

Department of Computer Science

The University of Hong Kong

# **Final Year Project**

## **Project Plan**

Topic: An e-learning platform for teaching JavaScript and  
React Native

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## **Background**

In this age of digital, people are familiar with smart phones and computers. They spend lots of time on playing games or browsing social networking sites in their spare time, while the majority of people may not know how those machines or functions actually work. The general public usually has a stereotype that writing codes is complicated and boring. It is common that graduates from Hong Kong prefer a job working in commercial field rather than the one related to computer science or technology. However, the situation is quite different from the United States. Among the top 25 jobs with high salaries and career opportunities in America, 8 of them are related to technology, including mobile developer and software engineer [1]. Besides, more industries are seeking for computer science professionals, such as banking, entertainment and healthcare. Therefore, the current graduates majoring computer science are not adequate for the increasing demand in the market. An article pointed out that the number of jobs in computer science will be 3.5 times more than the number of graduates in the coming decade [2]. It is obvious that having knowledge about programming will be beneficial for finding a job in the future and programming has been an essential skill for modern people.

Apart from the career side, learning programming is also an effective way for teenagers to develop computational thinking. It is a technique that helps people break down the complex problem into small pieces which will be easier to solve. Combining knowledge of mathematics, logic and algorithms, computational thinking is not only useful for questions about computer science, but also powerful for solving the problems in almost all disciplines. For instance, people engaged in commerce can find out the market rule by computational analysis, thereby making a better decision [3]. If teenagers are able to develop computational thinking at an early stage, it will benefit for life.

Lao Tzu has said, a journey of a thousand miles must begin with a single step. It would be easier for the teenagers to take the first step with a simpler programming language. Both JavaScript and React Native can be a good choice since thousands of online resources are accessible and the syntax is easy to understand. They can also be learnt together as they share the same library and have a similar scripting style. Moreover, JavaScript is the basic programming language for HTML and web designing, while React Native is designed for phone applications. People are familiar with websites and applications, therefore studying something they have seen everyday will be more attractive and interesting. As time goes by, people can discover the fun of writing codes and have a deeper understanding of programming.

## **Objectives**

This project aims to enhance people's learning motivation of programming by teaching JavaScript and React Native in an interesting and interactive way. Since the target user of the platform is the beginners, it will consider the user experience for both old and young people. The platform needs to be attractive enough for teenagers and also clear enough for the elderly. Through the use of multimedia and games, the platform will be able to increase the number of users in different age groups. Furthermore, people can make use of the platform to learn the two languages from the beginning. With the design of some knowledge checkpoints, user will have a better understanding and get a chance to practice their knowledge in real-life situation.

In the long term, this project will also try to promote the importance of learning programming to the society. In Hong Kong, people may not aware of how computer science will affect their daily lives, and even do not recognize computer scientist as a professional. Encouraging the teenagers to start writing simple codes can help changing people's attitude towards programming, which also helps maintaining the sustainable development of computer science in Hong Kong.

## **Literature review**

E-learning is a popular issue and many educational organizations make an effort to combine studying and entertaining. Currently, there are several famous e-learning platforms related to computer science and programming, such as Scratch and Code.Org. These two platforms have some distinctive features that are worth for referencing.

For Scratch, the greatest feature is the powerful functions that allow users to show their creativity. Without downloading of a software, Scratch offers an online platform for users to write their own program. It can be a game, an animation, or even a story only. User can create anything they want by dragging and dropping the boxes with clear instructions, and they can cooperate with friends if they wanted. User can also browse the projects finished by other users in the website, and study the codes if they are interested. Besides, Scratch also provides tutorials of simple games such as catch game and hide and seek. User can follow the steps to create a game and change any details of the game as they like.

For Code.Org, one of the most attractive functions is the one-hour tutorial, "Hour of Code". From the perspectives of user, lessons designed with limited time are more convenient for managing the time. By following the instructions in the tutorials and dragging some boxes to the correct place, user can

learn about the syntax of programming languages and understand how the actions are executed in a program within only one hour. Besides, there is also a short video introducing the lesson before each tutorial, it helps the user to clearly know about the learning outcomes and make sure that it is suitable for him. Additionally, Code.Org provides tutorials for all ages and different purposes. For example, user can choose to learn about applications, games and websites by clicking different buttons. Containing the elements of well-known games like Minecraft in the tutorial is also a good way to stimulate the curiosity of users and encourage them to find out the behind principle of a game.

There are several similarities between the two platforms. First of all, they are both designed for all ages. Elements like colorful images and interesting games can successfully attract the young generation, while the clear instructions are easy for the older people to follow. Second, the presentation of the programming knowledge is intelligible for the beginners. However, they also provide space for further development to the one who has a certain knowledge as the commands provided are enough for designing a complex program. Third, the tutorials are all in the format of step-by-step instructions. It includes some short sentences and edited screenshots to help the user getting familiar with different functions and resources. As a result, it is easy to master and user can continue with various development in a short time.

This project will try to include all these features and become an effective e-learning platform for JavaScript and React Native. At the same time, it will also try to improve some functions. For example, the tutorials will be shorter in order to fit in the fast paced life of Hong Kong people. A tutorial that can finished by half an hour will be more suitable and therefore, more people will choose to study about programming through the platform.

