

**A MOBILE APPLICATION TO IMPROVE ONLINE  
LEARNABILITY TO VISUALLY IMPAIRED ELEMENTARY  
SCHOOL CHILDREN**

Project Id: TMP-23-310

Project Proposal Report

Liyanage A.L.D.K.S

BSc (Hons) in Information Technology Specializing in Information  
Technology

Department of Information Technology

Sri Lanka Institute of Information Technology Sri Lanka

March 19<sup>th</sup>

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## Declaration of the Candidate and the Supervisor

I declare that this is my own work, and this dissertation does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any other university or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgment is made in the text.

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The supervisor/s should certify the proposal report with the following declaration.  
The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

.....  
Signature of the supervisor:

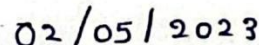
**Ms. Chathurangika Kahandawaarachchi**

.....  
Date:

  
.....

Signature of the co-supervisor:

**Mr. Sathira Hettiarachchi**

  
.....

Date:

## **Abstract**

In the digital age, many students with visual impairments face challenges in accessing course materials like their classmates. Online learning can be a powerful tool for students with disabilities, especially the visually impaired. We will discuss the importance of making online learning accessible to visually impaired students and the ways in which it can be achieved. We intend to help vision-impaired primary students overcome the difficulty of learning subjects in the primary stream. It is a smart mobile device application that they can use to learn and improve their knowledge. The application includes a tutor recommendation module based on the student's knowledge level, virtual tutor and voice calculator, brain improvement gaming module, and supportive voice bot. As my part, I will be developing the games for visually impaired elementary students that will help them to improvement their knowledge. Their capacity to develop socially and academically is limited by the lack of accessibility since they might not be able to experience the same advantages of gaming as their sighted friends. This study explores the viability of creating a mobile game that is usable by visually impaired elementary children, the difficulties involved in such creation, and the possible advantages of such a game for these kids. There are three types of games. First one is identifying the sounds of animals. In this game, players are exposed to different animal sounds and challenged to identify the correct animal. This game enhances learning knowledge in children and facilitating development. The second one is synonyms game. Synonyms games are an interesting and interactive way to improve vocabulary skills. It is a game that involves matching words with their synonyms, which are words that have similar meanings. This game is not only fun but also an educational tool that can increase one's understanding of the English language. Third one is Fun Spelling Game. Fun spelling games can enhance a visually impaired elementary child's spelling ability, vocabulary, and memory retention.

**Keywords:** visual impairment, online learning, accessibility, mobile application, primary students, tutor recommendation, virtual tutor, voice calculator, brain improvement, gaming module.

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## **1. Introduction**

### **1.1 Background Literature**

Visually impaired elementary school children face unique challenges when it comes to learning and engaging in games. It is rare to find good brain improvement games to visual impaired primary students. Therefore, the attention of many researchers has been focused on this side.

Regarding conducting for games there is research called “Toward designing mobile games for visually challenged children” [1]. In here there are create a mobile learning game for kids with vision impairment to help them with their spatial skill and executive function. Two audible mobile games were designed and tested. In our research we conduct a mobile game.

“Mathematics for all: a Game-Based Learning Environment for Visually Impaired Students” [2] in this research there develop brain improvement Mathematics mobile application for Visually Impaired Students. We are also planning to develop the brain improvement game for Visually impaired elementary school.

The research "Design and implementation of educational game considering issues for visually impaired people inclusion" [3]. focused mostly on developing games to add entertainment to the study. They have used various audio-based systems to develop the games. The game "EduGameAcces" covers not only the playability but also the educational aspect. Also, the guidelines are audible to the students. They have used the accessible modules to design the games.

“Design, implementation, and evaluation of a mobile game for blind people: toward making mobile fun accessible to everyone” [3]. This also explains an Android application that was designed for online games for visually impaired students. These games also used the audio concept. And also, this allows students to gain educational knowledge from these games.

