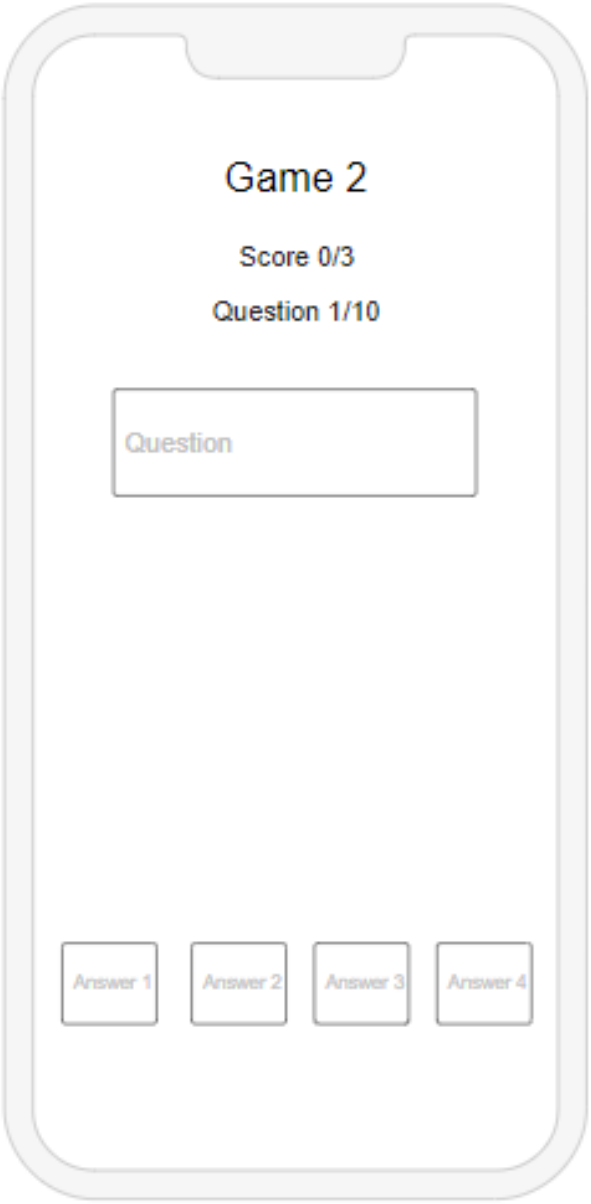


Figure 4.10 Alphabet Learning Game 2 Module Wireframe

F. Dialog of Alphabet Learning Game Module

Figure 4.11 Dialog of Alphabet Learning Game Module Wireframe

G. Color Lesson Module

Figure 4.12 Color Lesson Module Wireframe

H. Color Learning Game Module

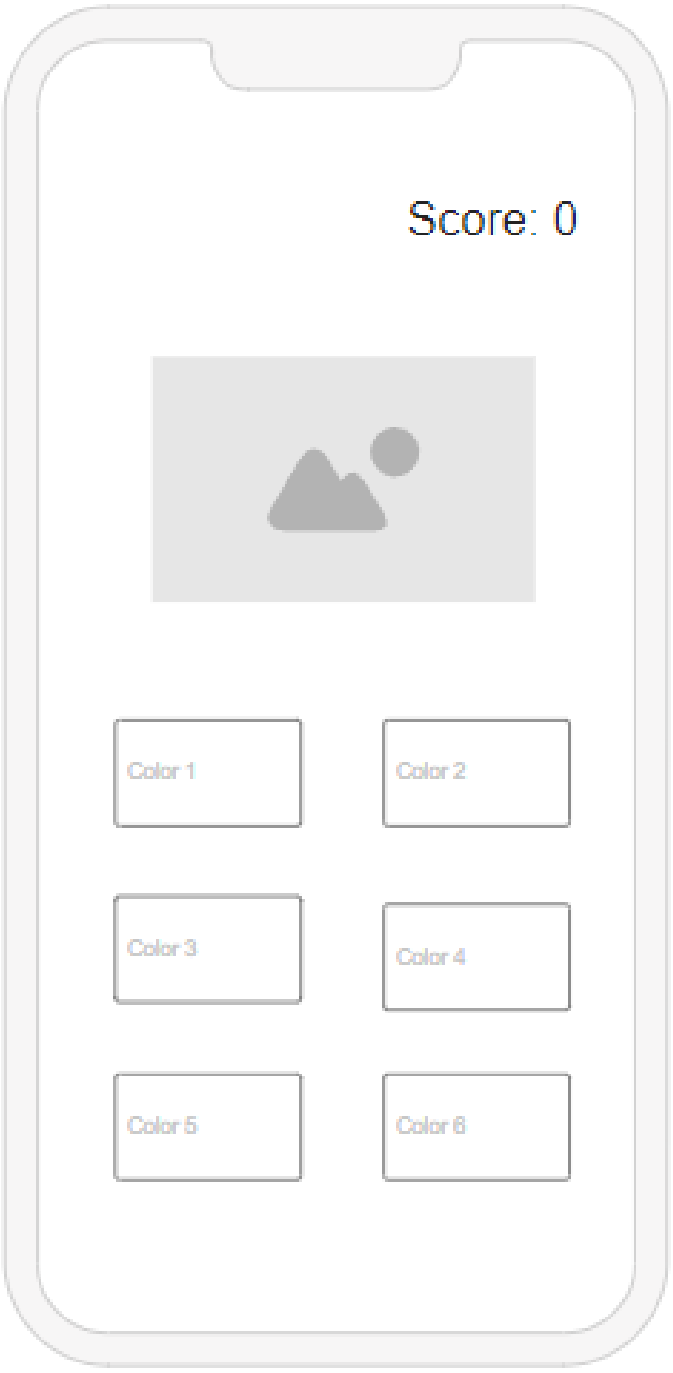


Figure 4.13 **Color Learning Game Module Wireframe**

I. Dialog of Color Learning Game Module

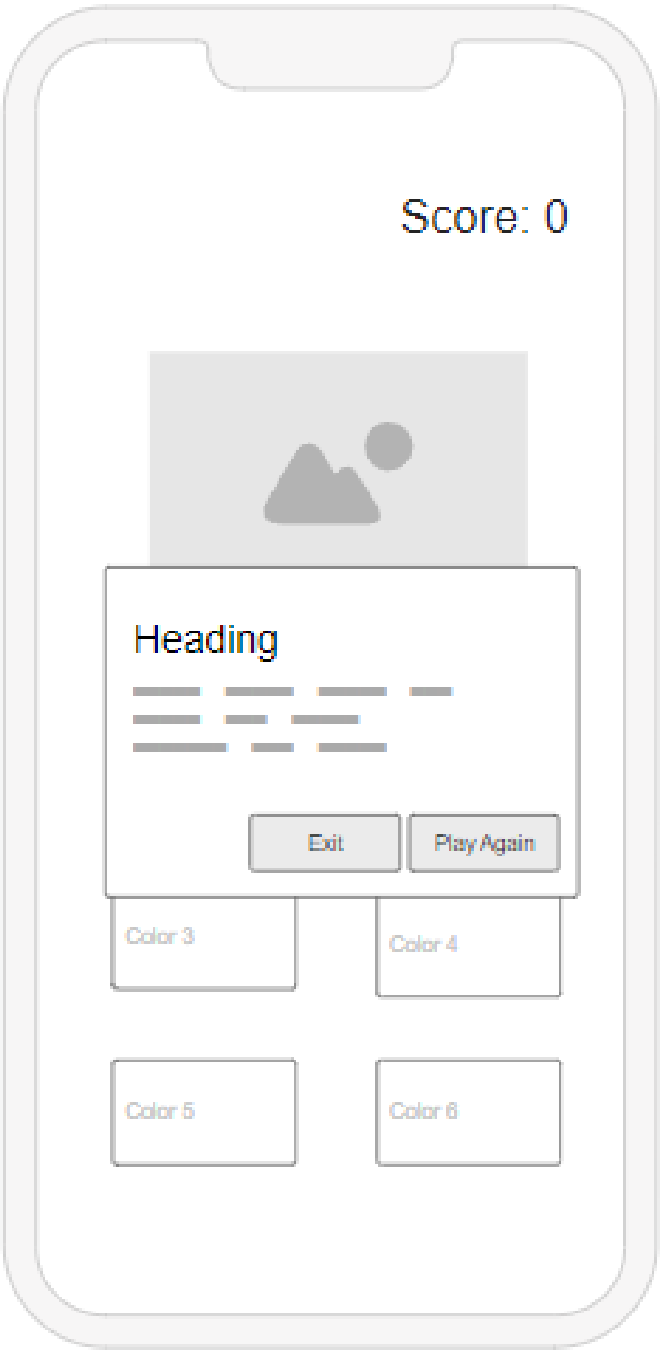


Figure 4.14 Dialog of Color Learning Game Module Wireframe

J. Number Lesson Module

Figure 4.15 Number Lesson Module Wireframe

K. Math Game Module

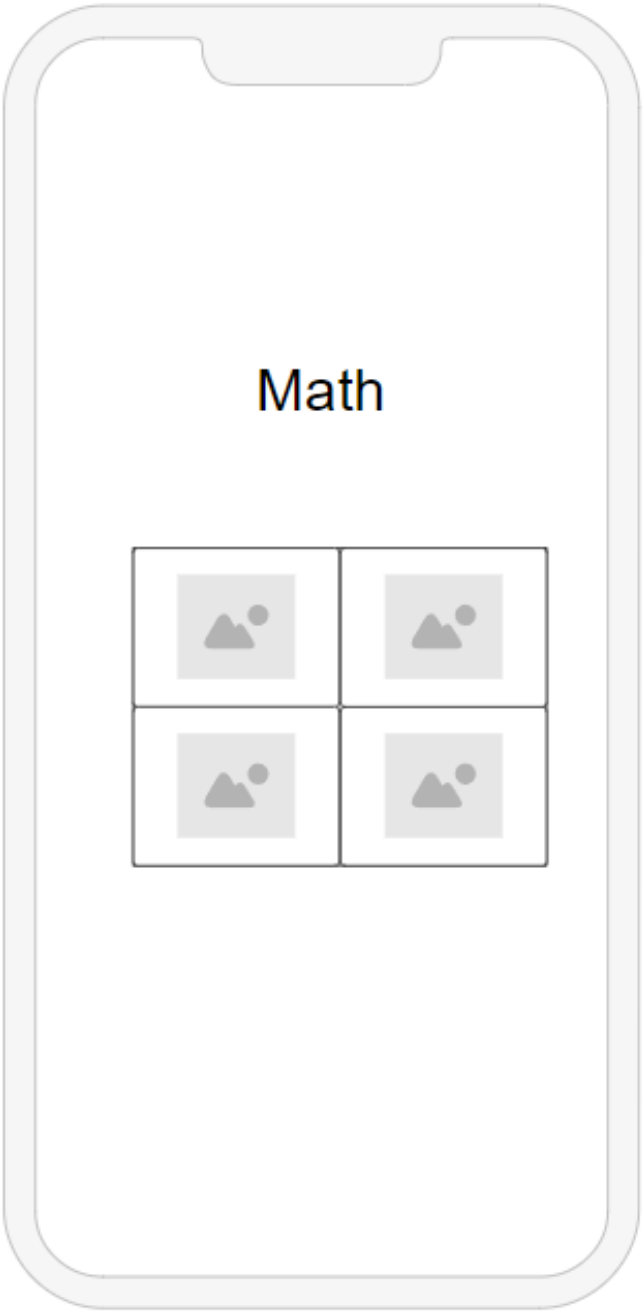


Figure 4.16 Math Game Module Wireframe

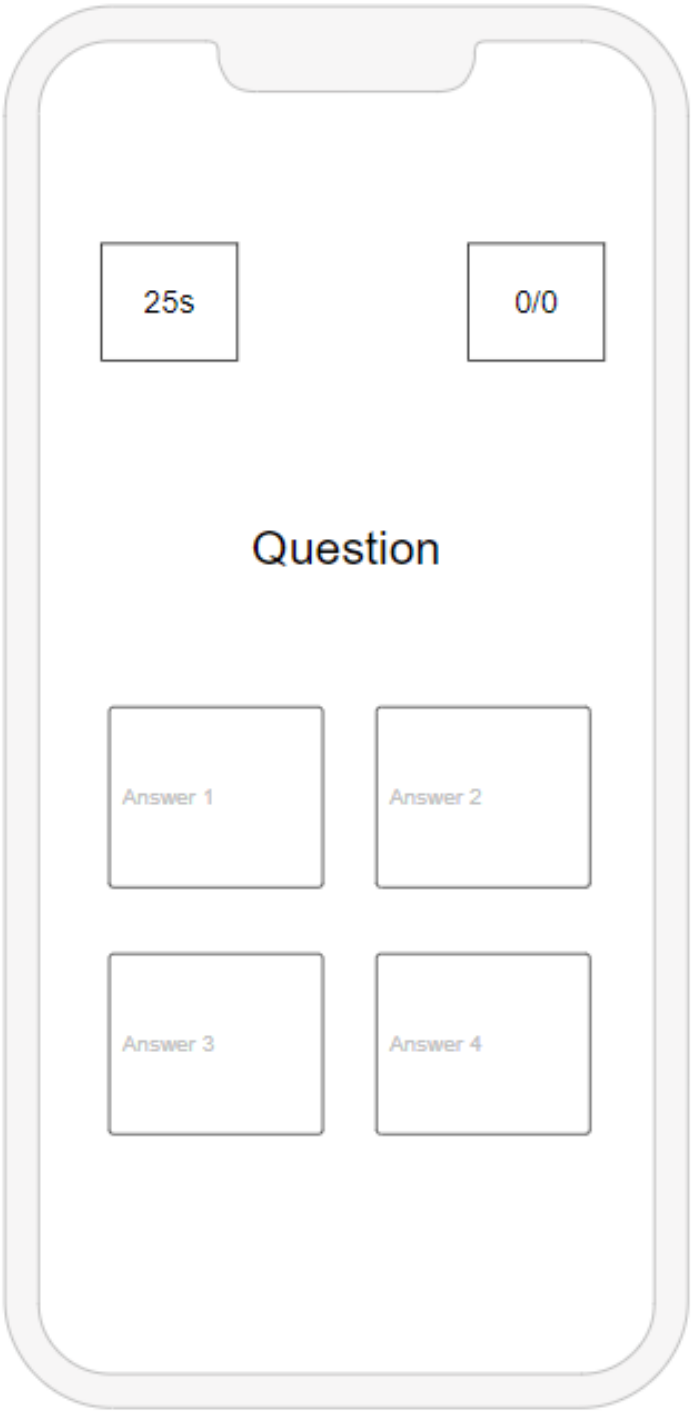


Figure 4.17 Math Game Module Display the Question Wireframe

L. Dialog of Math Game Module

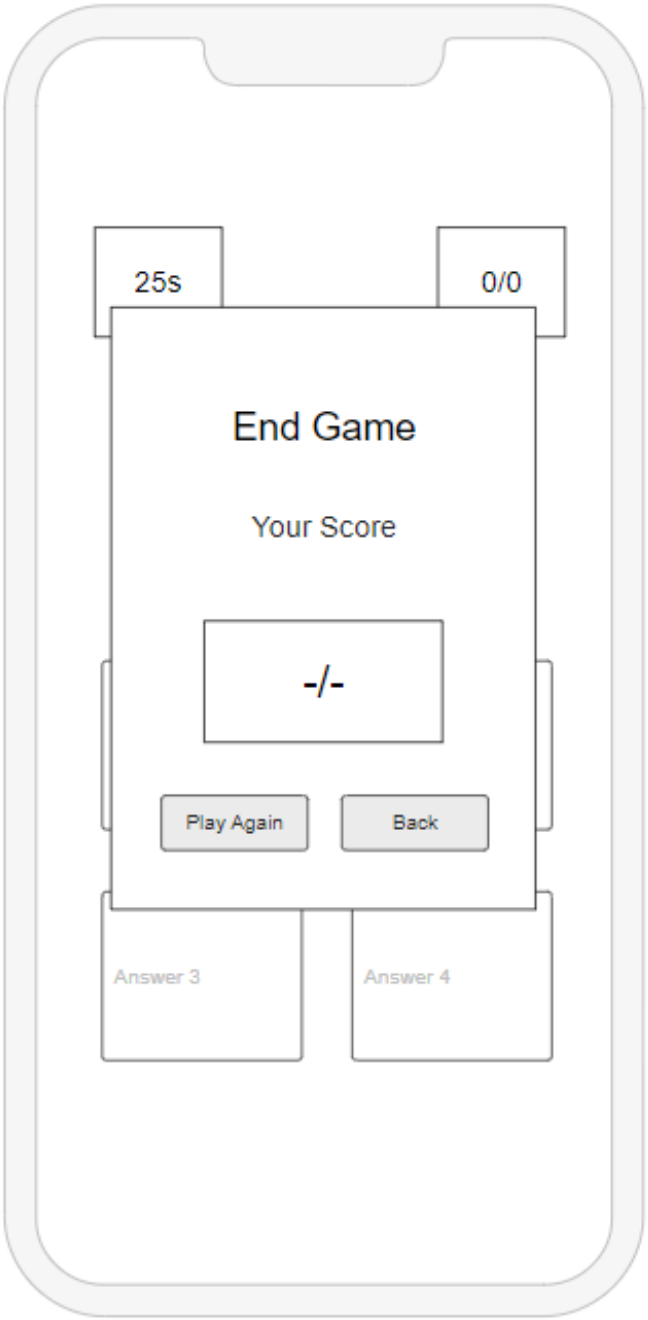


Figure 4.18 Dialog of Math Game Module Wireframe

M. Shape Lesson Module

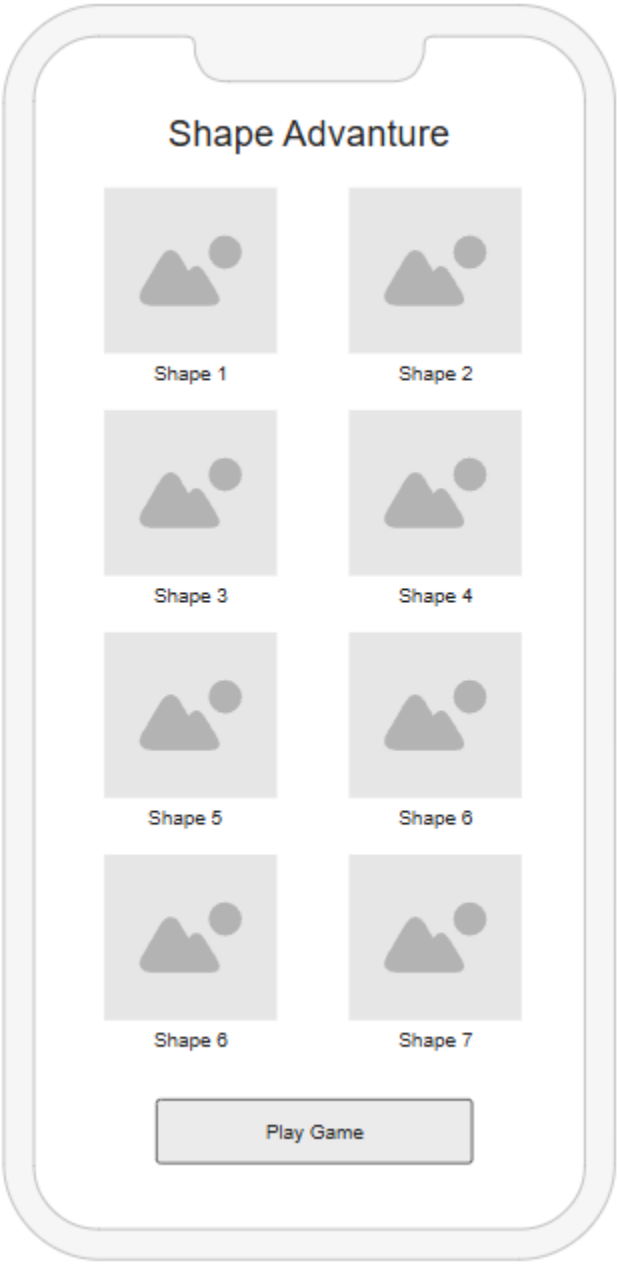


Figure 4.19 Shape Lesson Module Wireframe

N. Shape Learning Game Module

Figure 4.20 Shape Learning Game Module Wireframe

O. Story Book Module

Figure 4.21 Story Book Module Wireframe

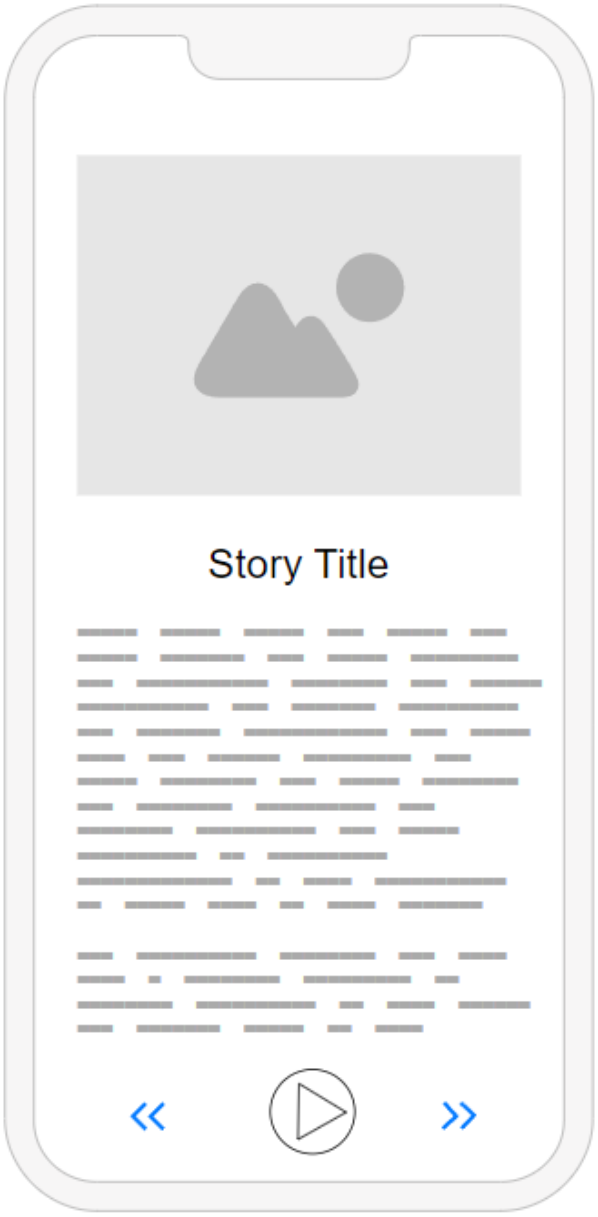


Figure 4.22 Story Book Module Wireframe

P. Learning Progress Tracking

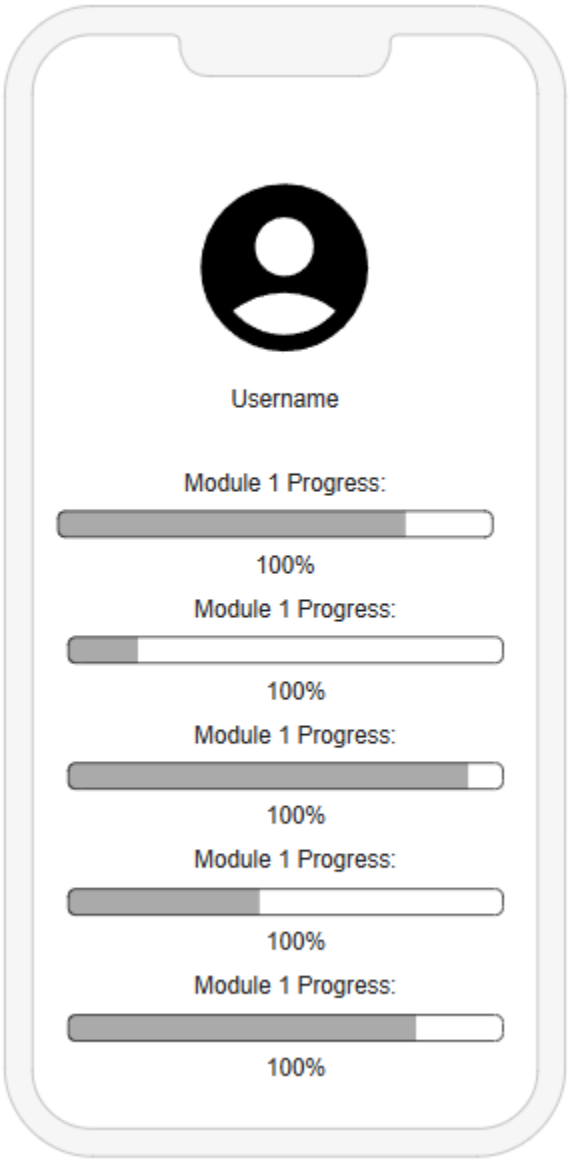


Figure 4.23 Learning Progress Tracking Wireframe

Chapter 5 System Implementation

5.1 Hardware Setup

The project's hardware consists of an Android mobile smartphone and a computer. When used for developing, designing, and testing apps, a computer boosts productivity by offering plenty of screen real estate for multitasking during the design and development stages. While mobile applications are tested on a mobile device with varying screen sizes and operating systems.

