# Design and Implementation of Web App to Facilitate Interactions in Classroom

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***Abstract***

*Smart devices and wireless network infrastructure are provided in schools for educational purposes, but their utilization methodology is still at the level of existing devices used for the modernization of teaching platforms. Thus, in this study, a new web application was developed for the realization of interactive teaching and learning using the advantages of wireless networks and personalized devices. This web app is a program that allows students to answer quizzes served from the teacher's PC of a teacher with their smart devices. Feedback for their responses and simple statistical results can be given as well. In this way, teachers can immediately check the level of understanding of their students. This enables a reliable utilization of smart infrastructure without students having to move around the class. In addition, it provides an opportunity to increase the quality of teaching and learning.*

***Keywords:*** *Smart Learning, Interaction, Educational Web Application*

## 1. Introduction

Information and communication technology has been introduced in Korean schools since 1987 in order to strengthen the quality of teaching and learning and to support learner-centered instruction. The main content of this effort was having a PC, network, and educational software in each classroom. One of the problems of this project has been the goal to provide one PC in each classroom. But one PC in each classroom was not sufficient to allow students to actively use information and communication technology because there is lack of accessibility of PCs for students [1].

In addition, the educational software used in each classroom so far is aimed at simply delivering course content to the students in most cases. In other words, educational software has played a role only as a delivery tool, but it has not been used as a tool to realize learner-centered instruction [2].

Today, however, smart devices and wireless networks have become common so that students have better access to information and communication technology in the classroom. But, the screen size of smart devices and a fast-paced platform environment limit the use of existing educational software.

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For this reason, the purpose of this study was to develop application software for interactive learning using smart devices, to increases the utilization of smart devices through appropriate software, and to present a new information and communication technology strategy by turning away from the strategy of using existing educational software. The model used in this study is application software based on Android and IOS platform interacting smart devices with the teacher PC. In this interaction, the PC allows the teacher to respond to the data sent from the students using the software.

## 2. Educational Meaning of Smart Device Based Applications

Recently, there have been many attempts to define the concept of smart education. However, actual cases in teaching-learning situations have not been categorized and it still remains in the stage to utilize existing educational software. Although there were sharing activities in the classroom even before the development of smart devices and wireless network, portability and compactness of personal devices and the development of wireless network make sharing activities in the classroom easier and more convenient. Such activities were performed in PDA-based PicMap project but sharing activities became more active outside of the classroom as well as in the classroom thanks to the more advanced system [4-5].

To exchange what they learn from teachers or from other friends among members is very important and basic thing in teaching-learning situation. Therefore, tools to facilitate and support it can play very important role in all forms of learning such as individual learning, cooperative learning and teacher and student driven learning. Thus the tool supporting this may be important element to enhance achievements and participation of students.

In this study, it is tried to propose 'sharing activity' as the example that advantages of smart devices and wireless network are applied to classes in the classroom and to propose smart device based application to support this sharing activity. In this application which supports sharing activities in classroom classes, teacher's PC, beam projector and smart devices of students could interoperate for efficient interactions between teacher and students and among students themselves.

The smart device based application proposed in this study supporting sharing activities in classroom classes will present a chance to improve students' academic achievements and participation.

## 3. Design and Implementation of Web App to Facilitate Interactions in Classroom

### 3.1. Development Environment

The development environment of this webapp facilitating the sharing activity is as follow.

**Table 1. Development Environment**

| Program Tool | Description |
|---|---|
| OS | • Windows7<br>• Android4.1.2 |
| Database | • Postgres8.4 |
| Web Server | • Apache Tomcat5.5 |
| Development Tool | • Eclipse ADT |
| Development Language | • HTML5, JSP & Servlet |

### 3.2. The Direction of Development and Design

First, interaction is established in the combined actions of the server software and the students. There are several interactions such as between students, between a student and a teacher, and between the application software and students. In this study, a system is developed where data is transferred by a button on smart devices that connect students to the server software in a way which is recognized by the server and results in feedback to the user.

