

ENHANCING STUDENTS' LEARNING PROCESS THROUGH MOBILE APPLICATIONS

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Abstract - Mobile learning has become an important trend for various subject areas including computer science and engineering. These mobile devices provide anytime, anywhere learning opportunity for students. We have used App Inventor from MIT to develop our mobile app for Android operating system. This application consists of two portals: teacher portal and student portal. By using teacher portal, faculty member can develop questions for a particular chapter of a course or any subject. Through the student portal, students can view the questions and take a test. Depending on the nature of questions developed such as multiple-choice questions, the portal can grade it, analyze it and display it in a graphical format to show the individual students performance. Faculty member monitors student's performance and provides specific guidance accordingly.

Introduction

Mobile technology has been increasing drastically and the popularity of smart phones has risen in the past few years due to its computational power and easy access of information. The ability to compute from remote locations has made transfer of information fast and easy. Mobile application is one of the fastest growing trends in exchange of information and in the usage of various mobile applications like healthcare, games, banking, mobile computation, and more. There are many platforms to choose in developing a mobile application such as Android, Blackberry, iOS, Windows Phone, and more. Research shows that 70.1% of the phones sold worldwide are using operating system [1]. Android, an operating system by Google Inc. is considered as the largest market share in smartphones and tablets. Android is the most popular mobile platform with 2.5 billion application downloads in a month and growing significantly [1]. As there is a significant increase in usage of Android operating systems in mobile phones, it is the main reasons of choosing Android over other operating systems.

App Inventor is an educational learning tool, which is free, and open source tool that allows users to build Android applications without any knowledge of programming. It uses a graphical user interface that allows users to drag and drop blocks (puzzle-shaped objects) to build their application without ever having to write traditional code. App Inventor is a web-based tool for creation of Android apps using block-based development. Therefore, App Inventor gained popularity as a learning tool for students to improve their fundamental skills and exercise their creativity and innovation. Due to the numerous demands and requirements of creation of Android applications it was impossible to create Android apps for a new age group.

The main focal point of our application is to increase the students' knowledge in a particular subject area by analyzing their mistakes in the test and/or quiz through the feedback from the

instructor by using this application. Analyzing the mistakes, providing more instructions, and teaching the student based on those weak points, improves the overall learning experience and knowledge of the student. This mobile application strengthens the foundation of the students' learning process and improves the communication between students and faculty members more transparent. Both faculty member and student can communicate anytime through their hand-held mobile devices. The implementation of this application aims at taking advantage of mobile applications to communicate more effectively between students and faculty members.

Teacher posts test questions to students through the application. Students take the test through student's portal and the results are analyzed and displayed as a graph to show students performance. The analysis part can be detailed into each student as in which the student is making mistakes. The core point of this research is to increase the knowledge of the student from the mistakes he made in the test. Analyzing the mistakes and providing more instructions, student improves the overall knowledge of the subject.

Background

There has been a quite large research on the possible methods, challenges and future of potential uses of mobile learning approach in education [3-13]. Hezel [4] has discussed about three points in an effort to better understand the learning outcomes in the use of the hand held devices in the delivery of higher education. First, he compared the course completion rates for three different modes: (a) course offered primarily on hand held devices, (b) courses offered primarily online, (c) course offered in the classroom as face to face instruction. Secondly, author addressed the differences among the delivery methods. Thirdly, he compared the attributes of mobile learning in the course delivery and identified the constraints in the design and implementation.

Reed [8] conducted a study to find out the effect of using mobile devices in classroom. One of the classes was randomly assigned as experimental class and the other one as the control class. Experimental class students learned the subject using the mobile devices where other students in control class learned the same topic with paper material. The pre-test and the post-test was conducted and the results show that the students in the experimental class who used mobile based learning has shown significant improvements in the topics covered and learning performance. The response from students when an interview was taken found that they were satisfied with the classroom using mobile based learning because of two main reasons: a) level of students control on the topics b) increased communication between students and teacher-students.