Laptop Specification	
Model	Asus TUF Gaming
Processor	AMD Ryzen 5 3550H with Radeon Vega Mobile Gfx 2.10 GHz
Operating System	Windows 10
RAM	NVIDIA GeForce GT 930MX 2GB DDR3
Memory	4GB
System Type	64-bit operating system, x64-based processor

Table 5.1 Specifications of Laptop

Smartphone Specification	
Model	STK-L22
Processor	Hisilicon Kirin 710F
Manufacturer	Huawei
RAM	4GB
Storage	128GB
Operating System	Android 11, ColorOS version V11.1

Table 5.2 Specifications of Smartphone

5.2 Software Setup

Designing a mobile application for a multimedia kindergarten learning platform involves using a combination of software tools for different purposes. Here are the software options across various categories that can be utilized for creating such a platform:

Android Studio

Android Studio is the official Integrated Development Environment (IDE) for Android app development created by Google [15]. A comprehensive set of tools for building, testing, and debugging Android applications was provided by Android Studio. It offers many tools for developing, testing, and debugging Android applications and supports the Kotlin and Java programming languages.

XAMPP

XAMPP is a cross-platform free and open-source web server solution package created by Apache Friends [16]. It provides an easy-to-install package consisting of Apache (web server), MySQL (database system), PHP and Perl [16]. XAMPP in this project is mainly used to host the backend database (MySQL), which holds user information such as account information, study status and quiz scores. Using XAMPP, the software can be connected to a local server environment to support testing and data management in the absence of a live web server. This supports faster, safer and more adaptable development throughout the software development process.

5.3 Setting and Configuration

To set up the app development environment, Android Studio is used as the primary development environment, an integrated development environment full of features for Android application development and capable of supporting both Kotlin and Java programming languages. Part of the Android Studio installation is also installed the major components such as the Android SDK and the Android Virtual Device (AVD).

Android SDK provides the tools, libraries, and APIs necessary for Android application development and debugging. The AVD feature allows testing on a virtual device, but a physical Android phone through USB debugging is utilized in the installation process. Also, USB debugging connection of an actual Android phone is utilized to test and run the program.

For backend and database installation, XAMPP was used as the local development server. XAMPP offers Apache and MySQL to host and manage the SQL database. Key data such as user accounts, course modules, learning game details, and progress tracking information are stored in the SQL database. Database tables are created and managed using phpMyAdmin, a component of XAMPP.

In order to connect the Android application to the database, PHP scripts on the local XAMPP server are used to handle HTTP requests. These scripts interact with the SQL database to perform CRUD operations. The Android application communicates with these scripts to register users, authenticate logins, retrieve courses and games, and update learning progress.

Finally, the application project was debugged on an actual Android phone. USB debugging was enabled and the phone was connected to the development computer. It offered real-time testing and debugging to ensure the application was working properly on real hardware.

