FYP Project Proposal Form 2019/2020

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Programme Code: DT282

Project Title: Kivy Primary Maths Game (not definitive)

Summary (approximately 200 words)
- Area of study:
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 in Kivy, using python programming, that will hopefully help primary school teachers by acting as a teaching aid for their students to improve their maths abilities.

- The problem being tackled:
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.

- How to tackle the problem:
During the implementation of this project I will be doing research into the primary school curriculum through books and maybe conversing with some teachers if this is possible to get an idea of areas where students are struggling with the topics that come up and see if I can make it more accessible to a wider array of students.

- Implementation of the solution:
I will implement this project through python programming using Kivy to make a cross-platform application that will use research I've conducted through books and online resources to create a fun, interactive and informative application that will aid both students and teachers in primary schools.

- How to evaluate the project:
The project will, hopefully, 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.
If this isn't possible I will try to get a small group of primary school students to participate in a study group to try evaluate its usefulness.

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Background (and References)
[1] This piece discusses the different programming environments that are available for mobile platforms such as python, c# and java through android studio.
The paper brought python to my attention as I was originally thinking that I was going to have to create my app using android studio which I personally thing is the opposite of user-friendly in comparison to something like python which lets you do a lot with very little code.

[2] This 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 also discusses a number of mobile learning approaches and how they can effect a students learning in a positive or negative way.

[3] This paper is similar to Matthew Kearney and Damian Maher's paper but instead of focusing on iPads it is about how there is limited access to PC's in South Africa but more than 3 million teenagers have Java enabled mobile phones which leaves a market open for learning tools to be developed digitally rather than on paper in the classroom.

[4] This paper 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 on PC's because almost everyone nowadays already owns a mobile phone. This cuts the cost on textbooks and on building expensive computer rooms for students.

[1] Emetere M. E., Oluwafemi T. J., Akinlusi T., Allen M. C., Ama E. C. - Developing a Mathematical Mobile App: A Case Study of an Environmental Model: http://www.iaeng.org/publication/WCECS2016/WCECS2016_pp150-153.pdf?fbclid=IwAR1iFguPdUgTeTq4pAUzfkYheh7g1EVxyUmrFUI8SE6hXfLr6E5DdhYSafg

[2] Matthew Kearney and Damian Maher - MOBILE LEARNING IN MATHS TEACHER EDUCATION: USING IPADS TO SUPPORT PRE-SERVICE TEACHERS' PROFESSIONAL DEVELOPMENT: https://www.researchgate.net/profile/Matthew_Kearney/publication/285751515_Mobile_learning_in_maths_teacher_education_Using_ipads_to_support_pre-service_teachers'_professional_development/links/568c55ca08ae153299b66628.pdf

[3] Machdel Matthee, Jacobus - Mathematics on the Move: Supporting Mathematics Learners through Mobile Technology in South Africa: https://www.researchgate.net/profile/Machdel_Matthee/publication/238749401_Mathematics_on_the_Move_Supporting_Mathematics_Learners_through_Mobile_Technology_in_South/links/0a85e53c38801e8c9d000000/Mathematics-on-the-Move-Supporting-Mathematics-Learners-through-Mobile-Technology-in-South.pdf

[4] Al-Zeidi, A, Al-Kindi, K, Al-Khanjari, Z. A. - SQU Future: From E-Learning to M-Learning Application Development: https://www.researchgate.net/profile/Youcef_Baghdadi/publication/236310002_Web-enabled_services_development_with_respect_to_service-orientation_paradigm/links/5528c2640cf29b22c9bcb350.pdf#page=185

Proposed Approach

At the moment I will be using Kivy to develop a python-based application.
I haven't yet decided what kind of database I will use to hold all of the users
information but it will probably come down to a SQLite DB or using Firebase DB.