“Egg Pair–A Hearing Game for the Visually Impaired People Using RFID” [4]. The RFID game "Egg Pair" is being developed here. The participant pushes an egg. The speaker then plays the animal sound that corresponds with the moved egg. The player needs to keep in mind the egg's location and the animal's voice. Upon discovering a matched pair of eggs with the same animal sound. In our research we are making a mobile game using animal sound.



## 1.2 Research Gap

As discussed above, many current research and systems have been presented but it is still not possible to present a complete system with all the proposed features. But this proposed system is more effective and comprehensive.

This table show a summery comparison feature of the proposed system and existing system approach.

*Table 1 Research Gap*

<b>Research</b>	<b>Brain improvement games</b>	<b>Voice base games</b>	<b>Accessibility mode in the UI design.</b>	<b>Mobile application</b>
Research 1 [1]	✗	✓	✗	✓
Research 2 [2]	✓	✓	✗	✗
Research 3 [3]	✓	✗	✓	✗
Research 4 [4]	✗	✗	✗	✓
New Research	✓	✓	✓	✓

## **2. Research Problem**

The usage of mobile games as a tool for education and enjoyment is important to note. These games are getting more and more common among kids and young people. However, since the majority of these games were not created with accessibility in mind, primary school students who are blind or visually impaired should not play them. This may impede their capacity to engage in social interactions with their classmates and have an adverse effect on their entire educational experience.

Mobile games have also been demonstrated to enhance attention span, problem-solving abilities, and collaboration, making them useful tools for fostering cognitive and social growth. It could be able to provide visually impaired students with the same advantages and chances for development as their sighted friends by developing a mobile game that is particularly made for them.

The creation of such a game does present some difficulties, though. There could be technological constraints to take into account, such as compatibility with different assistive devices, and it might be challenging to develop a game that is both enjoyable and accessible. As a result, the purpose of this study is to examine these difficulties, pinpoint potential solutions, as well as to look into the viability and potential advantages of creating a mobile game that is usable by elementary students who are blind.

### **3. Research Objectives**

#### **3.1 Main Objective**

Introducing an E-learning platform based on mobile applications for visually impaired primary students. It can be a useful tool for ensuring that they have a right to gain knowledge and equal educational opportunities by making educational content accessible, interesting, and interactive for students who are visually impaired.

In here we mainly focus on tutor recommendation modules, virtual tutor and voice calculator, and gaming modules in voice. We plan to create a voice bot in three languages: Sinhala, English, and Tamil.

#### **3.2 Sub Objective**

- Develop identifying the sounds of animal's game.

In this game, players are exposed to different animal sounds and challenged to identify the correct animal. This game enhances learning knowledge in children and facilitating the development.

- Develop synonyms of telling game.

Synonyms games are an interesting and interactive way to improve vocabulary skills. It is a game that involves matching words with their synonyms, which are words that have similar meanings. This game is not only fun but also an educational tool that can increase one's understanding of the English language.

- Develop fun spelling games.

Spelling is an essential skill that everyone must learn. Learning how to spell words can be especially challenging for visually impaired children. Fortunately, this fun spelling games that can teach children how to spell while keeping them entertained. Fun spelling games can enhance a visually impaired elementary child's spelling ability, vocabulary, and memory retention.

- Accessibility mode and include it in the UI design.

The use of assistive technologies and design concepts that make technology more usable and easier to use for people with visual impairments is referred to as being in accessibility mode for those who are blind or visually impaired. We want to provide accessibility features for our mobile app, such as High Contrast Mode, Text-to-Speech Mode, & Magnified Mode.

