

Primary Mathletes – Primary School Mathematics Teaching Aid Application

Final Project Report

DT282

BSc in Computer Science International

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Abstract

This project will be focusing on improving primary school teaching through the use of mobile apps. The project will consist of an app that is going to be developed with Kivy, a Python library used to create GUI elements and using Python programming, that will help primary school teachers by acting as a teaching aid for their students to improve their mathematics abilities.  
  
One issue that commonly occurs in classrooms, especially ones with a lot of students, is that no matter how slow the teacher goes, eventually they will have to move on so that they can appropriately tackle all elements of the curriculum before the end of the year. This project aims to aid the teacher and student by giving them the ability to teach the student more of the curriculum in a fun and interactive way, inside and outside of the classroom so that even if they fall behind there is a way of catching up

without taking up valuable class time.

The app will hopefully improve the grades of students who may be struggling with maths in school and prevent them from giving up once they fall behind.   
  
During the implementation of this project, research into the primary school curriculum through books was conducted as well as conversing with primary school teachers to get an idea of areas where students are struggling with the topics that come up and see if it is possible to make it more accessible to a wider range of students.

Implementation of this project was completed through python programming using Kivy to make an application that uses use the research conducted through books and online resources to create a fun, interactive and informative application that will aid both students and teachers in primary schools.

The project was initially going to be evaluated by getting in contact with a primary school teacher and asking them to use the app during their maths teaching/learning in-class and seeing is there any improvement with the use of the app. There were also other plans to get a small group of primary school students to participate in a study group to try and evaluate its usefulness but due to the sudden outbreak of Covid-19, by the time the application was ready to be tested, neither of these evaluations were possible due to the country being on lock down. Other testing methods were conducted instead and these are discussed further on in the document.

Declaration

I hereby declare that the work described in this dissertation is, except where otherwise stated, entirely my own work and has not been submitted as an exercise for a degree at this or any other university.

Signed:

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Paul Davis

\*\*\*DATE\*\*\*

Acknowledgements

Body text

Table of Contents

[1. Introduction 6](#_Toc36820338)

[1.1. Project Background 6](#_Toc36820339)

[1.2. Project Description 6](#_Toc36820340)

[1.1. Project Aims and Objectives 6](#_Toc36820341)

[1.2. Project Scope 6](#_Toc36820342)

[1.3. Thesis Roadmap 6](#_Toc36820343)

[2. Literature Review 8](#_Toc36820344)

[2.1. Introduction 8](#_Toc36820345)

[2.2. Research Topic 1 8](#_Toc36820346)

[2.3. Research Topic 2 8](#_Toc36820347)

[2.4. Existing Final Year Projects 8](#_Toc36820348)

[2.5. Conclusions 8](#_Toc36820349)

[3. Experiment Design 9](#_Toc36820350)

[3.1 Introduction 9](#_Toc36820351)

[3.2. Software Design 9](#_Toc36820352)

[3.3. Software Test plan 9](#_Toc36820353)

[3.4. Front-End 9](#_Toc36820354)

[3.5. Middle-Tier 9](#_Toc36820355)

[3.6. Back-End 9](#_Toc36820356)

[3.7. Conclusions 9](#_Toc36820357)

[4. Experiment Development 10](#_Toc36820358)

[4.1. Introduction 10](#_Toc36820359)

[4.2. Software Development 10](#_Toc36820360)

[4.3. Front-End 10](#_Toc36820361)

[4.4. Middle-Tier 10](#_Toc36820362)

[4.5. Back-End 10](#_Toc36820363)

[4.6. Conclusions 10](#_Toc36820364)

[5. Evaluation 11](#_Toc36820365)

[5.1. Introduction 11](#_Toc36820366)

[5.2. Software Evaluation 11](#_Toc36820367)

[5.3. Specific Evaluation 11](#_Toc36820368)

[5.4. Questionnaires and Interviews Evaluation 11](#_Toc36820369)

[5.5. Conclusions 11](#_Toc36820370)

[6. Conclusions and Future Work 12](#_Toc36820371)

[6.1. Introduction 12](#_Toc36820372)

[6.2. Conclusions 12](#_Toc36820373)

[6.3. Future Work 12](#_Toc36820374)

[7. Bibliography 13](#_Toc36820375)

# 1. Introduction

## Project Background

Many sources state that children, even from young ages, can learn a lot by using technology and can reinforce information already covered in their school curriculums through gamification in apps on phones or tablets. Below are articles and documents about these sources and also includes some research conducted to find what the best programming language would be to write the Primary Mathletes application using:  
  
One paper discusses the different programming environments that are available for mobile platforms such as Python, C#, and Java through Android Studio. The paper mentions *“the flexibility of Python for mobile platforms”.* [1] Originally the Primary Mathletes application was going to be developed using Android Studio which, for a lot of cases is not very user-friendly in comparison to something like Python which lets you do a lot with less code and so this is what was chosen to develop the application of this project.