The user will need to have at least android device running Android 6.0 (Marshmallow)
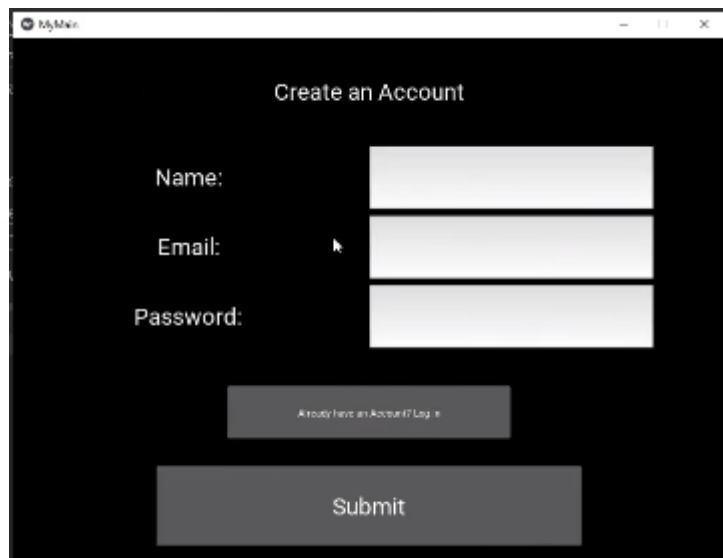which will cover over 60% of android users.

The app will be a 3-tier system with the UI being the presentation layer,
The background workings of the app itself being the application layer and finally there
will be a database taking care of the data layer.

If it isn't possible to get in contact with a primary school teacher, I will try to get a
small group of primary school students to participate in a study group to try evaluating
the apps usefulness.

I need to do a lot of research around how doable this app is with what I have put forward in
this proposal. I am not sure if Firebase is a suitable way of handling my database for the app
and I haven't used python in conjunction with kivy to know for a fact that the app is in fact
possible to make.
I also need to find somewhere to host the web application as at the moment I feel I might need
to buy a domain or pay for somewhere to host the website.

When the user first downloads the app they will probably be asked to create an
account with a username/email and a password which will then be stored in a
database (The password will be hashed to prevent users information being stolen).
After this initial set up, every time the user goes into the app it will remember their
details and sign them in automatically. If ever the app cannot verify that the user
came from the same device then it will ask for confirmation through username and
password or just password.

The app will follow a very similar approach to the way the Duolingo app handles
progression.
It will start from the very beginning of a topic and get progressively harder as you get
better and better at a particular area of maths. The app will have a points/currency
system that will act as a reward system for the user to improve their experience. This

will hopefully be tied in with some nice sounds for correct answers, finishing a topic etc. that will help with the UX.

Basics at the beginning

Difficult topics locked until easier topics are completed
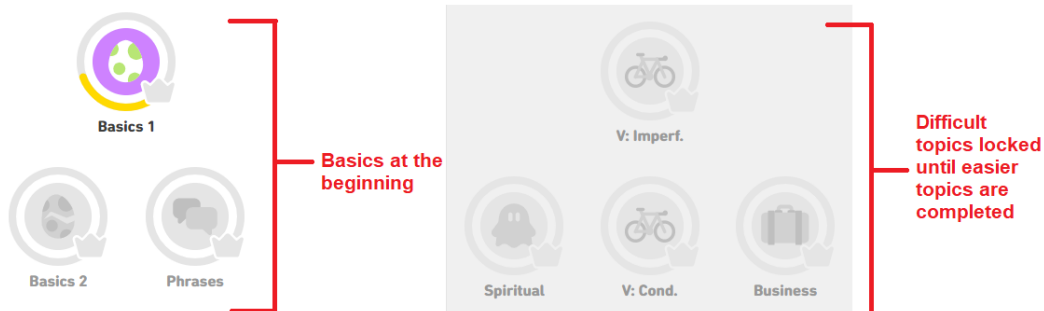
The content shouldn't be too difficult to create, I will be looking at primary school books on maths and following their approach. The topics will stay quite basic as it is only for primary school students so slight progress in difficulty will occur as the user completes more and more sections. An example of this may be going from low numbers [1-10] and gradually moving to [11-50] and then again to [50-100] but the basic idea will stay the same, like learning addition subtraction etc.

