Development of BYOD Strategy Learning System with Smart Learning Supporting

Myung-Suk Lee and Yoo-Ek Son

College of Liberal Education, Dept. of Computer Engineering, Keimyung University
mslee@kmu.ac.kr

Abstract

With the proliferation of mobile devices such as laptops, tables and smartphone, the BYOD trend is increasingly spreading in schools learning, transforming the way students learn and how, where and when they consume educational information. This study is to develop system that supported smart learning interaction and evaluation learning using advantage of BYOD devices. The developed system can be managed learners and classes in the server. Using the App for tablet PC or SmartPhone, the learning evaluation, real-time interaction and feedback is possible. The schools adopting a BYOD strategy are numerous benefits for schools and for students, the generation of students being exposed to mobile devices basically from birth, will be reborn as a system to support learning.

Keywords: BYOD Strategy, App, Smart Learning, Interaction

1. Introduction

With the recent high dispersion rate of individual IT terminals, such as, smart phone and tablet PC, interest on BYOD (Bring Your Own Device) has been increasing on daily basis. It means the facilitation of individual IT equipment as the auxiliary means for work undertaking while using the general PC provided by business for major work terminal as a new trend of facilitating individual IT equipment for work affairs and it is facilitated as an educational tool [1]. As such, following the advancement of internet communication equipment and technologies, there are e-Learning, m-Learning, u-Learning and others that would be linked to education. In addition, with the emergence of smart phone in recent days, there are efforts to facilitate the foregoing in education [2-3].

The Ministry of Education, Science and Technology has operated the digital textbooks on pilot basis for promoting the learning effect since 2007 and it has been expanded for students in nationwide. Therefore, the pilot schools have structured the facilities, such as, tablet PC, electronic blackboard, tap and others, and through the faculty training, it has implemented education on method to use and teaching-learning method [4, 5]. However, together with the digital textbooks, contents that may use smart phone for education have been developed, but contents that may be used in the education field have been greatly lacked [6].

Therefore, under this thesis, BYOD has been facilitated as much as possible to develop the system that is available for interaction and feedback for teacher and students. Followings are the strengths to earn by using this system. First, the devices that learners and teacher use may be used as much as possible. Second, by developing and applying the evaluation system to
find out the level of understanding on class contents, the level of understanding on class of learners would be found out. And, third, by enabling the real-time evaluation and feedback, it may heighten the level of interest on learning and enable coaching and repetition for each level.

2. Theoretical background

2.1. Smart learning

Recently, the Ministry of Public Administration and Security [7] defines the smart learning service as the ‘new education service converged with e-learning new technology and smart device of smart phone or tablet PC’ [8, 9]. Accordingly, Roh Kyu-sung (2011) [10] arranges several studies to define the concept of smart learning as in Table 1.

<table>
<thead>
<tr>
<th>Division</th>
<th>Concept &amp; Characteristics</th>
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<tbody>
<tr>
<td>e-learning</td>
<td>• Electronic means, learning that uses IT and radio &amp; broadcasting technology</td>
</tr>
<tr>
<td>m-learning</td>
<td>• Learning that uses a notebook or mobile device, a type of learning that is not restricted by time or place but uses the wireless internet, • A form of e-learning inducing mobile technology to e-learning</td>
</tr>
<tr>
<td>u-learning</td>
<td>• A mode of learning integrated with ubiquitous computing technology, learning that can be conducted anytime, anywhere even without a PC only by connection to the internet, • No time or space limitation, using various multimedia materials, • Customized education considering each individual’s level, • Providing self-direction learning environment</td>
</tr>
<tr>
<td>Smart learning</td>
<td>• Student-centered, self-directed, interaction, intelligent, informal learning, and a sense of reality, etc.</td>
</tr>
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Looking into the characteristics on previous studies, first, it is clear that smart learning actively facilitates the cutting edge information communication technologies that are specified as smart teacher. Second, it maximizes the learning effect through mutual cooperation by breaking away from the function of single-directional knowledge delivery with the actual realization of mutual cooperative learning. In particular, the concept of social learning that facilitated the social network computing is very important in smart learning that it is expected to undertake the role to supplement the mutual cooperative functions that has been considered as the limit of e-learning. Third, it may contribute to build up the environment for self-initiated learning design. Fourth, the non-formative learning that breaks down the boundary of living, work, leisure and learning has to be actually realized. By connecting the information communication technologies, such as, virtual reality technology, reinforced reality technology and others, and the structural learning design model, the learning method of formative or objective unilateral direction is refrained and it enables the learner-oriented and human-oriented learning method. Considering such advance studies in comprehensive terms, it requires exploratory study on realization requirement on smart learning.
2.2. Mobile Internet

