IT Education Using SmartPhone: an e-Learning Approach

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***Abstract*—The teaching and learning of IT education in secondary and higher secondary level is an acute problem in Bangladesh due to lack of experienced teachers and appropriate infrastructure. This paper presents an android based learning and evaluation system for IT students of secondary and higher secondary level in Bangladesh. This system focuses on a guidance system to enable self-learning and self-evaluation among student from distant parts of the country.**

Keywords—Student;Teacher;IT;Hint;SMS;Feedback; Android;Question;Answer;Blended Learning.

I. INTRODUCTION

The teaching and learning of IT education in secondary and higher secondary level is an acute problem in Bangladesh due to lack of experienced teachers and appropriate infrastructure. Technology Enhance Learning (TEL), Mobile learning (m-learning) and Blended learning (BL) can be effective to solve this problem.

JISC (2010)[1] defines a Technology Enhanced Learning culture where the wide range of learners (e.g. full-time, part-time, professionals, overseas) are provided with a robust technology environment which provides the learning opportunities wherever the learner chooses.

Mobile learning is defined as "learning across multiple contexts, through social and content interactions, using personal electronic devices" [2]. In other words, with the use of mobile devices, learners can learn anywhere and at any time [3].

Blended learning is a formal education program in which a student learns at least in part through online delivery of content and instruction with some element of student control over time, place, path, and/or pace and at least in part at a supervised brick-and-mortar location away from home [4].

All, three systems above are very popular around the world and give us a cost-effective way to solve our problem. Mobile devices are now available to all people of our country. Internet facility is also spreading rapidly to the distant part of our country. We have developed a system using e-Learning with Mobile Apps (eLMA) for effectively self learning and self evaluation by students based on these three models.

II. BACKGROUND OF THE PROBLEM

Bangladesh is a third world under developed country in south-east Asia. It has a vision to turn into a digital one through a mass progress in the field of IT and IT education [5].

Under the existing curriculum at the secondary and higher secondary level of education, there is provision for imparting both theoretical and practical lessons in computer science. All secondary schools are supposed to have both computer laboratories and a sufficient number of qualified teachers. The reality is that, in cities and towns, most schools are well equipped and student can learn about computer even at home from house tutors. But in rural areas where most schools do not have sufficient numbers of computers and qualified teachers and most students do not have any scope to learn about computer at home, this subject is not taken seriously either by students or by their teachers [6]. There are around 14,669 secondary schools and 1,185 higher secondary colleges [7] in Bangladesh. Building infrastructure and ensuring skilled man power for IT education in each of them is a quite impossible problem. A poor computer lab facility of rural area is shown in Figure 1.

Figure 1:Poor Computer Lab facility in rural area

To solve this problem of lack of sufficient resource and manpower on IT Training, we can find a solution in our available technologies in our country. We have recently got 3G technology Internet [8] [9] access in our country. Though it is now limited to main cities only, we can expect that it will expand in our remote place in next few years. In addition to that, high performance android based smart phone devices are now available at a very low cost in our country [10] [11]. So it is now very easy to reach, connect and share data among people. So, if we can use these technologies in a guided way then we can use it to expand education among our people in a cost-effective, faster and more generalized way. If we spread learning stuff on IT in web through a guided system, then more people can learn about IT. In addition, using smart phone to access the learning stuff will make learning enjoyable to students.

Hereby, we have built an android based guidance system for our IT students of secondary and higher secondary level. This system ensures students get helps on need with the best learning materials along with their IT courses.

III. SYSTEM ARCHITECTURE AND ANALYSIS

This smart phone based e-learning system has been divided into two parts: client side mobile app and server side database application. The system architecture is shown in Figure 2.