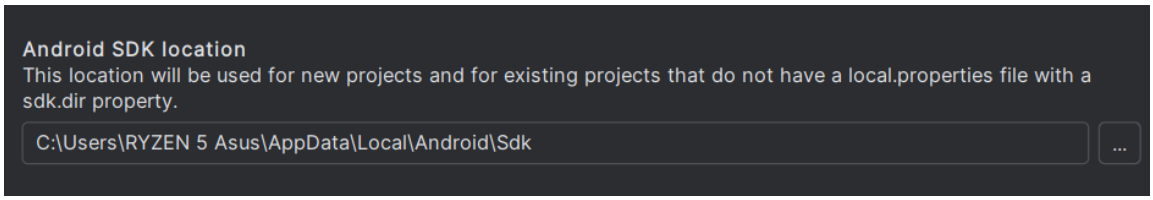


Figure 5.1 Locate the Android SDK

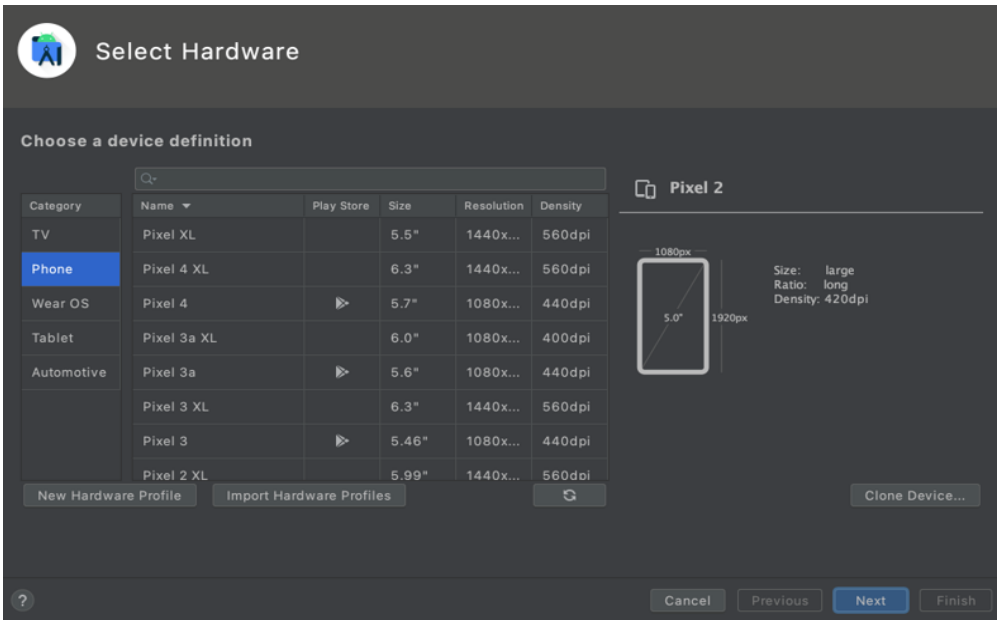


Figure 5.2 Create Virtual Device in Android Studio

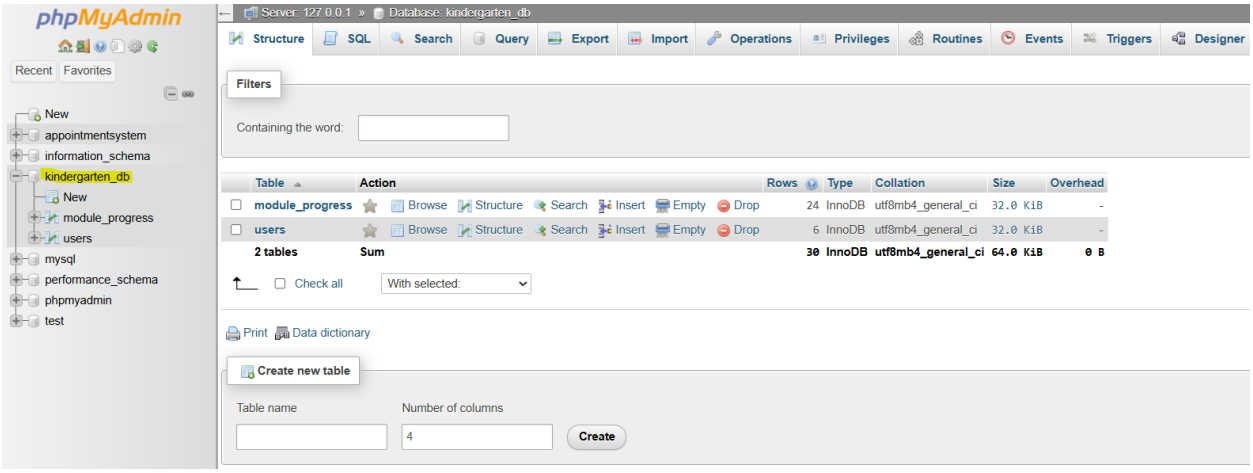


Figure 5.3 Create database by using XAMPP

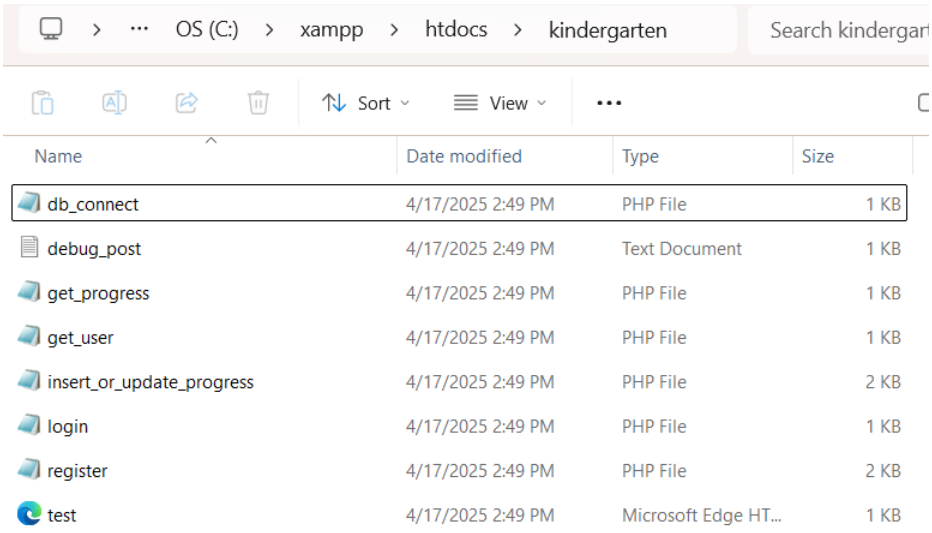


Figure 5.4 Set up PHP script in Android that connects to XAMPP

```
private fun updateModuleProgress(email: String, moduleName: String, progress: Int, stars: Int) {
    val url = "http://192.168.0.109/kindergarten/insert_or_update_progress.php"

    val request = object : StringRequest(
        Method.POST, url,
        Response.Listener { response ->
            Log.d("ProgressUpdate", "Response: $response")
        },
        Response.ErrorListener { error ->
            Log.e("ProgressUpdate", "Error: ${error.message}")
            Toast.makeText(this, "Error updating progress", Toast.LENGTH_SHORT).show()
        }) {
```

Figure 5.5 Using Http URL Connection in Kotlin

5.4 System Operation

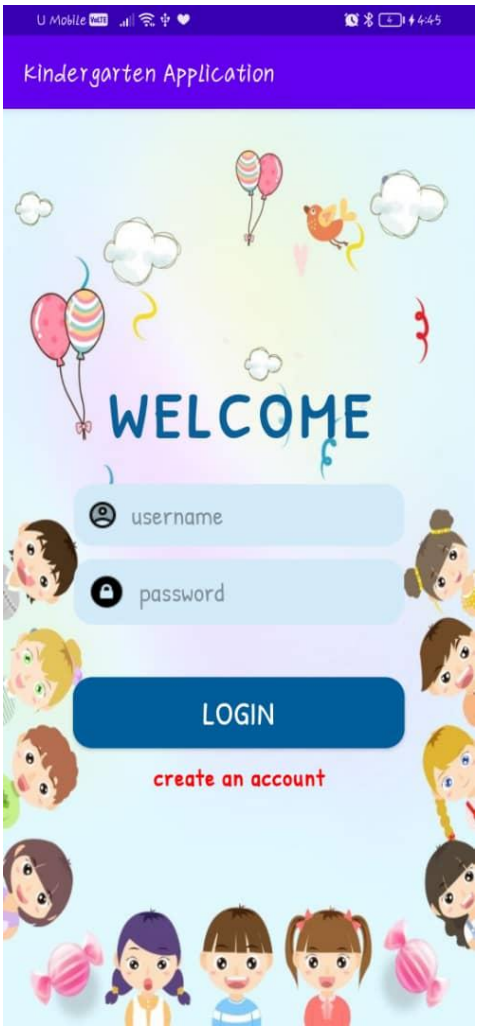


Figure 5.6 Login Page

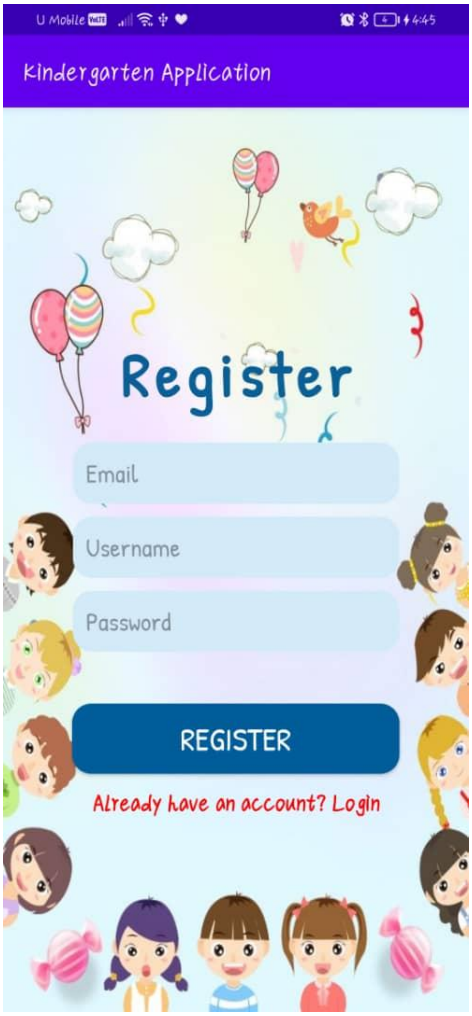


Figure 5.7 Registration Page

When the user opens the application, they will first see the login page. To access the home page, the user must enter a username and password. If the user does not have an account, they can click on the 'Create Account' button to go to the registration page. On the registration page, the user will need to fill in a username, email and password to register a new account. Once all information is entered correctly and verified, the user can log in and go to the main page of the application.

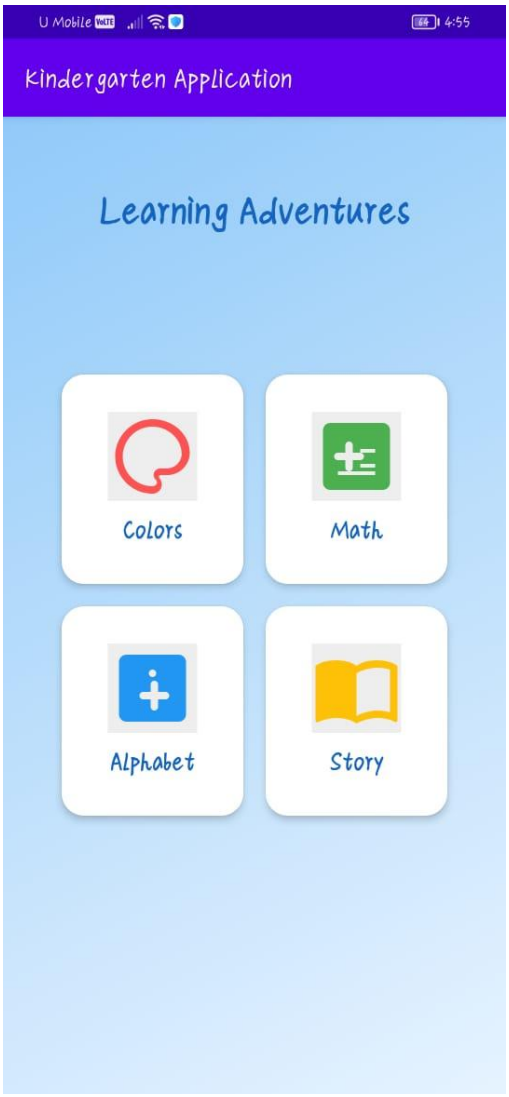


Figure 5.8 Main Page of PenguinPlayground Edu

Figure 5.8 shows the main page of PenguinPlayground Edu. Each subject is designed with a different icon to make it easier to identify. The user can click on each subject that they are interested in to start their learning journey.