Mobile means the ‘one with mobility. Mobile is the wireless Internet that is based on the technology to forward and receive the information by linking to internet and other diverse data communication network under the wireless environment [11]. The wireless Internet is the service that forwards and receives voice, data and video information and it is the wireless Internet linked service by the data communication through browser built-in to the mobile communication terminal, information service by using SMS, PDA or mobile computing service, and wireless Internet link service by the wireless modem and this is referred to as the mobile Internet.

The implication in mobile has the concept of 'mobility' other than the implication of 'wireless' in details. In general, the mobile Internet is defined as the Internet through the mobile terminal that includes the 'mobility'. For the strength of mobile Internet, it embraces mobility, approachability, expandability and promptness. For characteristics of the mobile Internet, it is shown as in Table 2 [12].

<table>
<thead>
<tr>
<th>Division</th>
<th>Characteristics</th>
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<tbody>
<tr>
<td>Ubiquity</td>
<td>• Properties that can receive real-time information from anywhere</td>
</tr>
<tr>
<td>Reach</td>
<td>• properties that can access from anywhere without the constraints of time and space</td>
</tr>
<tr>
<td>Security</td>
<td>• Properties that ensure the security and safety</td>
</tr>
<tr>
<td>Convergence</td>
<td>• Properties that simplify the communication tools</td>
</tr>
<tr>
<td>Localization</td>
<td>• Properties at a specific point in time where the user's current location is unknown</td>
</tr>
<tr>
<td>Instant Connectivity</td>
<td>• Properties that can navigate the necessary information within a short time</td>
</tr>
<tr>
<td>Personalization</td>
<td>• Mobile users personalized and differentiated customer service</td>
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</tbody>
</table>

2.3. Collaborative learning

Collaborative learning is accomplished by interaction between a learner and a learner, and a learner and a teacher; here the interaction between learners and learning equipment should also be considered.

Basic interaction devices include non-real-time communication such as web board, Q&A, e-mail, and text messages, real-time communication methods such as messenger chat, real-time debate room and whiteboard, and multilateral collaborative learning which uses learning community. Also, social network services, which come into wide use recently, such as Facebook and Twitter, enable student to have collaborative learning without boundary of non-real-time and real-time communications.

Especially, smart phones support collaborative learning by using tethering, in which other wireless communication device can use the internet through one connecting line, and ad-hoc network, which connects each wireless communication device without AP (access point). These functions, however, have a disadvantage that the implementation of the functions depends on the types and models of each device [13, 14].
3. Design of system

3.1. System configuration

This system is configured with the system as the model that is linked for server, PC, tablet PC and smart phone through wired Internet and wireless Internet (WiFi). Figure 1 displays the environment for the system as the model. The electronic lecture desk and project are displayed on each classroom that the design and realization parts are developed for server and tablet PC for the application to be used by teacher, application to be used by learning on smart phone, and communication for the above three.

![System configuration diagram](image)

**Figure 1. System configuration**

The teacher client (tablet PC) makes the questions for learners to send to the server. The questions received from the teacher from the server are saved on the database. The server forwards the questions received from teacher to learners who are linked to the server. The learner client that received the questions turns into the question-solving screen. From the question-solving screen, learners read the questions and input the answers. On the basis of answers inputted, result on questions is forwarded to the server. In the server, the result forwarded from learner client is saved on the database. When the teacher requests the result of learners to the server, the server inquires the result from DB and forwards it to teacher client. In addition, the result returned in request for the result inquiry to the server from the electronic lecture desk PC is shown from the project.
3.2. Sequence diagram

The sequence diagram of the system is shown on Figure 2.

First of all, learner has to log in through inputting the ID. When logging in, the student ID number and password are sent to confirm the learner information of the server. When the student ID number and password are the confirmed, the approval information is sent to the learner and record the attendance. After logging in, it turns over to the main screen to stand by.

The teacher executes the application and prepares the questions by selecting the 'question preparation' menu from the main screen menu. The prepared questions are stored in the question DB in the tablet PC.