$\square + 4 = 10$

Choose the right answer

| 4 | 5 | 9 |
| 3 | 6 | 1 |

clickable buttons

Basic numbers [1-10]

no options user input only

$73 - \square = 47$

type the correct answer

1234567890
qwertyuiop
asdfghjkl
zxcvbnm

Difficult numbers [50-100]

I will probably end up using a firebase database to store the users login information and their progress within the app.

https://vplayqt5test.firebaseio.com/

vplayqt5test
├── public
│   └── news: "Firebase Plugin is now live!"
├── users
    └── QzHAZVVKqNbZtgfRbBYIAJpyb7u2
        ├── age: 22
        ├── motto: "V-Play is awesome!"
        └── username: "John Doe"

Deliverables

- This project proposal
- An interim report
- A dissertation (around 60 pages)
- A video tutorial walking through how the app works from when you first download it and then when you are a repeat user.
- A user manual labelling everything that can be interacted with in the app.
- A mobile app for Android and iOS.
- a web application that can be used in the same way as the mobile apps.

Priority features:
- Creating at least one of the following: iOS application, Android application, web application.
- Creating a database to handle the user's information and progress
- Creating a system that gets progressively more difficult as the user completes tasks/topics.

Secondary features:
- Creating nice sound and button feedback to improve user experience.
- Creating the other applications: iOS application, Android application, web application that weren't made as part of the Priority features.

Technical Requirements

For the project I will need to have:
- windows 10
- one of the latest versions of Python installed.
- internet connection for research.
- the latest version of Kivy that works with my version on python.
- web hosting (hopefully free somewhere)
- database hosting
- a laptop or access to a lab computer that can get both python and Kivy.
- an android phone to test the app works across different platforms.
- an iPhone to further test that the app works on all platforms.

Project Reviews – Please include reviews of two of LAST 2 years projects from either DT228, DT282 or DT211C.

Project 1
Title: Fantasy Premier League Predictive Analytics

Student: Alex Brady

Description (brief):

This student attempted to create a web application that would be able to accurately predict how many points a player would get in the next football match based on the previous seasons. The student split the project into three sections:

The first of which was a predictive analytics system which was created in Jupyter Notebook using the Python coding language. This part of the project would do the heavy lifting in terms of scraping historical data, sorting the data and generating the predictions. The second section was a Python Flask back end web service which held all of the predictive data which was cloud hosted.

Finally, the third section of the project was a web application which the student developed with AngularJS and NodeJS. This was the part of the app that the user would see when using the students project. In the end the student is quite happy with how all of the features ended up after the proposal at the start of the paper.

Although there were some features that were never implemented the core idea for the project was a success. The student was able to confidently answer the question he put forward at the beginning of the conclusion "can a machine know more than me?" and so I believe that the project was a successful one.

The student also planned to continue to update the app and add features in past the submission of the project to DIT.

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Project 2
Title: Temple of Thoth

Student: Keith Mc Loughlin

Description (brief):

The student set out to create a game environment that tracks users behaviors and uses this information and apply logic to the data in such a way that it could predict the best way to challenge specific users. It aimed to manipulate a 3D virtual environment with the intention of leading the player into traps and to discourage them to reach the end goal. The reason for this was to see could the game itself design a challenging level purely based off the players previous moves and decision-making patterns and use these against them.
The game aimed to see could it actually control user behavior by using previous data farmed from global user data and actively use player's minds against current players. The game was created inside the unity engine and was written in C++ and used a MongoDB database to store player information.

In the conclusion the student talks about how they now know how to effectively design a game, create different scenes and game objects in unity and persist data that was generated inside of the game. This student also talks about how the project could be further worked on and perhaps more on how the project can track user behavior.

Proposal Sign off:

Student Signature:	Date:
Lecturer Signature:	**Date:**