## 4. Methodology

### 4.1 System diagram

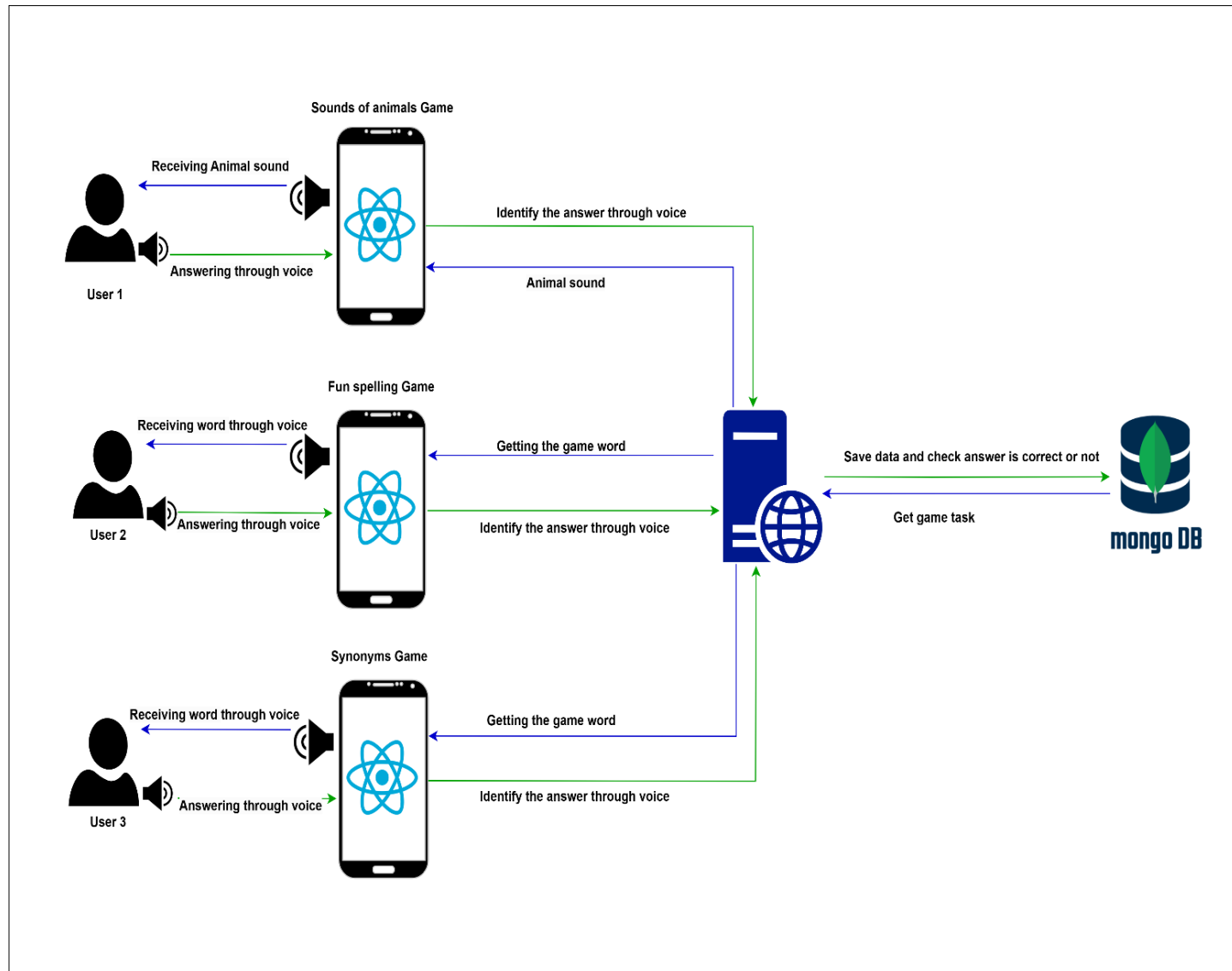


Figure 1 System diagram

Here, visually impaired users should select an Edu Sense application. Then the selected gaming module will display three games:

1. Sound of animal's game
2. Fun spelling game
3. Synonyms game

The animal sound game is a voice-based game where the system plays the sound of an animal, such as a lion's roar or a dog's bark, through a speaker. The user must then use their voice to answer which animal they think they heard. For example, the user might say "lion" or "dog" into a microphone after hearing the corresponding sound. After that spoken answer, compare it to the correct answer for the animal sound. If the user's answer matches the correct answer, the system will save the data and notify the user that they were correct. If the user's answer does not match the correct answer, the system will provide feedback indicating that their answer was incorrect.