In the event that evaluation is implemented in class, the 'evaluation start' menu on the main screen is selected to retrieve the question list of the question DB. Applicable questions are selected from the question list to send to the server. The server with the questions is linked to the server through logging in to send to the learners standing by on the ‘m4’. The learners received of questions from the server are converted from the ‘m4’ to the ‘question-solving’ screen. Answers to questions are prepared and sent to the server. The server that received the answers from the learner stores the answers to the result information DB. When the answers are received from all learners, the server sends the 'evaluation completion' message to the teacher since all learners completed the question-solving. When the evaluation is completed, the teacher selects the 'result view' menu from the m4 to request the server for the result in

Figure 2. Sequence diagram
order to confirm the result of the learners. The server that received the request on the 'result inquiry' from the teacher inquires the 'result information DB' to send the evaluation result to the teacher. The teacher obtains the result from the server for confirmation.

3.3. The class diagram of teacher

The class diagram of teacher is shown on Figure 3.

![Class diagram of teacher](image)

**Figure 3. Class diagram of teacher**

Teacher Client is comprised of 11 classes and 1 interface, and the program is executed after calling the class of each screen, starting with the main class. The method of class called teacher_Client, which gets connected to the server, is used by being called from multiple classes as follows. First, it gets connected to the server by using the Connect() method from the main class. Then every time each screen changes, each class is used after bringing the teacher_Client object connected to the server by using the getInstance() method. Meanwhile, the DBAdapter class, which accesses the database of Teacher Client, is used after declaring the DBAdapter object from a class that stores problems and reads them.

3.4. Sequence Diagram

Figure 4 shows the class diagram that implemented the Student Client, and consists of 6 classes and 1 interface. In order to be connected to the server from the main class, the Connet() method is used from the std_Client class, and std_Client object is declared from each class, which maintains the access when the screen changes through the getInstance() method.
3.5. Class diagram of server

Server acts as an intermediary between the client of teacher and student, and can access the DB to identify the student information and the evaluation result. Server class diagram Figure 5 consists of three classes and on interface.

Figure 4. Class diagram of learner

Figure 5. Class diagram of server
4. Conclusion

The feedback on learning activities is very important in education. In a case where the teacher provides feedback on learning to the learners, it has higher level of understanding on classes as well as enhanced learning desire for the learners compared to the case of providing no feedback. On the basis of the foregoing, the feedback system has been developed for the learners to use the smart phone to enhance the interaction anywhere and anytime and reduce the level difference for the learners.

By using the application realized, the learners are learned of the level of understanding on class after obtaining the real-time evaluation on the class contents. In addition, the teacher may have the learning for each level through the real-time interaction and narrow the gap by intense feedback on the slow learners.

With the system realized under this thesis, following effects could be expected. First, the teacher may check the level of understanding for individual learner on the class contents in short period of time in class hour. Therefore, the level difference for each individual may be confirmed immediately and the feedback for appropriate level is available. Second, the evaluation result may be made for DB. In general, in order to place the evaluation result into DB, the teacher has to make direct input. This practice is improved to compiling the evaluation result of the learners onto the DB automatically. By facilitating the accumulated DB, the level of respective learner may be evaluated and may refer to produce the questions of formative evaluation. And, third, installation and use are easy to save expenses. Classrooms of schools already are equipped with PC, projector and other multi-media equipments and the smart phones are widely used by the learners. This system is used under already structured environment that it is easy to use and save the costs.

For future projects, the designed programs are realized and the learning contents are produced and placed under the server program to enable direct learning and evaluation initiated by the learners in a way of enabling evaluation in diverse parts on the system use.

References

[8] SmartLearning-Wikipedia, http://ko.wikipedia.org/wiki/%EC%8A%A4%EB%A7%88%E D%8A% B8%EB%9F%AC% EB%B8%9D.

Authors

Myung-Suk Lee

e-mail: mslee@kmu.ac.kr
2001  BSc in Computer Engineering, Keimyung Univ., Korea
2003  MSc in Computer Engineering, Keimyung Univ., Korea
2009  PhD in Computer Engineering, Keimyung Univ., Korea
2009 - 2012 Univ. of Keimyung, professor.

Yoo-Ek Son

e-mail: yeson@kmu.ac.kr
2001 1976  BSc in Electronic Engineering, Kyungpook Univ., Korea
1990  PhD in Electronic Engineering, Kyungpook Univ., Korea
1984 - 2012 Univ. of Keimyung, Professor.