Second, the type of interactive content is a text-based quiz. On top of that, the content can be provided as educational software and students can manipulate it from a remote location. However, the intention of the study is to develop an application in order to allow teachers to easily modify and supplement the interactive content. Hence, we are going to develop quiz-type content where the students can select answers using number keys.

Third, only the simplest screen is provided for students' smart devices. The devices may have a large TV screen as well, but in this study, no additional information is going to be provided on the screen of the smart device for the students.

### 3.3. System Components

A data sharing learning environment using smart devices can be divided into a classroom environment and a server environment for learning management as shown in Figure 1.

The major components of the classroom environment are smart devices for the students and a PC for the teacher. In addition, the teacher and the students can share a projector screen by sending the smart phone screen to the PC screen.

The major components of the learning management server are a data base that manages students' quiz results, the problems for each subject, immediate feedback and a web app which permits the organization and transfer of content that the teacher intends to teach.

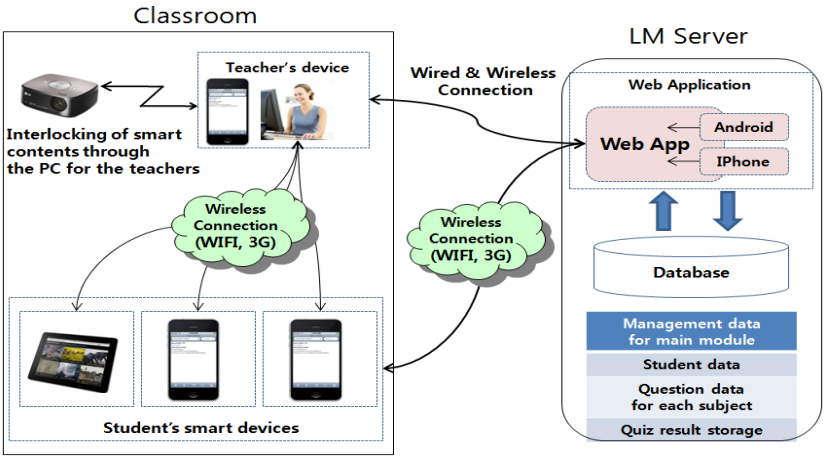


**Figure 1. Shared data learning environment components**

The learning process in a shared data learning environment are as follows as shown in Figure 1.

• The teacher logs in as administrator and generate quizzes from the question bank.

• The database of the learning management server stores and manage the problems for each subject, the results of each quiz, and provides web app interlocking with the DB in accordance with the requirements of the users.

• The students solve the quizzes. Correct answers and results are confirmed in real time.

• The smart devices for the students and the PC for the teachers are connected with WIFI or 3G so that they can learn and teach by sharing their screens through a projector.

## 4. Study Results

The interactive program produced in this study is a program that can promote and support sharing activities among the types of smart devices used. This program may be specifically stated as a way to share a small amount of data. In addition, the specific configuration of the program content is discussed below.

### 4.1. Learning Activity Process

#### 4.1.1. Presentation Stage

In this stage, quiz contents stored in teacher's PC is presented on beam project screen and smart phones of students. Students can read quizzes by accessing to the web page and beam project screen shows the number of connecting students and the status of present screen. Although students can access to the web page outside of the classroom, answering is allowed to the designated student only.

