

# Development of web app for mobile inquiry-based learning using cross platform

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**Abstract-** The development of mobile devices and wireless networks has brought about many changes in the form of e-learning. Now mobile devices provide new opportunities to support student learning. Also the role of the instruction changed to the learning assistant from the knowledge messenger, inquiry-based learning with the dynamic process in which students pose questions and solve a problem for themselves became more important. Access to information in inquiry-based learning is closely associated with the inquiry process. In this study, have developed web app for mobile inquiry-based learning using a cross-platform and it was evaluated with respect to software requirements and usability by six computer training professionals. Mobile inquiry-based learning will be used to support for potential, effect, the problem of teaching and learning environment of the classroom for the teacher.

**Keywords-** Mobile inquiry-based learning, Mobile devices, Cross platform, Web App, Hybrid App, Web server

## 1. Introduction

The development of mobile devices and wireless networks has brought about many changes in the form of e-learning. Now mobile devices provide new opportunities to support student learning. Also the role of the instruction changed to the learning assistant from the knowledge messenger, inquiry-based learning with the dynamic process in which students pose questions and solve a problem for themselves became more important. Access to information in inquiry-based learning is closely associated with the inquiry process.

In this study, using a cross-platform web app independent of the platform compared to the native applications for mobile devices and has developed a mobile inquiry-based learning environment. Mobile inquiry-based learning environment can be utilized in all classes outside the classroom space, which may be stabilized by the recent development of the Internet cloud.

There is also the advantage of being able to attach all kinds of files in a device based on the API than in previous studies. This will complement the biggest disadvantage with those for the Web app. The study by increasing the availability of mobile devices, a new e-learning strategy away from the center of the educational software will be presented.

## 2. Literature Review

### 2.1. Development Trend of Software Using Cross Platform

The advent of the smart phone platform enables easy development of applications, and has brought explosive growth of smart phone apps market. At the same time, the smart phone platform, has developed a way to support a variety of iPhone OS, Android, Windows 8, different platforms [1-3].

Accordingly, the cross platform issues to support multiple platforms in a single development and increased interest in the smart phone, has evolved in a complex pattern.

Therefore, the tool capable of promoting and supporting them can be a very important role in all forms, such as learning of the individual learning, collaborative learning or teacher and student. Therefore, tools that support them can be an important lesson factors that may increase the academic achievement and student participation.

### 2.2. Mobile Inquiry-based Learning

Inquiry-based learning starts by posing questions, problems or scenarios rather than simply presenting established facts or portraying a smooth path to knowledge. The process is often assisted by a facilitator. Inquirers will identify and research issues and questions to develop their knowledge or solutions. Inquiry-based learning includes problem-based learning, and is generally used in small scale investigations and projects, as well as research [4].

Effective inquiry is more than just asking questions. Inquiry-based learning is a complex process where students formulate questions, investigate to find answers, build new understandings, meanings and knowledge, and then communicate their learning to others. In classrooms where teachers emphasize inquiry-based learning, students are actively involved in solving authentic real life [5-6].

## 3. Design of Mobile Inquiry-based Learning Environment Using Cross Platform

### 3.1. System Components and Models

A mobile Inquiry-based learning environment using cross platform can be divided into mobile client, pc client environment and a server environment for learning management as shown in Fig. 1 [7].

The major components of the client environment are mobile devices for the students and a PC for the teacher [8]. In addition, web applications of server include question-posing module, assessment module for inquiry-based learning.

The major components of the learning management server are a database 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. The learning procedures are as follows as shown in Fig. 1.

- The teacher logs in as administrator and generates quizzes from the question bank.
- The database of the learning management server stores and manages 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.

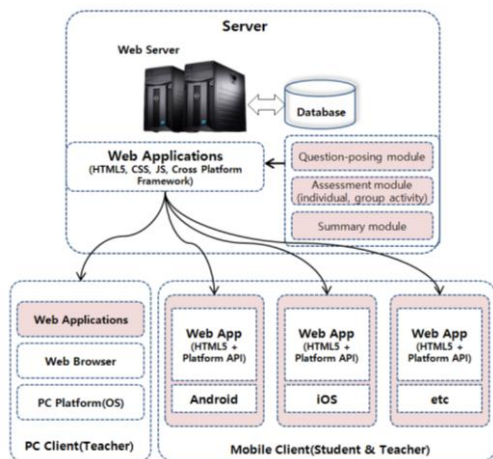


Fig. 1. System components of Mobile inquiry-based learning environment.

## 4. Results and Discussion

### 4.1. Inquiry-based learning environment

Fig. 2 shows the Web App for Mobile Inquiry-based learning using cross platform. In student List area, the teacher can see a whole list of students who are logged in through this area. Each Student's Response Summary under the area can see specific summary of selected student at the student list. Also, this area can check the number of respondents and the percentage of correct answers for each question. In Quizzes

area, we can see questions created by the students. View Question can check for question selected in Quizzes areas.



Fig. 2. Teacher's controller main in PC.

Fig.3 shows the process of inquiry-based learning using student's mobile devices. Students answer the quiz provided to using mobile device. After answering, they can save their answers in DB. Students should finish answering in prescribed time and the teacher can change the prescribed time. 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.

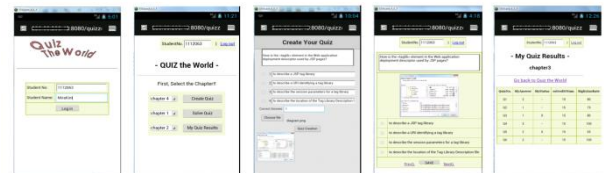


Fig. 3. Process of Inquiry-based learning using student's mobile devices

### 4.2. Evaluation of software requirements

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 [9-10]. The following questions to measure functional/non-functional requirements were evaluated by five teachers who majored in computer education selected as a panel of experts. Table. 1 Shows questions to evaluate and the results of evaluation by experts.

Table 1. Questions to evaluate software requirements

Functional/ Non-Functional	Application Requirement	Measure	Mean score	Std. dev.
Functional	User Accessibility	Are the resources that the system provides (database and all the functions) accessible?	4.28	0.81
	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?	4.26	0.78
	Efficiency of Program	Does the developed system contribute to the improvement of efficiency of teacher-driven classes utilizing sharing activities in the classroom?	4.20	0.78
Non-Functional	Reliability of Program	Are there errors in availability of provided resources and program answer results? If so, please mark the times.	4.30	0.74
	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'?	4.12	0.75

## 5. Conclusions

In this study, using cross-platform mobile development was inquiry-based learning environment. This application is a platform-independent and easily accessible compared to the native application for a mobile device. Mobile inquiry-based learning environment can be utilized in all classes outside the classroom space, which may be stabilized by the recent development of the Internet cloud.

There is also the advantage of being able to attach all kinds of files in a device based on the API than in previous studies. This will complement the biggest disadvantage with those for the Web app. Model to be presented in this study is a smart device with the PC and teachers to interact with applications such as Android or IOS software platform. Learner to send data to the teacher's PC, and the interaction with them to react the teacher's PC.

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