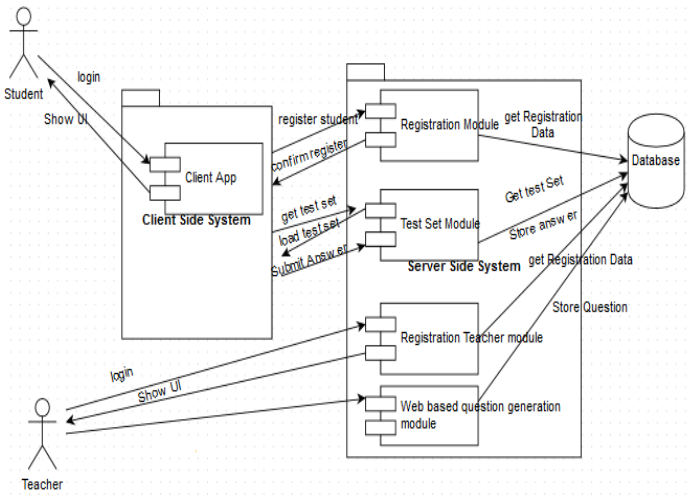


Figure 2: System Architecture

In the system, there are two main subsystems. First one is the client side mobile app. Student interacts with the client side one. Client side system interacts with server side system. Teacher interacts directly with the web-based system. This system consists of three modules- registration module, test set module and web based question generation module. The registration modules confirm registration for student and teacher. Test set module provide test set to client app on request. This set also store student answer and feed backs. The web based question generation module stores question sets submitted by teacher into the database.

Process Details and Flowcharts

In the first day teachers meet with students in a live session. The system follows a blended learning model. Student's enrollment is performed in this session. Then teacher changes the app for the appropriate class and subjects. Then teacher enters the primary sets of questions. In the second class, teacher gives them the android app back to install in the android set. Then the student takes test. Student activity flow chart is depicted in Figure 3.

Here, student logs in first using his/her roll number. Then he/she selects a subject to give test on. When he/she has selected a test then the system will check if a test set is available. If available, then he/she gives the test. If not available, student can send sms to notify the instructor. After a test, a student gives feedback about test. This feedback and the answers of the test are stored in the database.

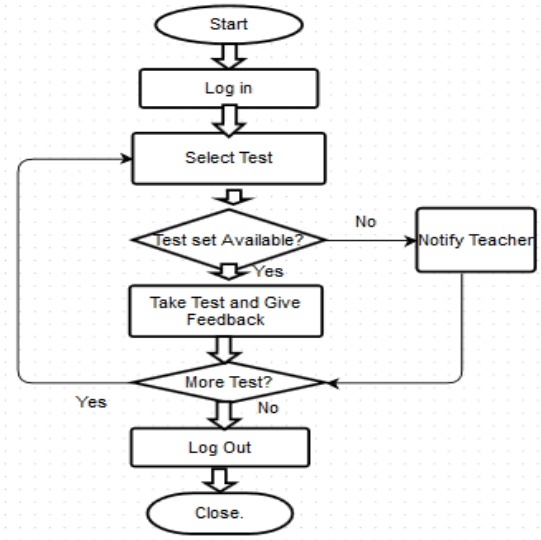


Figure 3: Student Activity Flowchart

In response teacher does his/her works. Teachers Activity flowchart is depicted in Figure 4.

Here, teacher logs in into website. Then he/she checks the notification page and the feedback page. If new notification pending, he/she immediately make's new sets of questions according to notification and feedbacks. If recent feedback says, his/her questions are getting hard. Then he/she have to make comparatively easy questions for the students. After question set is made, teacher will immediately inform the student.

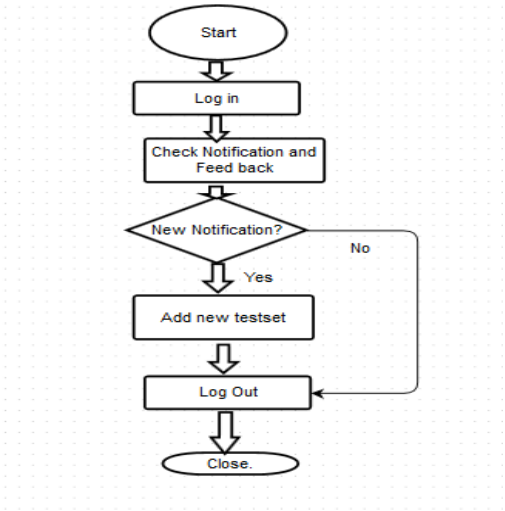


Figure 4: Teachers Activity Flowchart

IV. IMPLEMENTATION

A. Environment

Server-side system: We have used php codeigniter_2.1.0 mvc framework, mysql-5.5.24 database to build the server. To do some auto check facility, we have used jquery. To ensure security php sessions are used. To deliver data to client app xml and json format are used.