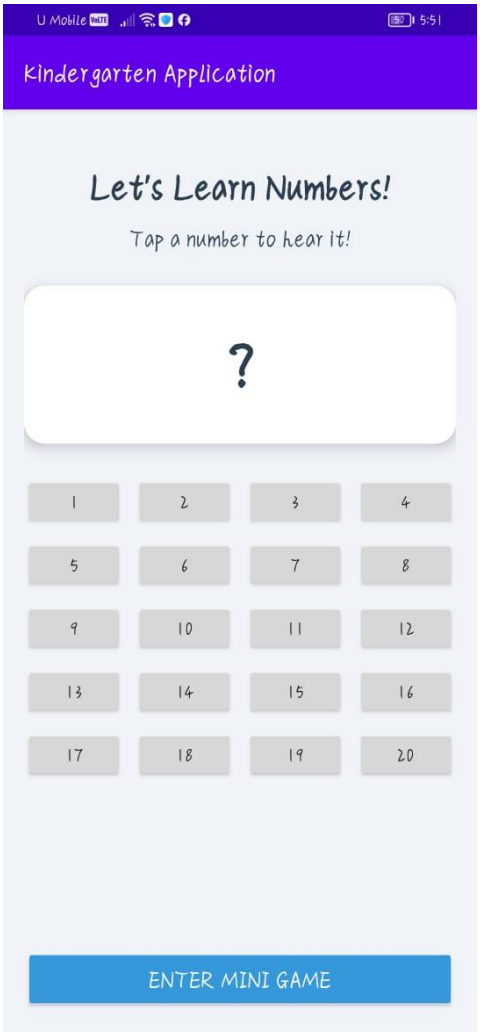


Figure 5.9 Number Learning Module ***Figure 5.10 Display the Number Text***

Figure 5.9 and 5.10 shows the number learning module of PenguinPlayground Edu. This page has an interactive layout with numbers ranging from 1 to 20 that is meant to make learning and number recognition fun for kids. The application provides the prompt with the correct pronunciation of the selected number and text number in the frame when users click to any numbers as Figure 5.10. Users can click again the numbers they were selected to play again for the number's pronunciation. After learning finish to each number, user can click to the mini game button below to learn for the related numbers learning game.

Figure 5.11 Main Page of number Learning Game

Users can access this page by clicking the mini game button from the number learning module. It was consisting of four type of math learning such as multiplication, division, subtraction and addition. Users can choose the type they would like to start for their quizzes.

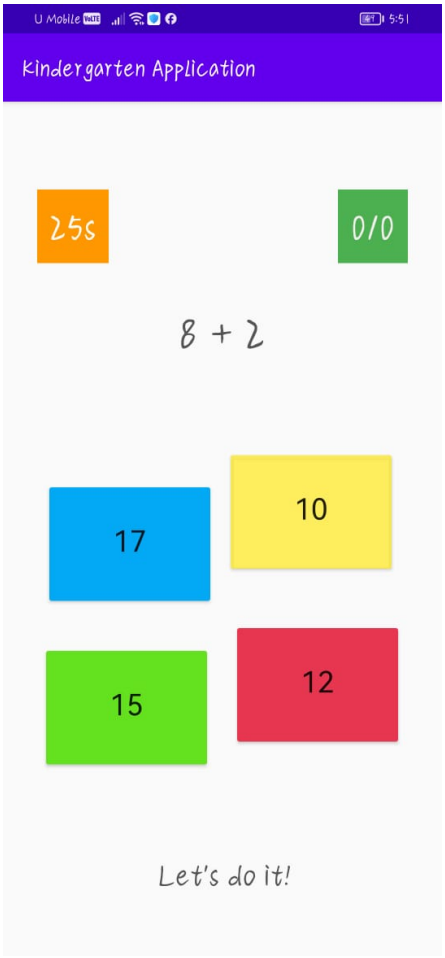
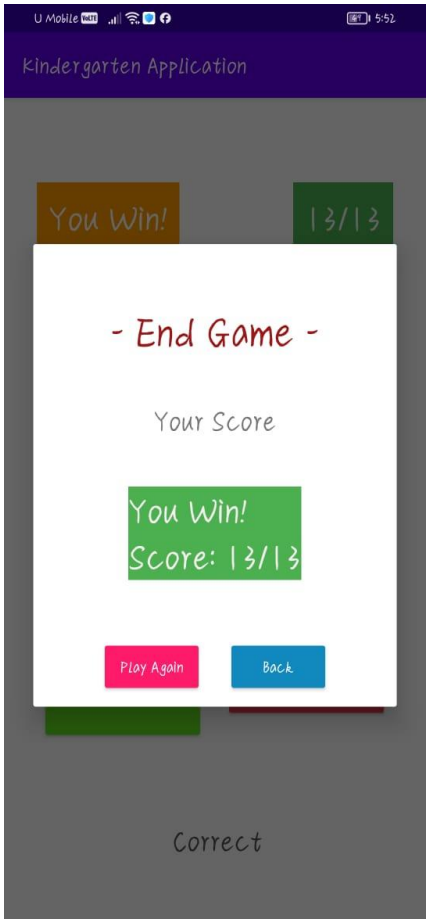


Figure 5.12 User Interface of Number Game

Figure 5.12 shows the user interface for the math test. It provides the question and four different answer choices. Users need to select the correct answer according to the question within a limited countdown. Countdown time is 25 seconds. Points are accumulated by correct answer choices. Users get one point for correct answers and no points for wrong answers.



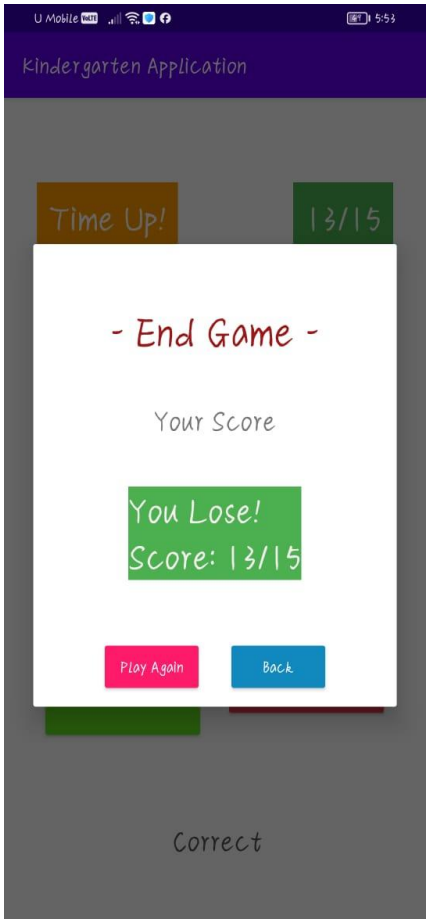


Figure 5.13 Score View in Win ***Figure 5.14 Score View in Lose***

If the user can get the corresponding score in the countdown, it represents the victory. Otherwise, the game is considered a failure. When the countdown time is over, the user interface of score view shows in Figure 5.13 and Figure 5.14 will pop up. Through this interface, users can know their score accumulation and judge their results on the game.

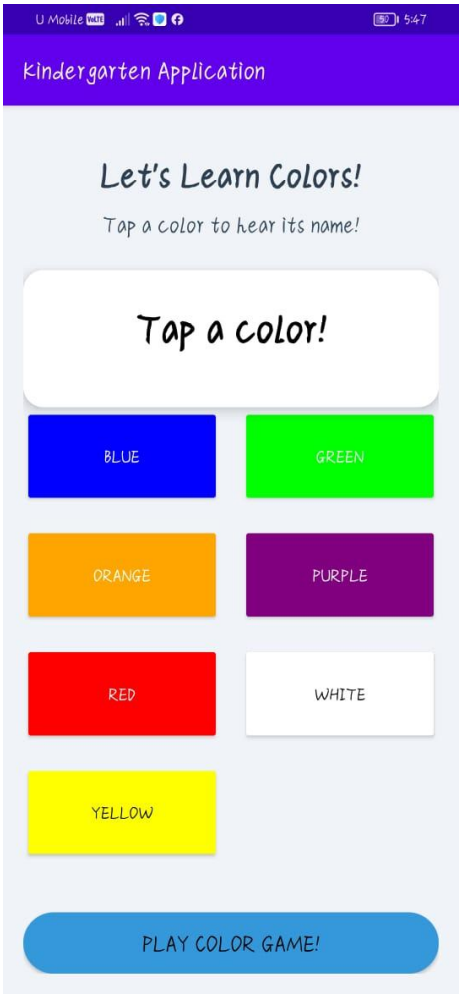


Figure 5.15 Color Learning Module

This is the color learning page, which lists red, orange, yellow, green, blue, purple, and white, as shown in Figure 5.15. The task of this activity is to display the corresponding color and text based on the user clicking the color button. Users can also click on text to display audio of color names and color sounds.