### **Project Scope**

This project will consist of several interactive games, which can be compiled in both computers and smart phones. These games are designed as the tutorials for JavaScript and React Native. In order to have a better management, these games will be separated for different tutorials, and user can study step-by-step. However, due to the time constraint, there will only be around 3 tutorials for each language. Also, although there will be both a website and a phone application that includes all the tutorials, this project will mainly focus on developing the website which covers more functions.

For the web version, the tutorials will be regarded as part of the whole website. The website will also provide other supplemental functions. For example, users are allowed to search for a particular

tutorial within the navigation bar, and they can have a quiz to test their knowledge after finishing a tutorial. Feedback system is also available to collect the user experience for all ages. The design of the interface will be clear and all function buttons will be visible.

For the phone version, the final product will only include the tutorials and a simple navigation bar which leads the user to the particular tutorial. Further development may be implemented in the future, such as a search function and feedback system.

### **Methodology**

The development of this project can be briefly divided into two parts: the tutorials and the supported platform. The former will be similar to games, and the latter will be a website and a phone application. The three parts will be developed separately, and the games will be implemented first since they are the main feature of this project.

Unity will be used for developing the tutorial. It is a game engine that can be ported on different devices, including Mac, iOS and Android systems. It only needs to consider the screen size and the placement of buttons, the final product will be able to compile in any platform with minimal adjustment. For the design of the tutorial, it will be in the form of completing tasks. User will follow the instructions and try to fill in the correct codes or make a suitable choice. After finishing all the tasks, it is ideal that the user can totally understand the scripts and be able to apply the knowledge to make their own projects. For example, by understanding the function of “getElementById” in JavaScript, the user can play tricks with pressing a button in a website. The reason for having tasks is to give the user a feeling that he has completed a course and has actually learnt something. Having a sense of satisfaction can encourage the user to learn more until the end of the set of tutorial. Unity satisfies the requirements for the development of the tutorial and it supports writing codes to implement extra effects.

Other features are as follows:

User interface: Due to the limitation of screen size, the platform may not be able to show many contents in a single page. Therefore, a navigation bar will be implemented to conclude the links directing to other pages. For instance, for the web platform, the navigation will include a search box and the links of “tutorial”, “about” and “feedback”. Tutorial button will direct the user to a list of available tutorials and show them from the simple one to the difficult one. If there are too many tutorials that they cannot be shown in a convenient manner, they will be then divided into chapters

and display the chapters instead of the tutorials. Instructional commands are also given to lead the users to finish the tasks. About button is the link to a brief introduction of the whole platform. It is essential to tell the user that the functions and the learning outcomes of this e-learning platform. At least the user need to know the main focus is JavaScript and React Native only. Feedback button will bring the user to the page that they can tell their user experiences to the developer. This function will be explained later.

Search function: this function is only available in the web version. In the navigation bar of the website, a search box is provided for the user to search for a particular tutorial. User can choose to enter the title of the tutorial or a command in the programming language. The system will show the results sorted by relevance. The tutorial will rank higher if the wording of description is more similar to the input. To realize this function, each tutorial will also include variables that contains the programming script and keywords of the tutorial.

Feedback system: this function is also available in the web version only. Feedback system is important that it can help the developer to collect opinions for the development of the platform and also the design of the tutorials. Due to the variety of potential users of the platform, the feedback system will ask for some basic information of the user in a form, including the gender, age, education background and contact. Contact is not necessary unless the user needs to get a reply. Moreover, all data in the form will be sent to the server by POST method. A database will be built to store the data and therefore, the developer can analyze and make improvement in the future.

Membership system: this function may not be able to implement due to the time constraint. If it is possible to develop, the membership system will require for another database to store the information and learning progress of a user. Username, password, name, age, gender, email are essential to fill in if the user wants to register as a member of the platform. The greatest advantage is that the platform can have a record of the learning progress of each member, and there will be marks for finished tutorials.

### **Challenges**

With the limited developing time, this project may not be able to support different languages. In order to meet the needs of different people in Hong Kong, it would be better if the platform can provide at least two languages, Cantonese and English. However, for the tutorial games, it may consume much more time if developing in two languages. Therefore, this project will only provide

an English version of the platform, since the international language can cover more groups of people. Besides, it will be easier for a beginner to learn the scripts and codes in English as all codes are only written in English and they are hard to translate into Cantonese.

### Project Schedule

September – October, 2017	Write a detailed project plan Build a project website Collect different tutorials for JavaScript and React Native as a reference
1 October 2017	Submission of project plan and project webpage
October, 2017 – January, 2018	Study codes of React Native that will be included in the tutorial Design an interactive game as the tutorial Finalize the flow of all tutorials Start implementing the interface and some functions of the platform
8-12 January 2018	First presentation
21 January 2018	Submission of preliminary implementation and interim report
January – April, 2018	Develop and compile the final product Test and improve all functions Test the platform with different systems (iOS, Android, computer) and screen-size Get feedback from other engineer and people in different age groups, and make adjustments Add more features if possible
15 April 2018	Submission of finalized implementation and final report
16-20 April 2018	Final presentation
2 May 2018	Project exhibition
30 May 2018	Project competition

## **References**

[1] Lydia Dishman. (2016, Jan 20). These Are The Top 25 Jobs In The U.S. This Year [Online].

Available: <https://www.fastcompany.com/3055629/these-are-the-top-25-jobs-in-the-us-this-year>.

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[3] Dan Crow. (2014, Feb 7) Why every child should learn to code [Online]. Available:

<https://www.theguardian.com/technology/2014/feb/07/year-of-code-dan-crow-songkick>.

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