QuizFun: Mobile based quiz game for learning

M. Isuru T. C. Perera*, Kulari Lokuge*, Hiranya Mudunkotuwa*, Nevindaree Premarathne* and Madura Kularathna*

Informatics Institute of Technology

57, Ramakrishna Road,

Colombo 6, Sri Lanka

Abstract—**This research paper is based on the software that was prototyped in order to increase students' interactive participation in learning. The software also intended to motivate students to be engaged in specific subject content. The students were inspired to use the activity by encompassing the gaming mode in teaching and learning. Further, excitement was created by mobile enabled game mode. The mobile game consists of two modes as multiplayer mode and single player mode comprising of three levels with an embedded scoring mechanism. The scoring system provided students with immediate responses making the game fun and highly interactive. In-depth studies were carried out in relation to teaching and learning methodologies, which enriched the gaming environment that was prototyped, facilitating the students encouraging learning environment. Encouragement through quick feedback and hints showed a change in the participant's attitude towards assessments. Use of smiley faces and other symbols for communicating emotions was an added feature in the developed prototype. The mobile application was built using Java Platform, Micro Edition (Java ME) while the web application was created using ICEfaces, which is an integrated Ajax application framework for developing Rich Internet Applications (RIA). The prototype built to implement the proposed idea was evaluated by several users. The research found high interactivity among students and found students becoming enthusiastic in participating in learning activity.**

Keywords-**Education, Games, Educational technology, Knowledge acquisition, Software prototyping**

I. INTRODUCTION

In the 21st century, technology is part of everything that we do. During the last three decades technology has grown rapidly, and its inevitable impact on our lives is undeniable. It has changed the way we look at things, the way we do things and even how we play games. The field of education is no exception. High tech software and hardware has changed the old methods of teaching and learning. From abacus to e-learning software, technology has found their way in the educational process, through computers, laptops and many other equipment. However the old way of the classroom based education still exists. Now we use projectors, power point presentations, computers and many more in place of a blackboard in a classroom, either way it is not hard to find sleepy heads in a classroom. It was these sleepy heads that provided the motivation to take this research a step ahead and incorporate mobile games into teaching and learning process.

However, mobile phones, even in a developing country like Sri Lanka, has become very popular with 11,082,454 cellular mobile subscribers by end of 2008 [1], especially among the Y2K, younger generation. This generation uses the mobile phone as an accessory, where mobile phone is used to listen to songs, play games, surf Internet and many more. Computer games or mobile phone games have become a phenomenal aspect among the younger generation. The younger generation is fascinated by the gaming world where they utilize their brain and energy to play games, and gain self satisfaction when they finally win. This observation has been taken into this research, to integrate mobile, gaming to teaching and learning environment to create a vibrant learning environment that students enjoy.

II. PROBLEM

Identifying the younger generation's enthusiasm over mobile phones and games were considered as a gateway to bridge a solution to a long existing problem. The current class room assessment system includes in class tests where students provide answers to questions with multiple choice. These tests were found to be monotonous to students, and found less interactive with no feedback until the papers were marked. This traditional mechanism did not provide any motivation to the students of the Y2K generation.

The traditional multiple choice questions did not provide group learning facility. It was found that the students most of the time were encouraged by their peers and many problems were solved through peer learning [2]. It was necessary to find a solution to facilitate peer learning within the learning environment even though they were not co-located geographically.

It was also found that student learning does not occur only in classroom but also through their daily life experiences. The mobile devices extended time and location of learning. Learners use the mobile devices with an expectation to access information in immediacy and to gain richness in learning.

Therefore, this research focused finding means and ways to provide collaborative learning in an entertaining manner. As a solution to the above mentioned problem, the project was initiated to blend the learning process, the young generation's keen interest in the games and mobile phones together.

III. BACKGROUND AND MOTIVATION

The initial idea was through the research conducted by Wang, Øfsdahl and Mørch-Storstein in 2008 at Norwegian University of Science and Technology's Department of

Computer and Information Science [3], [4]. Sharples, Zurita and Nussbaum were few others who conducted similar research that were identified in the area of teaching and learning using mobile devices [5], [6]. At the same time, Ceangal has mentioned that computer games have become growing part of our culture [7].