Client-side system: We have built the system with android api-17 platform. To store questions, xml database is used. To connect with server http client is used. Programs are built to extract data encoded in xml and json format. Shared preferences are used to store small data.

B. Application:

Student uses the client side android app. By using this android app, student can learn with self evaluation and appear test. Student selects a test. At first, student read through hints. If basic is clear, then starts giving answer. After all answer is given, correct and wrong ones will be shown.
Teacher uses the server side website. Using this website teacher can set question bank using web, upload file, create test set for the student for any topic.

C. Course Analysis:

At top of the course hierarchy is class. A class consists of many subjects, a subject consists of many books, a book consists of many chapters, a chapter consists of many sections and a section consists of many questions. For each question, there are multiple answers of which student have to choose the right answer. A test set will have many questions selected by the instructor.

IT courses for intermediate level student are covered. Topic on which test sets have been prepared is Information and Communication Technology: World and Bangladesh Perspective.

D. Additional Features:

To make the system more robust and user friendly, we have implanted some features. They are:

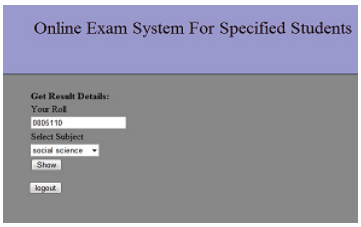
a) Guideline by Hints:

A student has to give a test on any selected topic (section). But with every test some hints will be provided. According to them, a student can get help from a web page or some discussion group in the Net. A lecture on this topic (supplementary to class lecture) will also be provided with each test.

b) SMS Response:

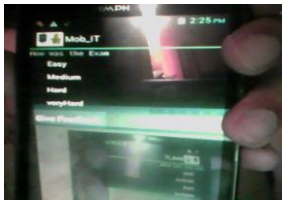
When the student is out of question of any topic, he/she can send sms the teacher. Getting the sms, the teacher will check the notification page of the server. Then s/he will upload new set of questions.

c) Automated Marking System:



The system has been designed initially only for mcq type questions. Accurate answers are given in the system. A student can connect with the server via apps and download appropriate test. Student can take test using his/her smart phone. After some time, teacher can review the results and can analyze student's progress on IT education.

d) Quick Feedback:



After each test a student give s feedback. Reviewing the feedbacks, instructor applies his idea to make the next question sets more useful for the student.

While implementing this system, we have considered some rules should be followed-

For Student, he/she must select a subject before giving the test. Every sms to the question administrator will cost an amount of money fixed by mobile phone operator.

For Teacher, when setting a question, for inserting Bangla text, ovro keyboard is used. For inserting English text, normal keyboard is used. When inserting Mathematics or Scientific symbol, the letters '&' and '<' are never used. They create problems in the android set when showing. Safe to use symbols for math are found in the link [12]. We have written them in a text first and just copy and paste from there to input form in website for safety purposes.

V. CONCLUSION

We have developed this guidance app on a test example for a test environment. We have used PC as the host and used the wireless LAN to connect with Android phone. We have prepared test sets on the topic introduction to computer for ICT in HSC level in app. For the real application we need a real server to host the main site. We also need expert manpower to prepare standard question set and appropriate guideline for different levels of secondary and higher secondary courses.

We will try to use this system as part of IT related course in an educational institution. After a session they will give us feedback and we will use it to evaluate our system. Using Evaluation Knowledge we will implement the system for IT courses for all the Secondary and Higher Secondary students in our country.

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