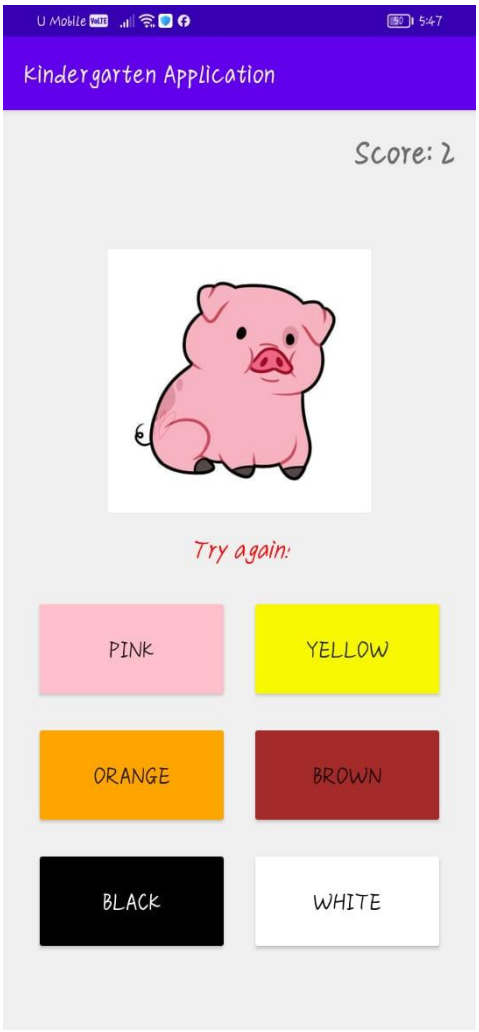


Figure 5.16 Wrong Answer in Color Learning Game

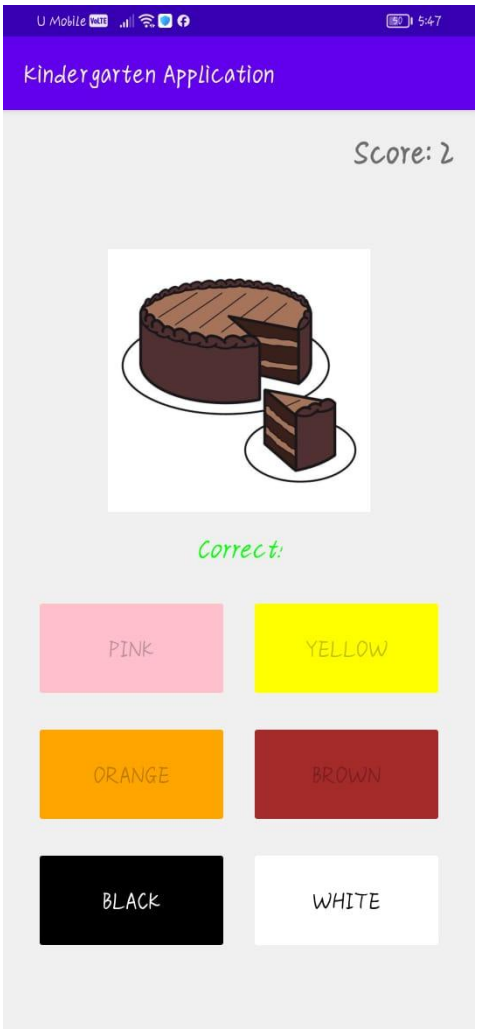


Figure 5.17 Correct Answer in Color Learning Game

In this learning game, an object picture and various answer color cards are included. The user can select the corresponding color card to obtain the score. Answer a question correctly to accumulate a point and display the text and sound“Correct!” then move to the next question (Figure 5.17). There are no points for incorrect answers, and the user has to re-answer the question until it is correct.

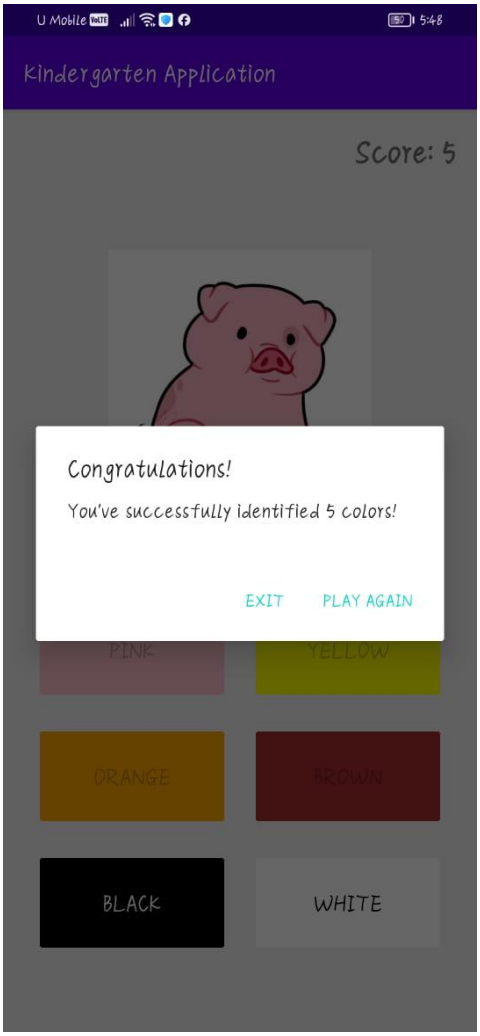


Figure 5.18 Window Message in Color Learning Game

When the users earned five points in the score, it will prompt out the window message to the users. If users select they would like to stay in the color game, they can click to play again. If not, they would exit from the color game.

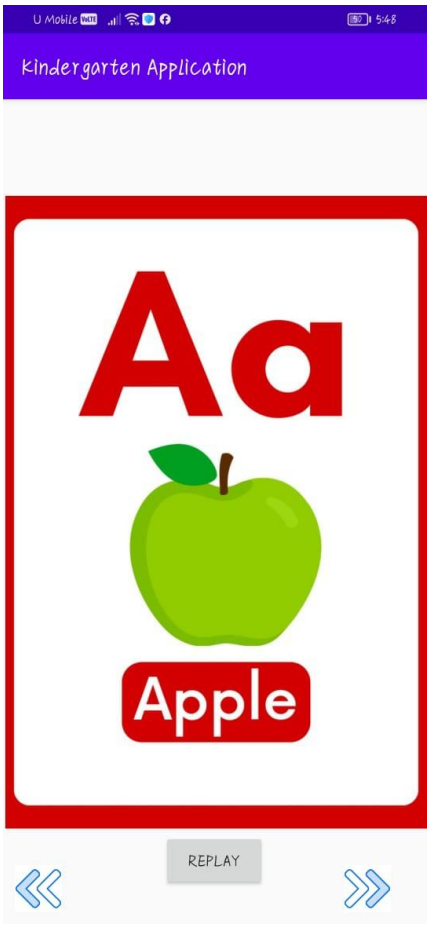


Figure 5.19 Alphabet Learning Module ***Figure 5.20 Alphabet Learning Page***

Figure 5.19 show the interactive layout of alphabet learning module. This page includes the letters of the alphabet from A to Z. While Figure 5.20 was showing the alphabet learning page. When users click on a selected letter, an associated object image and the pronunciation of the letter will appear. Users can click the arrow buttons to navigate to the letter they want and can click to replay button to replay the audio.

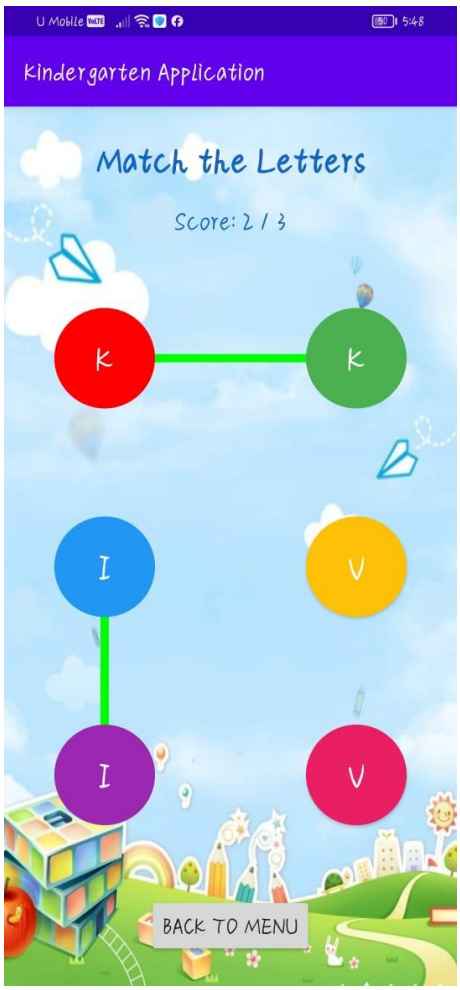


Figure 5.21 Alphabet Matching Game

Figure 5.22 Alphabet Fill-In Game

Figure 5.21 and Figure 5.22 illustrate two different games available in the alphabet learning module: the alphabet matching game and the alphabet fill-in game. The alphabet matching game helps users pair letters with corresponding images, reinforcing letter recognition. The alphabet fill-in game challenges users to complete words by selecting the correct missing letters, enhancing spelling and vocabulary skills. Users can choose the game they prefer, allowing for a personalized learning experience.

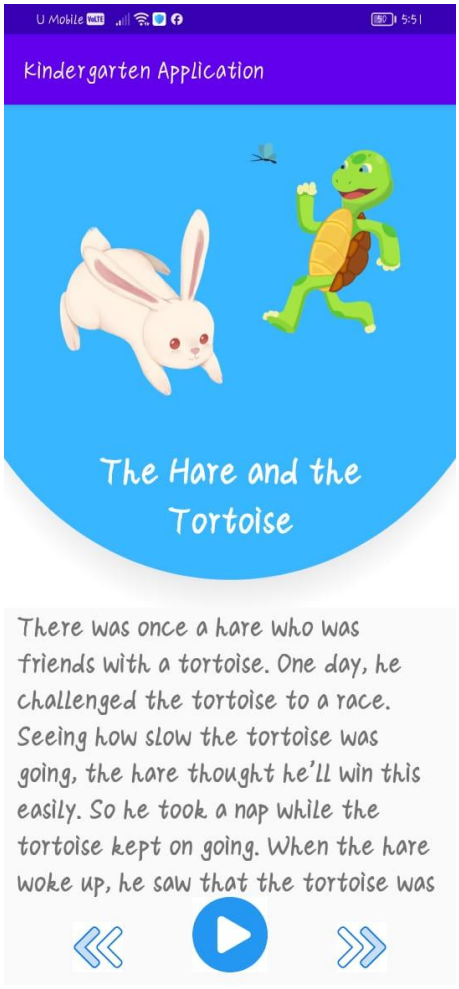


Figure 5.23 Story Book Module ***Figure 5.24 Storytelling in Story Book Module***

Figure 5.23 shows the layout of story book module. The storybook module has a visually appealing interface with vibrant text and images. Swipe gestures or arrow buttons can be used by users to move through stories (Figure 5.24). Large, simple-to-read text and eye-catching graphics can be found on every page, and readers can click to play button play for the audio to their reading experience. Young users are intended to find reading entertaining and educational with this layout.