BECTA reports on computer games in education project, highlighting the inductive qualities of software games such as encouragement to continue the students involvement with their role as game player including satisfaction, desire, anger, absorption, interest, excitement, enjoyment, pride in achievement, and the approbation of peers and of others [8]. Gaming software is capable of providing benefit for teaching and learning through provoking and harnessing some of the above mentioned emotions of the learner [8].

However, Carpenter and Windsor state that, in spite of many research conducted, uptake of gaming concept within teaching and learning was slow [9]. Carpenter and Windsor further highlighted several reasons for slow uptake of gaming in education as: lack of bespoke products, natural caution adapting gaming as a learning aid since the level of achievement is unknown and academia feeling uncomfortable in taking a step forward with gaming as a tool [9].

In identifying the research requirements and goals it was necessary to investigate technical and implementation methods. Several mobile application programming methods, designs and technologies were establishing in the industry. Considering time and developer capabilities and the suitability for the game based mobile application development, Java ME, ICEfaces Ajax application framework, Spring and MySQL database with Hibernate were selected for this research development.

IV. DEVELOPMENT AND IMPLEMENTATION

The research was experimented as a development project. The research tools and techniques were selected through identifying the resource availability and suitability. The evaluations were carried out with the students who were taking subjects for their BSc in Software Engineering at Informatics Institute of Technology.

QuizFun project consists of two applications; a web application and a mobile application. The web application is deployed on a server. Students download the mobile application from the server and install to the mobile device. Lecturers enter questions and create games using the web interface. The mobile application connect to the server over the Internet to get questions.

Figure 1 shows the system architecture of this application, where students connect through mobile phones.

The software architecture used for QuizFun Game is shown in Figure 2.

This software architecture is commonly used with Spring, which is a framework for developing Java applications.

The web application was built using ICEfaces, which is based on Java Server Faces (JSF) and it is a simplified
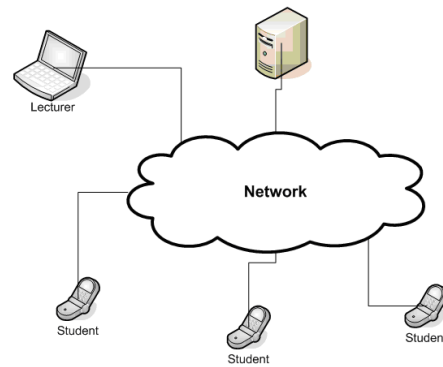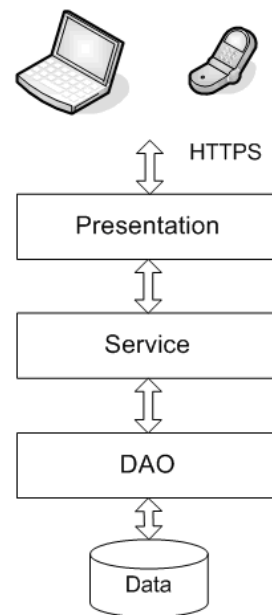

Figure 1. System Architecture

Figure 2. Software Architecture

technology for building user interfaces for Java Server applications. ICEfaces is an integrated Ajax application framework for developing Rich Internet applications (RIA) in pure Java. Further, Hibernate was used to build powerful, high performance object/relational persistence and query service in the system.

Similarly, the mobile application was built using Java Platform, Micro Edition (Java ME). Java ME platform is a collection of technologies and specifications combined to construct a complete Java runtime environment specifically to fit the requirements of a mobile device.

Development Environment was based on NetBeans and Eclipse. NetBeans was used to develop the mobile application and web application was developed using Eclipse.

HTTPS is used as the communication protocol, which ensures secure communication. Mobile application and the server communicates using HTTP connection. Extensible Markup Language (XML) is used as the data interchange format.

Figure 3. Single player game

Figure 4. Multi-player game

Figure 5. Login form

Figure 6. QuizFun Menu

Figure 7. Question

V. THE GAME FLOW

QuizFun has two Game Modes, Multiplayer Game mode and Single player Game mode.

Following is the game scenario.