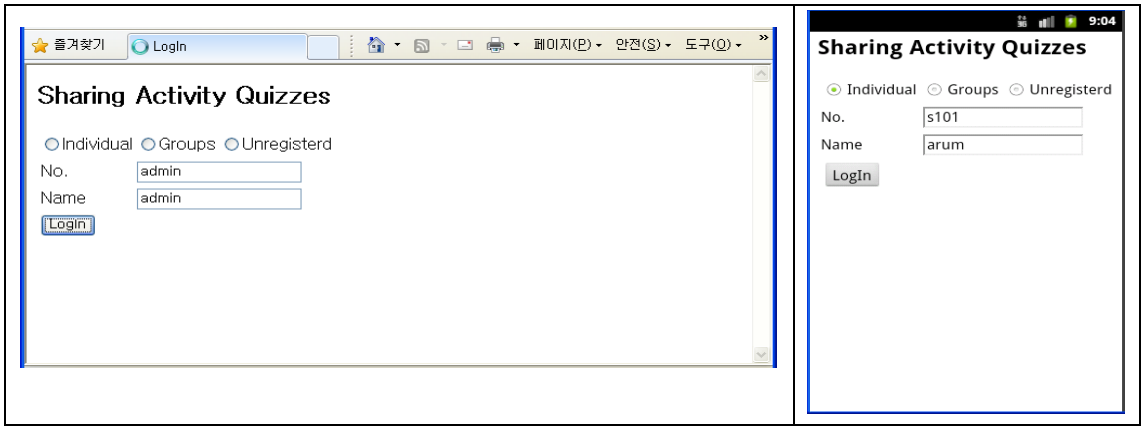


**Figure 2. Teacher Login in the PC, Student Login in the Smart devices**

#### 4.1.2. Answering Stage

Students answer the quiz provided to them and on beam project screen using smart phone buttons. After answering, they can save their answers in DB. Students should finish answering in prescribed time and the teacher can change the prescribed time.

Students can remain the same screen without going to next page but in this case they cannot answer the questions or save their answers. Beam project screen will show the current status of the student.

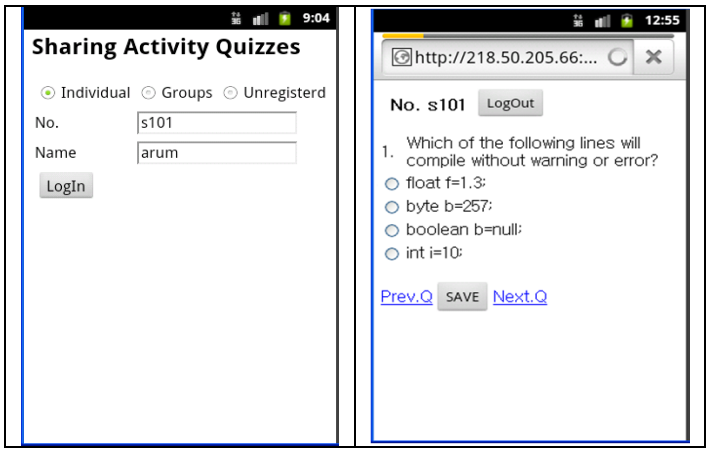


**Figure 3. Student quizzes on smart devices**

### 4.1.3. Feedback Stage

It shows the right answer on large screen instantly so that teacher and fellow students can check the correctness of the student's answer. It has many options allowing group answering or anonymous answering so that the teacher can configure the learning diversely.

When the teacher clicks 'Check Answer', the screen shows the correct answer of the question with ratio of correct/incorrect answers and ratio of answerers. You can move to the previous or the next questions according to your needs.

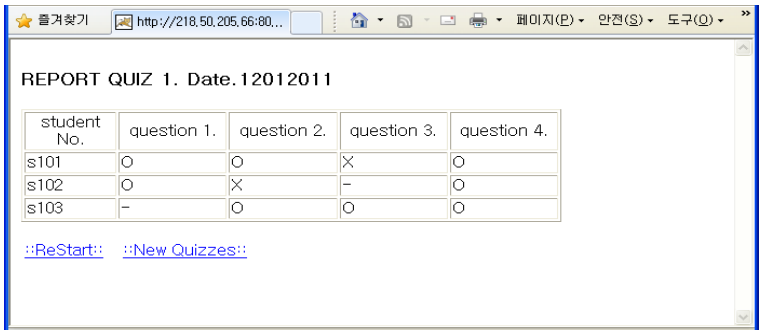


**Figure 4. Quiz Report**

### 4.1.4. Closing Stage

When it finishes all the questions in the quiz, statistics with or without names is provided on the large screen and each learner's screen. Beam project screen provides statistics in simple chart formats.