Reed [8] surveyed about the literature of mobile learning and the consequences of implementing mobile learning in workplace. He reviewed the point of view on the current mobile learning technology and mobile learning strategy. His paper looked into the benefits of mobile learning in an organization and how it would be helpful for employees, as well as on factors that impact employees and the organization and how willing the employees are to adapt to mobile learning. This paper also explored the future of mobile learning in education and in an organization including content development, technology functionality and design strategy. There are many such motivational studies as mentioned in [3-13] which indicate the trend of higher

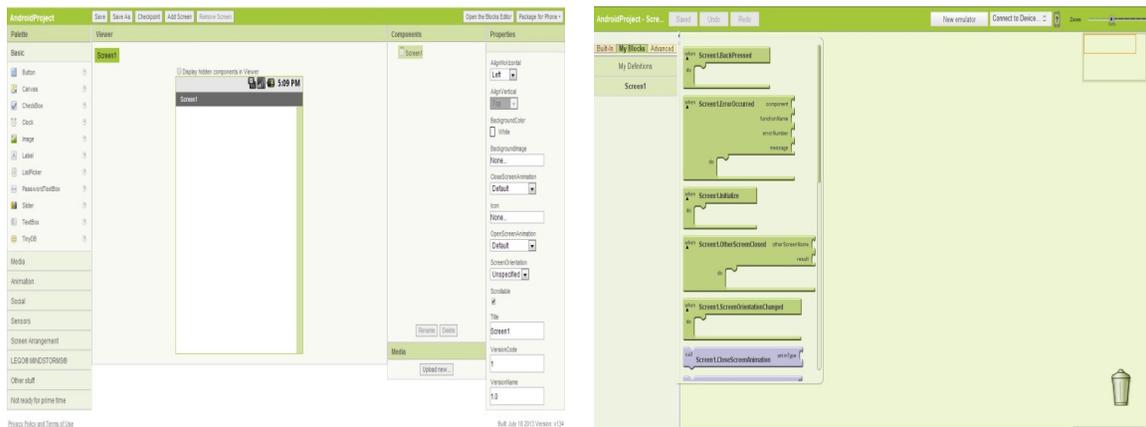
education towards mobile learning.

Design of the Learning Tool

We have used MIT App Inventor to develop our applications. The main two components are:

- **App Inventor Designer:** where we can select all the components for our app
- **App Inventor Blocks Editor:** where we assemble the entire program blocks, which specify how the components should behave.

The Fig. 1 shows the two components. The web-based graphical user interface screen is used to design apps for the application. It is divided into 4 different columns (Fig.1 (a)). First column is known as palette that contains all the components that can be used for the application like the button, textbox, checkbox, database, timers and many more. Second column is the viewer, which contains the components that are selected, and shows as it is shown in the mobile. Third column is the components column, which contains all the components for the application. Fourth column contains the properties of the components. When a component is clicked either in the second or the third column the properties of that particular component are show in the fourth column.



(a) App Inventor Designer

(b) App Inventor Blocks Editor

Figure 1: Components of App Inventor

Blocks editor is divided into two columns (Fig.1 (b)); first column contains all the blocks user enters in the app inventor designer. When one clicks on the blocks, the events and the calls that are associated with the blocks will appear which can be simply dragged and put in the second column.

We developed two Android applications: one for the student and another for teacher. Student portal is visible to students where they can answer several questions posted by teacher and the teacher can view student's progress and how he/she is performing in the course through teacher portal. The student portal is divided into two screens: first screen contains all the questions and the possible answers for the question and the second screen contains student's name and the number of questions that a student has answered correctly. Student portal components are shown in Table 1.

Table 1: Student portal components

Component type	Palette group	Name of component
First Screen		
Horizontal arrangement	Screen arrangement	ProtalHeading
Label	Basic	PortalName
Label	Basic	Qno
Label	Basic	Minlbl
Label	Basic	Seclbl
Horizontal arrangement	Screen arrangement	QuestionArrangement
Label	Basic	QuestionLabel
CheckBox	Basic	Option1chkbox
CheckBox	Basic	Option2chkbox
CheckBox	Basic	Option3chkbox
CheckBox	Basic	Option4chkbox
Horizontal arrangement	Screen arrangement	HorizontalArrangement3
TextBox	Basic	TextBox1
Button	Basic	Nextbtn
Label	Basic	EndofQuestions
Button	Basic	Submit
Label	Basic	Count
TinyWebDB	Other stuff	TinyWebDB1
Clock	Basic	Clock1
Clock	Basic	Clock1
Second Screen		
Label	Basic	EnterName
TextBox	Basic	EnterNameTxt
Button	Basic	SubmitBtn
Image	Basic	Image1
TinyWebDB	Other Stuff	TinyWebDB1
Notifier	Other Stuff	Notifier