Another paper discusses how the use of mobile devices such as iPads can be used by teachers to make the teaching of maths more efficient and more involved by having data stores with a piece of software on a mobile device. It found that *“pre-service and in-service teachers saw value in integrating iPads into Maths education as a tool to promote student learning”* [2] and it also discusses several mobile learning approaches and how they can affect a student’s learning positively or negatively.

Another piece speaks about how in South Africa there is limited access to PC’s in many homes but yet there are *“three million teenagers have Java enabled cell phones”*  [3] which would strongly benefit from mobile learning or m-learning applications due to the inaccessibility of web apps in that region of the world.

The final paper looked at discusses the differences between e-learning (using a PC to teach students) and m-learning (using mobile devices) such as handheld phones and tablets that are internet-enabled and how m-learning is a lot more accessible because there is no hardware limitation of PC’s because almost everyone nowadays already owns a mobile phone. This cuts the cost of textbooks and on building expensive computer rooms for students. [4]

## Project Description

## Project Aims and Objectives

Overall aim and some milestones along the way to achieve the aim

## Project Scope

Project scope, what the project isn’t about

## Thesis Roadmap

One sentence summary of the following chapters

# 2. Literature Review

## 2.1. Introduction

## 2.2. Research Topic 1

## 2.3. Research Topic 2

## 2.4. Existing Final Year Projects

## 2.5. Conclusions

# 3. Experiment Design

## 3.1 Introduction

## 3.2. Software Design

## 3.3. Software Test plan

## 3.4. Front-End

## 3.5. Middle-Tier

## 3.6. Back-End

## 3.7. Conclusions

# 4. Experiment Development

## 4.1. Introduction

## 4.2. Software Development

## 4.3. Front-End

## 4.4. Middle-Tier

## 4.5. Back-End

## 4.6. Conclusions

# 5. Evaluation

## 5.1. Introduction

## 5.2. Software Evaluation

## 5.3. Specific Evaluation

## 5.4. Questionnaires and Interviews Evaluation

## 5.5. Conclusions

# 6. Conclusions and Future Work

## 6.1. Introduction

## 6.2. Conclusions

## 6.3. Future Work

As seen in section ***\*find section with airtable in it \****Airtable was used to document any bugs that were found while testing and there are still a number of low to normal level bugs that were found too late in the testing phase to be fixed. The application still runs with these issues present but they are quality of life fixes that would be beneficial to implement. When providing an application to younger students it would be especially important to integrate aspects such as having the minigame wait a second after each correct or incorrect answer to guard the user from miss-clicking the next answer straight away, which is a possibility in the current state of the application so this would be one of the first things to be fixed in the future.

In the future it would also be necessary to come up with a different system for storing the users data. The firebase database that is used currently in this project works but as seen in the ***\*section where the fact that the app doesn’t compile because of firebase is mentioned\**** section, it was not possible to compile this project into a useable APK for android or IPA for iOS due to the inclusion of the Firebase library which is not supported by Buildozer for some reason. Due to this, turning the application into a web application and developing a Django database using MySQL or Oracle might not be a bad idea in the future because even if this project did compile with the Firebase library, their pricing plans are pretty expensive when scaling up with more and more users using the application.

Creating more minigames would be vital to the future success of this project as only having a single type of question that can be asked gets repetitive quite quickly. The addition of more minigames alongside additional educational content from the curriculum outside of basic operators would not only benefit the users currently targeted by this project (3rd class primary students) but could also be scaled up and down to include the entire curriculum needed to teach all primary school students from 1st to 6th class.

Other smaller and quicker additions to the application could be made, such as an improved experience system. The one implemented at the moment can be exploited easily by spamming any of the potential answer buttons and, if the user is lucky, no matter what questions they answer they will still end up gaining experience points that will eventually unlock all of the levels available in the game without ever actually learning anything. Such exploits could be detrimental to the success of the application in the future. Bringing the minigame system that Duolingo uses into the Primary Mathletes system may be beneficial, this is where if a user gets three questions wrong in any given minigame they are automatically kicked out of the minigame with 0 experience points gained so users are forced to think about the answers they are giving and not just mindlessly pressing buttons until they unlock all of the available levels.

Another small feature that could be implemented but that would be very beneficial to teachers using the application as a supplemental teaching aid is seeding. This would involve giving out a seed for every “random” set of questions that could be copied and sent out to each student so that they would all receive the same set of random questions at the same time so that the teacher could observe whether the majority of their class actually has knowledge about recently studied aspects of the curriculum or whether the teacher needs to revisit these sections again.

With more time and effort, I think that this application could be put out into the world and be used by teachers, parents and students to improve retention of mathematical information. With the recent outbreak of Covid-19, it has become apparent that an application like the one developed for this project could actually be very useful in times where students are unable to attend a physical classroom for whatever reason they might have, whether that be an illness or even a nationwide quarantine. With further input from actual primary school teachers to ensure the implementation of proper educational information is being presented to the students, as well as more development on the minigames to include different aspects of the curriculum, it would be very possible for the application to be used as an alternative to reading numbers from a book and instead turning it into an interactive and fun learning experience that could result in further knowledge being gained overall.

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