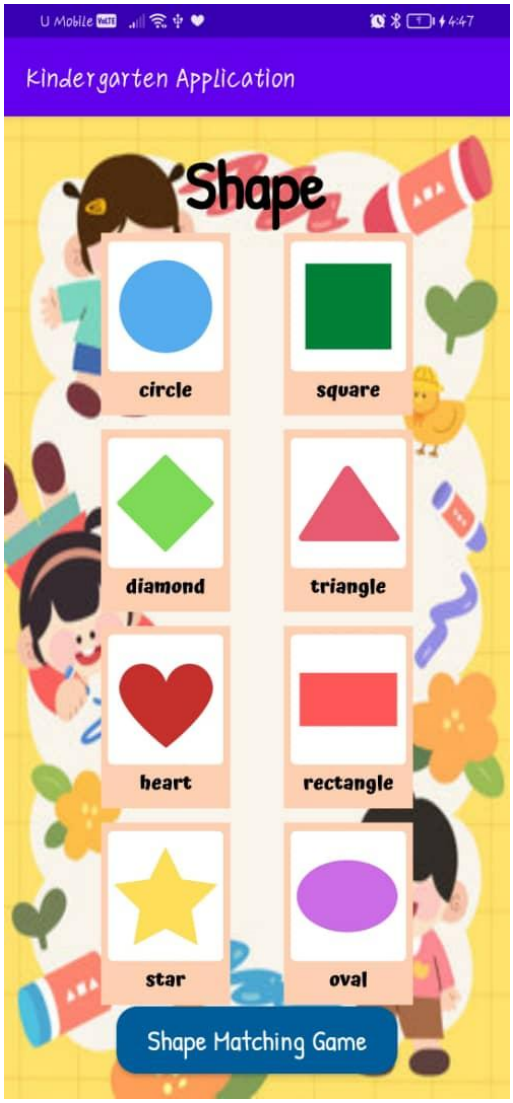


Figure 5.25 Shape Module

Figure 5.25 shows the interface to the Shapes module and illustrates a variety of basic shapes. Each shape is accompanied by a name to help young learners visually associate the name with the corresponding shape. When the user clicks on the picture of any shape, the application plays the pronunciation of the name of that shape. This audio feature supports auditory learning and helps young users improve their shape recognition and pronunciation skills.

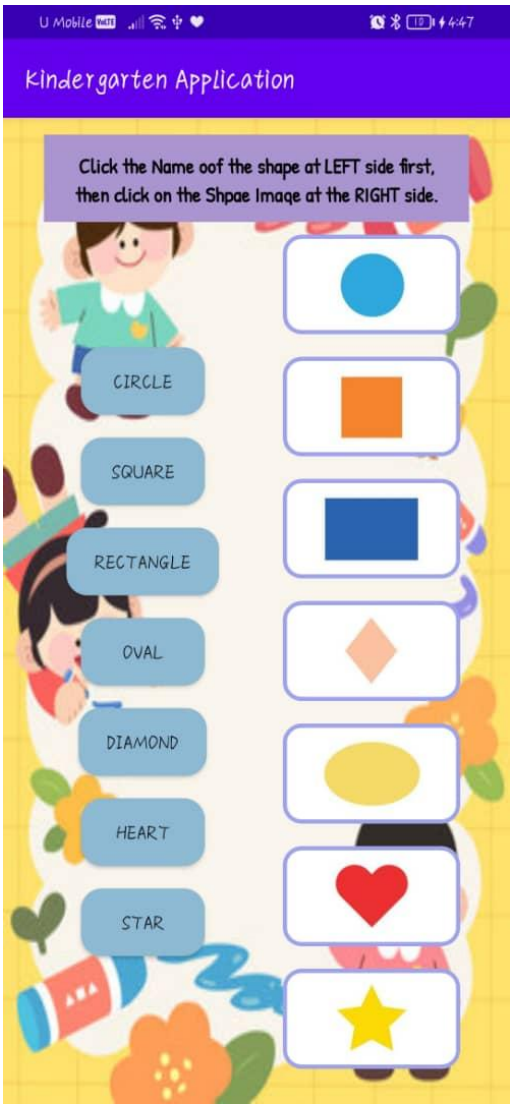


Figure 5.26 Shape Lesson Game

The Shape Matching Game is shown in Figure 5.26. This interactive page allows users to match the shape name on the left with the appropriate shape image on the right. The user is guided by instructions at the top to click on the shape name and then match it with the corresponding image, which helps with shape recognition and memory.

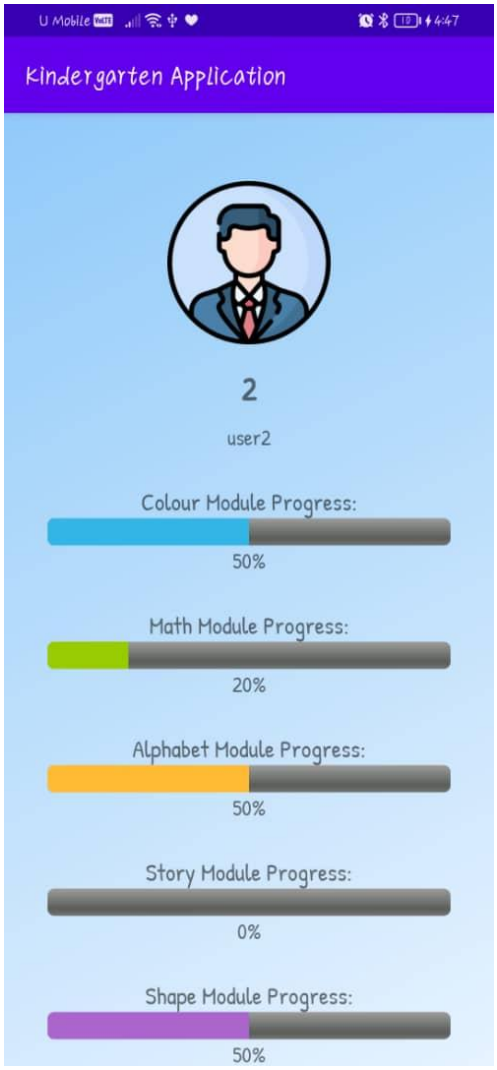


Figure 5.27 Progress Tracking Dashboard

Figure 5.27 displays the progress Tracking dashboard for the use. At the top of the page, there is a user icon and username display, allowing users to identify their personal profile. Below it, progress bars for each learning module are shown with colored indicators and percentage values. Each bar visually represents the user's completion level in that particular module. This tracking system helps users, parents, or educators monitor a child's learning progress and identify which areas need more focus or practice. It provides a clear overview of overall learning development and encourages consistent engagement with all modules.

5.5 Implementation Issues and Challenges

Throughout the execution of the project, a number of issues were encountered that affected the development process. One of the technical issues encountered was how to handle the connection between the Android application and the backend database using XAMPP and MySQL. Establishing stable communication through PHP scripts meant proper configuration and testing on real Android devices added complexity due to network limitations when accessing localhost. Additionally, handling user data such as login credentials and progress tracking posed the question of whether to use local storage in the form of shared preferences or to rely entirely on a remote database.

Another important issue was how to handle media resources such as images and audio files. These resources lead to an increase in application size and performance issues, especially on devices with limited memory. It is very difficult to load these resources efficiently without compromising the smoothness of the user interface. The responsiveness of the user interface is also an issue; different screen sizes and resolutions result in inconsistent layouts that require extensive testing and tuning using responsive design techniques such as constraint layout and scroll view.

Finally, time constraints and the learning curve associated with mobile app development software were a significant concern as this was a student project. Effective time management and problem-solving skills were necessary during development to learn how to add multimedia, write code in Kotlin, use layouts in XML, and debug in a short time and self-exploration.

5.6 Concluding Remark

This chapter highlights the hardware and software environments used throughout the project and details the multimedia learning application's full setup and execution. Each step, from setting up XAMPP and Android Studio to integrating the application with a MySQL database, was crucial to creating a fully functional interactive learning platform. While implementation problems such as database connectivity, media management, and user interface responsiveness reflect the actual difficulties faced throughout development, system operation shows the application's true applicability. Overcoming these challenges improved the final product's quality and stability in addition to increasing understanding of mobile development tools and techniques.

Chapter 6 System Evaluation and Discussion

6.1 Testing Setup and Result

To ensure the system functions properly, effectively, and fulfills user expectations, testing a project is crucial before it is put into use. It reduces the chance of failure after release by enabling in the early detection and correction of defects, usability problems, and functional mistakes. Developers may produce a more dependable, secure, and user-friendly solution by extensively testing the application, assuring end users a satisfying experience and encouraging system confidence.

A. Test Cases for Registration Page

No.	Test Action	Expected Output	Actual Result
1.	Enter valid username, email and password.	User account is created and redirected to login page.	As expected
2.	Leave all fields blank and submit.	Error message: “Please fill all fields”.	As expected
3.	Enter already registered email.	Prompt out the volley error message.	As expected

B. Test Cases for Login Page

No.	Test Action	Expected Output	Actual Result
1.	Enter correct username and password.	Successfully logged in and redirected to main page.	As expected
2.	Enter incorrect username and password	Prompt out the volley error message.	As expected
3.	Leave fields blank and submit.	Error message: “Please enter username and password”.	As expected

C. Test Cases for Main Page

No.	Test Action	Expected Output	Actual Result
1.	Lauch the app.	Main page loads with each lesson buttons.	As expected
2.	Tap on “Alphabet” button.	Navigates to Alphabet Learning Page.	As expected
3.	Tap on “Color” button.	Navigates to Color Learning Page.	As expected
4.	Tap on “Shape” button.	Navigates to Shape Learning Page.	As expected
5.	Tap on “Number” button.	Navigates to Number Learning Page.	As expected
6.	Tap on “Story Book” button.	Navigates to Story Book Learning Page.	As expected
7.	Tap on “Progress Tracking” icon.	Navigates to Progress Tracking Dashboard.	As expected

D. Test Cases for Story Book Module

No.	Test Action	Expected Output	Actual Result
1.	Tap on story thumbnail.	Storry open with text and narration.	As expected
2.	Navigate through story pages by tap on next or previous button.	Moves to next or previous page.	As expected
3.	Audio plays correctly.	Voiceover narration plays and words highlighted.	As expected

E. Test Cases for Alphabet Learning Module

No.	Test Action	Expected Output	Actual Result
1.	Tap on letter.	Displays letter with associated image and audio plays.	As expected
2.	Tap next button.	Go to next letter and change to the associated image.	As expected

3.	Tap previous button.	Go to previous letter and change to the associated image.	As expected
4.	Tap replay button.	Replays associated sound	As expected
5.	No crash on rapid tap.	No app crash or freeze.	As expected

F. Test Cases for Color Learning Module

No.	Test Action	Expected Output	Actual Result
1.	Click on color image.	The name of color is pronounced aloud and displayed on screen.	As expected
2.	Click on next color.	New color appears with correct audio and text.	As expected
3.	Click on color image as replay.	The current color's pronunciation is replayed.	As expected