The fun spelling game is a voice-based game where the system plays a word through a speaker. The user must then use their voice to spell the word out loud. For example, the system might play the word "sky", and the user would say "s-k-y" into a microphone. After that spoken answer, convert it into text. The system would then compare the user's spelling to the correct spelling of the word. If the user's spelling matches the correct spelling, the system will save the data and notify the user that they were correct. If the user's spelling does not match the correct spelling, the system will provide feedback indicating that their answer was incorrect and encourage the user to try again.

The synonyms game is a voice-based game where the system plays a word through a speaker or headphones. The user must then use their voice to provide a synonym for the word they just heard. For example, the system might play the word "happy", and the user could say "joyful" into a microphone. After that spoken answer, convert it into text. The system would then compare the user's answer to the correct synonym for the word. If the user's answer matches the correct synonym, the system will save the data and notify the user that they were correct. If the user's answer does not match the correct synonym, the system will provide feedback indicating that their answer was incorrect and encourage the user to try again.

## **4.2 Commercialization of the Product**

Our mobile application has been developed to accommodate the requirements of visually impaired learners to help them in successfully completing their academic journeys. Our intended audience includes the parents or guardians of visually impaired primary students, primary schools that serve these students, and organizations that help the community of the blind. We want to use social media channels to advertise our goods to the widest possible audience of potential customers.

We are interested in using a number of revenue-generating techniques to market the product. These might involve adding a price to the application itself, charging for premium features, or making money from in-app advertisements. We are aware that the community of people who are blind has particular needs, and we have added a number of features to meet those needs. With features like text-to-speech and audio explanations of the pictures, our program is intended to be user-friendly and accessible.

We want to use social media communications to promote our product in order to make it stand out in the marketplace. In order to reach our target audience, we produce powerful materials that highlight the benefits of our product. As part of our social media plan, we'll build a strong brand identity, interact with potential clients, and inform our audience of any application changes or new features.

In conclusion, our mobile application is intended to help visually challenged students, and we think it has a lot of promise for the business world. We're convinced that with the help of our revenue-generating plans and social media marketing, we can connect with our target market, bring in money, and enhance the lives of visually impaired students.

## **5. Software Specifications**

### **5.1 Functional Requirements**

Functional requirements are a set of specifications that describe what a system or product must do to meet the needs of its users. Here are some functional requirements that may be included:

Audio and descriptions: The gaming module should provide clear and descriptive audio and descriptions for the visually impaired students to navigate the game, understand their progress, and perform tasks.

Voice navigation: The gaming module should have voice navigation, allowing visually impaired students to easily navigate through menus and options.

Clear instructions: The mobile gaming module should provide clear and concise instructions on how to play the game, how to progress through different levels, and how to achieve different objectives.

High contrast visuals: The gaming module should use high contrast visuals to help visually impaired students differentiate between different elements on the screen.

### **5.2 Non -Functional Requirement**

Non-functional requirements are also important considerations when designing mobile games for visually impaired primary school students. These requirements focus on the game's performance, usability, and other quality attributes. Here are some non-functional requirements that may be included:

Accessibility: The gaming module should be designed to be accessible to visually impaired students with clear and concise labels, easy-to-use menus, and intuitive navigation. It should also be compatible with screen readers and other assistive technologies.

Performance: The gaming module should be optimized for performance, with fast load times and smooth gameplay to ensure visually impaired primary students can play without lag or lag.