## 4.2. Evaluation of Software by Experts

The smart device based application that was developed in this study not only supports sharing activities to facilitate interactions between subjects in the classroom learning environment but also allows the teacher to drive the class without distracting students' attention to various devices. Therefore it is expected that this smart device based method will improve students' academic achievements and participation comparing to the conventional method to utilize high-tech devices in the classroom. However, doubt and worries if the

developed system can satisfy reliability and validity in both functional and non-functional aspects cannot be resolved completely. Thus, we performed verification process to check the quality and completeness of the application.

The main purposes of software verification are to check if the developed software is appropriate for the purpose, and if the software operates as intended. To measure the accuracy of the software, specifications on the characteristics to be implemented, in other words, functional and non-functional requirements should be verified [6].

The following questions to measure functional/non-functional requirements were developed and 3 computer education majoring teachers and professors, 2 educational technologists, and 3 computer engineering professors and developers were selected as experts for evaluation. Figure 5. Shows the results of evaluation by experts.

**Table 2. Questions to evaluate software requirements**

| Functional/Non-Functional | Application Requirement | Measure |
|---|---|---|
| Functional | User Accessibility | Are the resources that the system provides (database and all the functions) accessible? |
| | Requirement Specification Conformity | Do the method that the system respond to specific entry of users and the method to provide resources conform to the design direction? |
| | Efficiency of Program | Does the developed system contribute to the improvement of efficiency of teacher-driven classes utilizing sharing activities in the classroom? |
| Non-Functional | Reliability of Program | Are there errors in availability of provided resources and program answer results? If so, please mark the times. |
| | Easy to use | Have the functions that the system provides been developed well so that users can use those functions intuitively? Or does it provide 'Help'? |

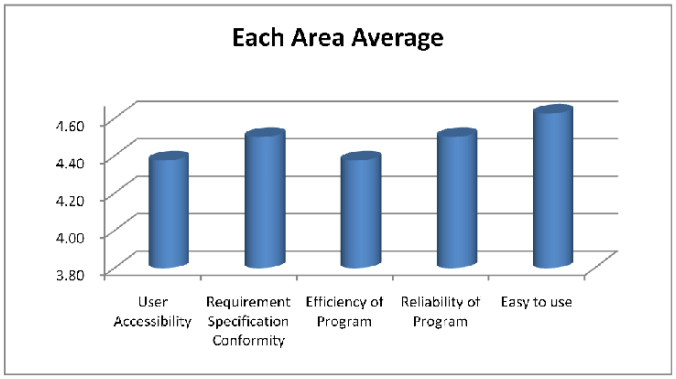


**Figure 5. Evaluation Results Application by Expert**

## 5. Conclusion

Although discourses on smart education have been actively made these days, the actual cases or class supporting tools utilizing advantages of smart system have not been sufficiently developed yet. Accordingly this study proposed the above to go for the classroom learning environment matching with current trend and improve students' academic achievements and

participation by developing an application software making most of wireless network infra and compact sized smart devices.

The developed software is not a native App dependent to specific platform, but a hybrid App that can operate on all smart devices including on Android and IOS. As the use of smart devices in classroom may distract students' attention, which used to be mentioned as a disadvantage of using smart devices in classroom, this software does not leave the control to learners but let the teacher operate Web App.

It may deteriorate some advantages of smart devices and make this software non-operable on various kinds of devices.

However, in current situations that there are no cases or solutions allowing easy use of compact size smart devices and wireless network technology, it can be a practical alternative. It can also be used for measurement of students' academic achievements and survey of students' opinions in individual and group classes as it provides various optional functions.

Through this, the teacher can check the understanding level of students instantly, select the educational contents appropriate for the level of the learners and provide the contents in a structured form.

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