The design of the home screen for the teacher portal contains basic components and a tiny web database to store the options and the questions a teacher enters into the portal. The questions and the answers can be seen below the screen after entering the questions. The behavior of the components needs to be implemented in the blocks editor. There are three main buttons on the screen, which are Submit, Students Marks, and New Quiz. Submit button is used to submit the questions and the answers entered by teacher into the database. Student marks (score) page navigates to the marks page where teacher can view which student has taken the quiz and how

much he/she has scored in the test. New quiz button is used to create a new quiz. Teacher portal components are displayed in Table 2.

Table 2: Teacher portal component

Component Type	Palette Group	Name of Component
Horizontal Arrangement	Screen Arrangement	HorizontalArrangementHeading
Label	Basic	Headinglbl
Table Arrangement	Screen Arrangement	TableArrangement1
Label	Basic	Questionlbl
TextBox	Basic	QuestiontxtBox
Label	Basic	Answerlbl
TextBox	Basic	Answertxtbox
Label	Basic	Label1
Label	Basic	Option1
TextBox	Basic	Option2txt
Label	Basic	Option2
TextBox	Basic	Option3txt
Label	Basic	Option3
TextBox	Basic	Option4txt
Horizontal Arrangement	Screen Arrangement	HorizontalArrangement1
Button	Basic	SubmitBtn
Button	Basic	StudentMarks
Button	Basic	NewQuiz
Label	Basic	QandAnslbl
Label	Basic	Listlbl
TinyWebDB	OtherStuff	TinyWebDB1

For teacher portal, we have designed three screens:

- a) Home Screen: In this screen, teacher will be able to add questions and options to the questions.
- b) Graphs: In this screen, student performance graphs are displayed showing the correct and wrong answers of the test. It has the following two formats:
 - a. Table form
 - b. Bar graph form
- c) Student Marks: Each and every student marks can be seen and the questions that they answered wrong can also be seen for every student.

When a call is made to TinyWebDB, the application goes to the database that is stored in the server using the URL of the web service and fetches the value from that particular URL using the tag name that is unique throughout the database. Once all the data is fetched from the server a method that is in the form of a block is called to handle the data that is fetched from the database. That method is shown in Fig. 2 and how it handles the data that is coming from the database.

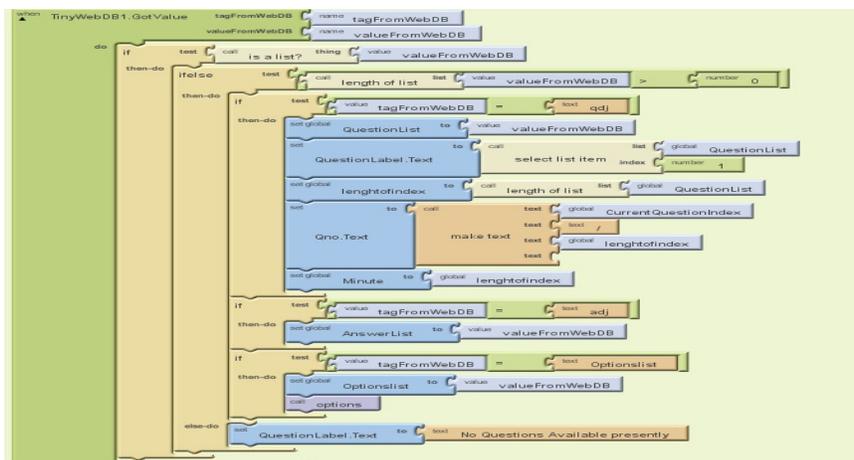


Figure 2: Load data from TinyWebDB

The communication between the student portal and the teacher portal is done through a database, which is stored in cloud. The database is in the form of a list. All the data is stored in the form of tables where the row of the table is searched using a key value. Each row in the list of the database has a unique key with which it can be stored and retrieved as per the application requirements. The implementation of this application is done in two different modules:

- 1) Teacher portal: Teacher posts the questions and answers to the questions in the portal in the form of choice answers. Teachers have the capability to view which student has answered the quiz and how many marks he secured in the quiz. They can view the overall graph of students how they are performing in the quiz with which several analyses can be performed. Teachers can view which student has answered what questions wrong when answering the quiz (Fig. 3).