Reliability: The gaming module should be reliable with minimal downtime or crashes to ensure visually impaired students can continue playing without interruption.

Safety: The gaming module should have safety measures in place to protect the user's data and prevent unauthorized access.

Usability: The gaming module should be simple to utilize and comprehend, with an intuitive and straightforward user interface, to ensure that visually impaired primary students can play the game without difficulty.

Compatibility: The gaming module should be compatible with a variety of devices and operating systems, this will allow visually impaired primary students to play the game on the devices they have access to.

Scalability: The gaming module should be capable of growing, being able to handle an increasing number of players, this would ensure that visually impaired primary students could participate in the game with their peers without experiencing issues of performance.

## 5.3 Tool and Technology

### Tools

#### I. Visual Studio Code



*Figure 2 VS Code*

Source code editors like Visual Studio Code, sometimes referred to as VS Code, were made by Microsoft. It is free and open source, and it can run on Windows, macOS, and Linux. Additionally, it is designed to be portable, flexible, and cross-platform.

### Technology

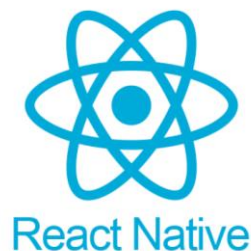
#### I. Mongo DB



*Figure 3 Mongo DB*

Document-oriented database system MongoDB is free and open-source. Documents having JSON-like structure have been used by the NoSQL database application MongoDB. For usage with MongoDB, creator MongoDB Inc. provides the Server-Side Public License.

#### II.React Native



*Figure 4 React Native*

The popular open source React Native framework was created by Facebook and is used to create mobile applications. From a single codebase, programmers can produce cross-platform mobile applications for the web, iOS, and Android. The web application development library ReactJS serves as the foundation for React Native.