G. Test Cases for Number Learning Module

No.	Test Action	Expected Output	Actual Result
1.	Click on a number.	Number is spoken and shown on screen.	As expected
2.	Click on others number.	Correct number is shown and pronounced.	As expected
3.	Click on a number as replay.	The number pronunciation is repeated clearly.	As expected

H. Test Cases for Shape Learning Module

No.	Test Action	Expected Output	Actual Result
1.	Click on a shape.	Shape is pronounced and the shape name is shown.	As expected

2.	Click another shape.	Another shape is replacing previous output and play the pronounced of current shape.	As expected
3.	Click on shape image as replay.	Repeat the current shape's audio clearly..	As expected

I. Test Cases for Alphabet Learning Game (Match the Letters)

No.	Test Action	Expected Output	Actual Result
1.	Load match the letters game.	The game screen should display pairs of letters to match.	As expected
2.	Correct matching of letters.	Line turns green, score increase.	As expected
3.	Incorrect matching of letters.	Line truns red or no score change.	As expected
4.	Score update after correct match.	Score displayed as 3/3.	As expected
5.	Navigation to main menu.	Returns to main menu screen.	As expected

J. Test Cases for Alphabet Learning Game (Fill in the Blank)

No.	Test Action	Expected Output	Actual Result
1.	Load fill in the blank game.	Game starts with "Question 1/10" and multiple choices.	AS expected
2.	Select correct answer.	Message "Correct!" is shown, score increments.	AS expected
3.	Select incorrect answer.	Message "Try Again" or no score change.	AS expected
4.	Score Tracking	Final score is shown at end.	As expected

K. Test Cases for Shape Learning Game

No.	Test Action	Expected Output	Actual Result
1.	Load shape learning game module.	Shape learning game page appear.	As expected
2.	Correct shape match.	Match is accepted and feedback is shown.	As expected
3.	Incorrect shape match.	Match is rejected, “Try Again” message is given.	As expected
4.	All shape interactive.	Each shape name should allow interaction and matching.	As expected
5.	Feedback for correct selection.	Positive feedback is provided such as feedback sound for each correct match.	As expected

L. Test Cases for Color Learning Game

No.	Test Action	Expected Output	Actual Result
1.	Load color learning game module.	Color options and related image and activities are displayed.	As expected
2.	Correct color identification.	Correct feedback is shown such as sound and message.	As expected
3.	Incorrect color identification.	Feedback for incorrect selection is shown such as sound and message.	As expected
4.	Visual accuracy.	Displayed color and name are consistent.	As expected
5.	Score tracking.	Score should increase for every correct answer.	As expected
6.	Back to menu.	User is redirected to the main page.	As expected

M. Test Cases for Math Learning Game

No.	Test Action	Expected Output	Actual Result
1.	Open math learning game.	Page loads with option: Addition, Subtraction, Multiplication and Division	As expected
2.	Choose an option mode.	Questions start with four answer choices.	As expected
3.	Answer correct question.	"Correct" feedback shown and score increases by 1.	As expected
4.	Answer wrong question.	"Wrong" feedback shown and score does not increase.	As expected
5.	Timer countdown behavior.	Time begins from 30 seconds and counts down.	As expected
6.	Time expires.	Game ends and displays final score.	As expected
7.	Question transitions.	Next question is displayed immediately.	As expected
8.	Score updates properly	Final score reflects total correct answers.	As expected
9.	Randomized answer choices	Four answer options vary per questions, and correct one is always included.	As expected

N. Test Cases for Progress Tracking

No.	Test Action	Expected Output	Actual Result
1.	Load dashboard successfully.	Dashboard loads with all modules listed: Alphabet, Color, Shape, Number and Story book	As expected
2.	Show initial progress.	All modules should display 0% progress.	As expected
3.	Update Alphabet Module progress.	Alphabet Module progress bar increases.	As expected

4.	Update Color Module progress.	Color Module progress bar reflects correct progress.	As expected
5.	Update Shape Module progress.	Shape Module progress bar reflects updated completion.	As expected
6.	Update Number Module progress.	Number Module progress bar updates.	As expected
7.	Update Story Book Module progress.	Story Book Module progress bar updates accordingly	As expected
8.	Full completion of a module.	That module shows 100% completed.	As expected
9.	Persist progress after app restart.	Previously saved progress is shown correctly.	As expected
10.	Visual feedback of progress bars.	Each progress bar should visually reflect progress %.	As expected
11.	Display username on dashboard.	The top or visible section of the dashboard display username	As expected

6.2 Project Challenges

One of the biggest problems that projects encounter in the development is runtime. Even when the compilation is successful, these problems arise when the application executes in an unexpected manner or crashes during execution. Debugging such problems involves a lot of testing on real devices and vigilant log analysis through Logcat in Android Studio. The variations between how the Android simulator operates and real devices make it even more difficult to troubleshoot. The significance of handling faults in a proper way to provide a consistent and intuitive application experience is highlighted by such runtime issues.

In addition, setting up a login and registration system for account management posed several problems. Validating user input and storing data securely, either locally or through a backend such as XAMPP, required additional development and testing. Additionally, ensuring that apps run consistently across different Android devices and screen sizes is another hurdle. Layout compatibility issues can arise on smaller or older devices, which requires further refinement using responsive design techniques.

Lastly, testing on actual devices often produces different results than simulators. Some functions are functional on the simulator but not on the real phone because of hardware restrictions or version differences. Because of these problems, the implementation process takes longer and requires more work to guarantee that the application functions properly and consistently across a variety of devices.

6.3 Objectives Evaluation

1. **To Implement More Interactive Elements**

   This objective has been successfully achieved in PenguinPlayground Edu Learning Application. The application integrates a variety of multimedia components, including interactive audio feedback, animations and colorful visuals. These elements are applied to different learning modules such as letters, numbers, colors and shapes to increase engagement. Children can interact with learning objects by clicking on them, hearing sounds and receiving visual feedback to promote active participation.

2. **To Develop and Integrate Mini Games for the Learning Module**

   The learning courses successfully integrated gamification elements. The software application includes several learning games that assess users' memory of material through quizzes, drag-and-drop activities, and matching games. These games come with a progress monitoring function that lets kids see how they're doing and encourages them to keep getting better.

3. **To Create an Innovative and Interactive Storytelling Module for Teaching Moral Values to Children**

   The story module in the PenguinPlayground Edu Learning Application was developed with a focus on moral education and interactivity. Embedded in the application is a series of child-friendly stories, each with a visual narration and voice-over that prompts children to reflect on moral values. The module encourages critical thinking and transpersonal thinking by allowing users to interact with the story characters and story outcomes.

6.4 Concluding Remark

In this chapter, thorough functional tests were conducted performed to ensure that the PenguinPlayground Edu Learning app's basic functionality and learning modules perform properly and meet the user requirements. The test results show that the application's core functions, such as registration, login, learning games, interactive stories and progress tracking, work consistently across several devices. In addition to the test setup and results, this chapter gives a thorough evaluation of the project objectives. Each aim was reviewed and analyzed to determine whether it had been met effectively. The interactive multimedia features, gamified learning activities, and moral storytelling module were all successfully implemented and closely matched the project's initial objectives. In conclusion, this chapter has highlighted the system's success in offering an engaging educational experience for young learners, as well as the problems experienced during the development process and areas for future improvement.

Chapter 7 Conclusion and Recommendation

7.1 Conclusion

In conclusion, an interactive educational mobile learning application specially developed for kindergarten children has been developed and used by this project in an effective way. The main objective of this projects was to improve the educational process through interaction with innovative story, gamification and multimedia. Children can learn basic skills like shapes, colors, alphabets and moral values more enjoyable and interesting with the help of the implementation of graphics, sound, animations and learning games.

All three project objectives were successfully achieved during development. First of all, with a view to keeping young learners engaged, the application proved to be more interactive with more useful features such as clickable visuals, audio answers and learning games. Second of all, learning was made easier, more fun by including learning games in modules. Third of all, the project succeeded in launching an interactive storytelling module which involves storytelling that is engaging and developmentally appropriate containing stories which teaches moral values to young learners. This is as well as being entertaining, it also develops critical thinking.

But there also happened some issues when develop the project. Runtime issues, setting up PHP connections for database access by using XAMPP and dealing with large amounts of multimedia files inside the application were a few technical issues that had to be solved, as well as going through a lot of testing and refinement to be able to make a responsive layout that worked well on different screen sizes. Designing a responsive layout that runs smoothly on different screen sizes also requires a lot of testing and modification. Time constraints, learning new tools such as Android Studio and handling back-end integration are also major obstacles, but they offer valuable learning opportunities. These challenges ultimately promoted the growth of developers in terms of technical knowledge, time management and problem-solving skills.

The completed program is now a useful, kid-friendly tool for education and can be further developed or modified, for parents to use in order to present basic concepts to children in a way that is engaging and effective. In a digital age where mobile learning is already increasingly

important, the project has demonstrated in a meaningful way how technology can be used to aid early childhood education.

7.2 Recommendation

In the future improvement there are a few recommendations that can be considered. First, the application can be improved by adding more content such as more learning modules, more stories, and more mini games. Second, the user interface can be made more colorful and attractive so that it will attract more young users and also support multiple languages to serve a wider audience.

Besides, it also can implement a rewards system into this project with virtual rewards such as stickers, avatar, or unlocking new games or lessons after completing a certain number of lessons or tasks, the app can further encourage children to continue learning. This kind of gamification has the added benefit of encouraging the children to keep up with learning and to feel like they have made progress.

Finally, perhaps more user testing with actual children in a classroom or at home is needed in order to understand what needs to be done better and how to make the application more effective and child friendly. By continuing to improve upon these suggestions I believe the application should become a completer and more effective tool for both children and teachers.

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POSTER


KIDERGARTEN LEARRNING MOBILE APPLICATION
Sim jing Jing
21ACB02372
INTRODUCTION
This app is made to help kids learn in an interactive way so they can acquire knowledge efficiently.
OBJECTIVE
To create a dynamic and enjoyable educational environment to children by integrating interactive modules, games, and storytelling. Aims to foster curiosity and critical thinking for learning among young children.
METHODOLOGY
Incorporate mini games module to boost engagement.
Add more interactive components to capture children's interest in learning.
Develop by using Android Studio
EXISTING FUNCTION
Lesson Module: Story book, Alphabet, Number, Color
Learning Game Module: Alphabet, Color, Math
Offer an alternative teaching strategy to encourage children's curiosity and build a solid foundation for learning.
CONCLUSION
UTAR
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