(a) Before entering the question and answers (b) After entering the question and answers

Figure 3: Teacher portal

- 2) Student portal: Student answers the questions posted by the teacher and these are stored in the database with a unique student name. The data that is being stored in the database is the student's name, marks of the student and the questions the student answered wrong during the quiz (Fig. 4).

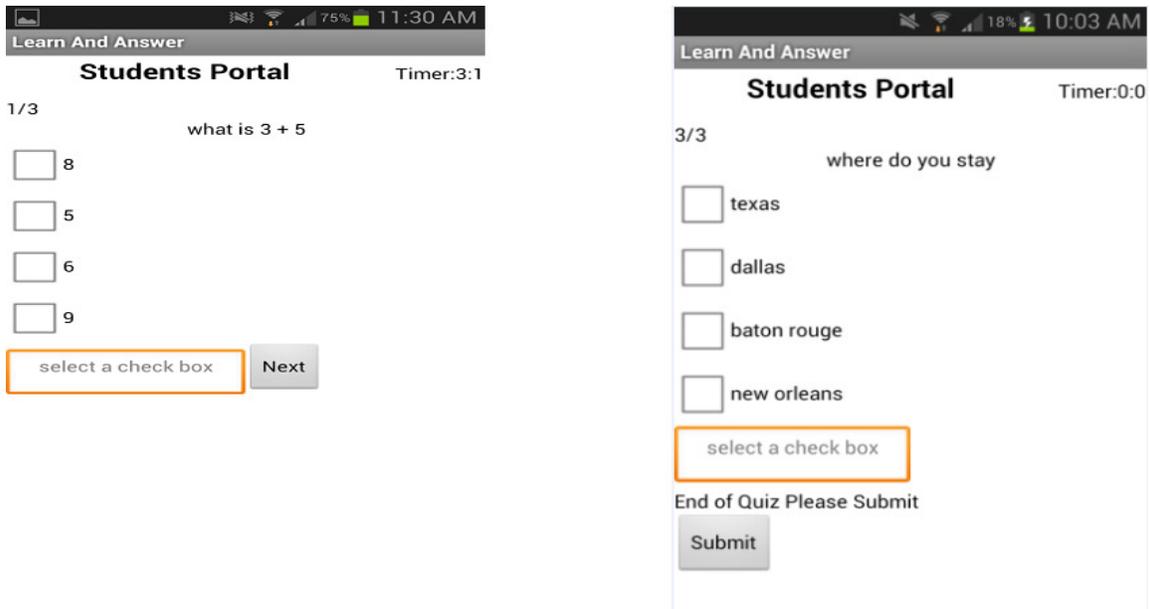


Figure 4: Student portal

Conclusion

In this paper, we developed an educational application using App Inventor to enhance the foundation of learning process and to improve the interaction and transparency between student and teacher. Mobile learning has appealed a lot of attention in recent years where students, teachers, and many researchers are seeing a lot of potential in mobile technologies to improve the learning experience. Wireless technology like the mobile technology gives an opportunity to change on how education takes place in classroom. There are some of the benefits of using technology in learning process includes:

1. Delivering the right content at the right time for each individual student at any place he requires.
2. Student learning will increase by helping students analyze and synthesize the data by collaborating through peer-to-peer communication.
3. Providing instantaneous feedback for teachers will help them to adjust the teaching methods in classroom or to the student individually.

In this paper, we have considered the aspects of the students and teachers and how they are affected using this mobile application in the process of learning. Implementation of the application for both students and teachers for their respective use will benefit both of them. In our developed application, teachers benefit by looking at the student's performance and how the teachers can change their teaching process or how they can improve student's performance by

interacting with individual students. Students can answer the questions and find out on which topics or areas they are not able to answer and improve those areas by through concentrated study. Students also increase collaboration between peers in the classroom which in-turn improves the team effort. Technology provides a new opportunity for students to explore more in field of mobile learning. We can leverage the technology to improve the learning process and to transform education.

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