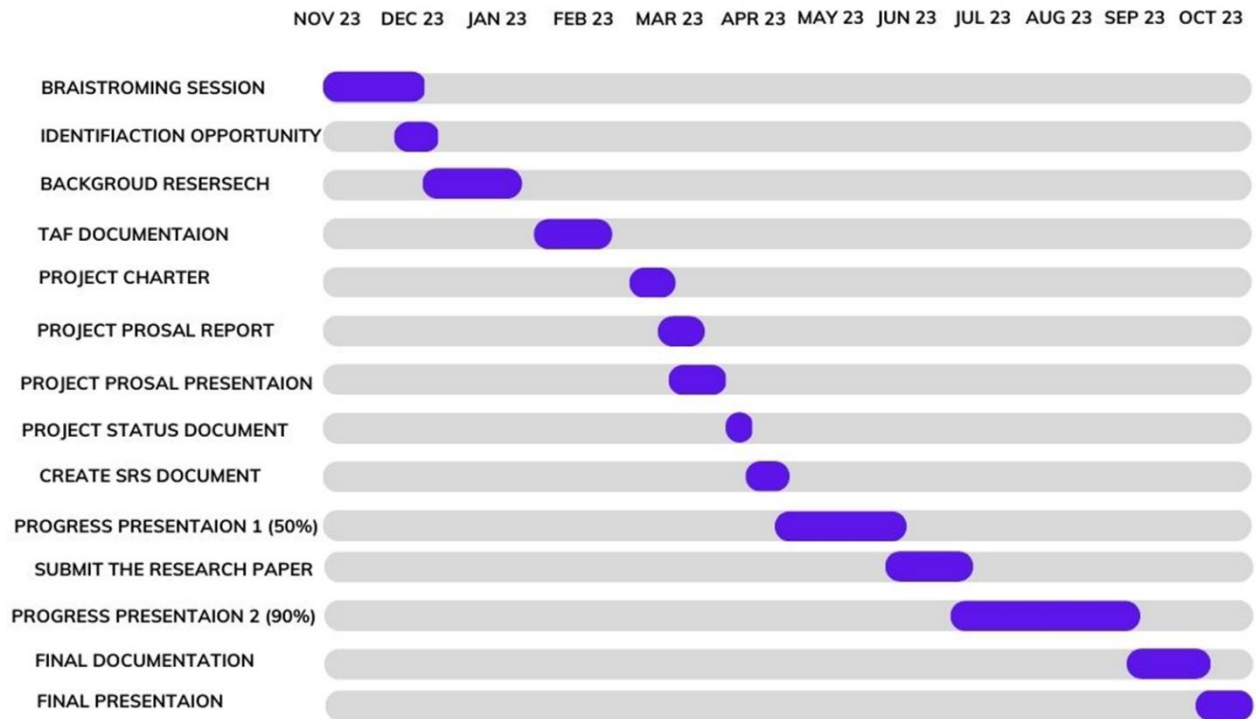
## 6. Conclusions

Based on the suggested e-learning system for visually impaired primary students, it can be said that the system offers novel solutions to the issues that visually impaired pupils experience in obtaining a leading education. The system consists of four basic parts that were developed to fulfill the special requirements of pupils who are blind or visually impaired. The system is using React Native as the technology and MongoDB as the database.

Mobile games have the potential to provide students with visual impairments and engaging and interactive learning experience, but their influence is now limited by a lack of accessibility. The difficulties and constraints involved in creating a mobile game that is usable by visually challenged primary students have been uncovered through this research, including technological, design, and user experience issues. The potential advantages of mobile gaming for these social and educational advantages have also been highlighted.

Overall, this research has given researchers insights on how to create entertaining and accessible mobile games for visually impaired students in primary schools. It is believed that these revelations will help in the creation of more inclusive and accessible gaming experiences for everyone and, in the end, contribute to closing the opportunity gap between visually impaired primary children and their sighted students in terms of social and academic chances.

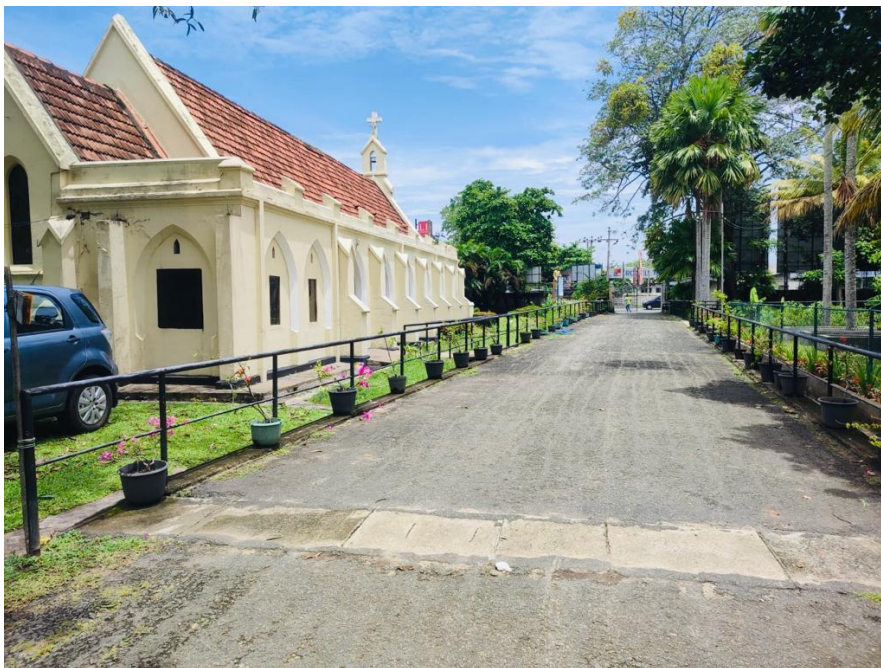
## 7. Gantt Chart



## 8. References

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## 9. Appendices



**We went to Ratmalana Blind College to gather information. We were able to learn a lot of information from there.**