There are questions with three levels. "Easy", "Medium" and "Hard". Questions are based on a "Module", for example: "Object Oriented Programming". There are at least 5 questions for a level. The player gaining a score of 80% or above is allowed to proceed to the next level. Failing to score the minimum requirement the "Game Over!" message is displayed. Players were given the opportunity to use a Hint or Reference to answer a question at a cost. That is in such instances the scoring is affected and a correct answer will only be awarded 50%. All players must be registered with the server before playing the game.

There are a few differences in the Multi-player game mode and Single player game mode. In the Multi-player game mode, the system requires the lecturer to create games by adding questions and answers. Also the students are expected to register with the server using their mob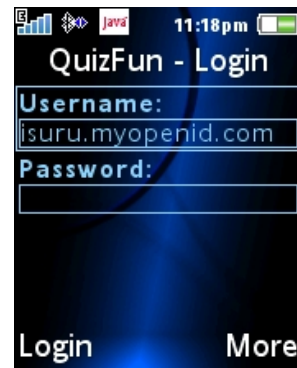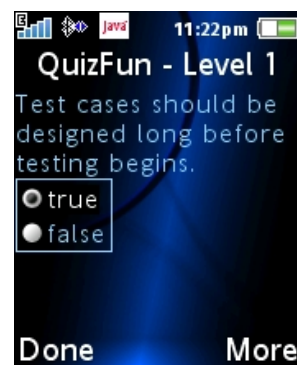ile client. Then the lecturer publishes the quiz. Student answers the questions for the level. At the end of each level, the statistics are displayed on the server. The lecturer can use the projector and show the statistics to students. Also, the statistics are displayed on the screen graphically providing detail information about the scores in each level.

In the Single player mode, the students get random questions for each level. In this mode, only the player will get to know his marks. Students can also select games which have been previously played as multi-player game. This will help students to review all the questions played in a multi player game.

As the initiation towards the above application, we built up a prototype for the single player mode.

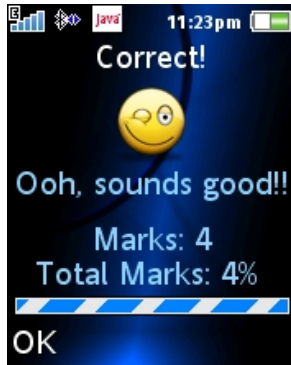The figures 5, 6, 7 and 8 show screenshots of the mobile game.

Figure 8. Correct Answer Display

VI. Findings and Discussions

As this research was heavily dependent on development, there are two categories of findings, as technical findings and teaching and learning findings.

The developed prototype for the Single player mode, was deployed to fifteen students to use for examination preparation. Users' anonymous feedback was used to enhance features of the system.

One of the main constraints identified was the technical compatibilities of the mobile phones and the prototyped system. Even though many students use mobile devices, only students with Java enabled mobile devices were able to install the application as other students' mobile devices were only consisting basic features. Hence, some students were unable to download the application to their mobile devices. However, the students who had the necessary features were able to use the system to attempt the QuizFun game. The students were provided with a user manual that included instructions how to download the software and how to play the game. Also, two novice users were given the opportunity to play the game who got entertained by the game and were interested in playing such educational games.

In the single player mode the student can play the game any number of times until they are able to finish the game or confident with the subject area. This is a major plus point because it enhances the knowledge of the student, directly fulfilling the main goal in this project.

The other points worth noting are that, according to the server capacity, any number of users can connect to the server, download the application and play the game. For a selected level, amount of data downloaded to the mobile phone via internet is about five kilobytes on average. At most two kilobyte of data needed for login, request headers and response headers. Thus, approximately seventeen kilobytes are downloaded when the game is entirely played. According to Dialog Telekom PLC (Sri Lanka), GPRS volume is charged at two cents per kilobyte [10]. Therefore the cost to play the entire game is about thirty four cents in Sri Lankan currency. That is about 0.003 US dollars under the currency rate [11]. Thus the game is very affordable according to tariffs in Sri Lanka.

VII. Conclusion

The use of mobile games towards the educational purposes can be rewarded effectively. It could build up the enthusiasm of students towards the learning process, and engage students in learning activities. It was found that such activities will provide better understanding. QuizFun can be used to make a difference to the traditional educational system, engage learners in learning activities enthusiastically to the lecturers about their learning capabilities.

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