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Supporting Face-to-Face Class with Mobile Device

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1. Introduction

Most higher educational institutes such as university attempts to introduce ICT education system called e-Learning or MOOCs (JMOOC, n.d.; gacco, n.d.). Teachers attempt to be continuous processes of trial and error to go toward high efficiency in learning by ICT, e.g. new type class called blended learning by incorporating face-to-face lesson with ICT.

On a technology front, the term "Internet of Things" (IoT) is a fashionable trend recently. In order to build a mechanism to exchange data each other, various things connect to the Internet more than ever by enhancing the ubiquitous computing. The things of IoT include the smartphone and the tablet that most students uses on a daily basis. Exchanging data among computers in a classroom, e.g. PCs, routers and home appliances leads to supporting learning activity in a classroom. In a face-to-face class, a teacher gives lessons with a handout, a black/white board or a projection equipment.

In order to provide teaching material in a class with ICT, the teachers have two plans. One is using a server on Internet called Learning Management System (LMS). Students uses LMS by PCs or smartphones. The other one is a network service on LAN. The network service provides teaching materials to students' mobile devices in the classroom.

Mobile devices such as smartphone or tablet provide various functions with apps. The users introduce a purposeful apps. The feature of mobile device is to be able to operate the apps with touch panel intuitively.

We are trying to support a class with mobile device by a small PC. In the class, a Wi-Fi network are built to provide the teaching materials to students' own mobile device as Bring Your Own Device (BYOD). In order to deliver teaching materials such as slide or movie to mobile device, we focus Digital Living Network Alliance (DLNA, n.d.) based on UPnP (Universal Plug and Play) (UPnP, n.d.) that is used for digital appliances. In this paper, we describe our practical system and discuss the use of mobile device in a face-to-face class.

2. ICT in a Class

2.1 Learning Design

We aims to realize an IoT oriented education system by BYOD. In this practice, we focus on mobile devices such smartphone, tablet and note PC that most students have widely. In the IoT, the system should provide the fit information in students' location and the situation. Therefore, we employ UPnP, DLNA as a platform for the service.

In this research, we focus on a face-to-face class to provide teaching material with BYOD. Most general education system realize to provide teaching materials. It is easy to compare with between the general system and the IoT system. In this practice, we use DLNA that realize to the function by installing an application and connecting network without authentication. By way of comparison, we employ the Moodle with a WWW browser.

However, it is difficult to get the logs in the DLNA. Therefore, we gather the communication packet by the packet capture software. By clarifying the students' learning situation from the log, we try

to define the IoT oriented learning function and to provide the suitable feedback in the face-to-face class.

2.2 Style of Class

In the trial, we focus a professional education of the faculty of information technology in university that is for 3rd grade students. The number of students was 48. The classes consists of 15 lectures and the term-end examination is conducted in the final lecture after being summarizing the all lessons.

The teacher held in a general lecture room without Wi-Fi network and PC as a classroom. The instruction style is lecture, which the teacher lessons with PC and a projector. In the class, the teacher gives some mini-examinations every section of the lecture as a means of motivation and students' level of understanding by description format. In order to answer during the class, the mini-examination is shown with the projector each time.

2.3 Utilization of Students' ICT

We had a questionnaire because we cared about the utilization of students' ICT before the practice. The result are: the most 86.5% of students brought smartphone as mobile device in class. In addition, the 56.8% of half students brings note PC. In order to use the tethering to connect to internet, the 88.9% (n=36) of students brings mobile router such as WiMAX/3G/LTE because the classroom do not give Wi-Fi network service. Then, we asked about the DLNA service in this practice (n=28). The 7.1% of the students have utilization experience and the 46.4% of the students do not know about DLNA.

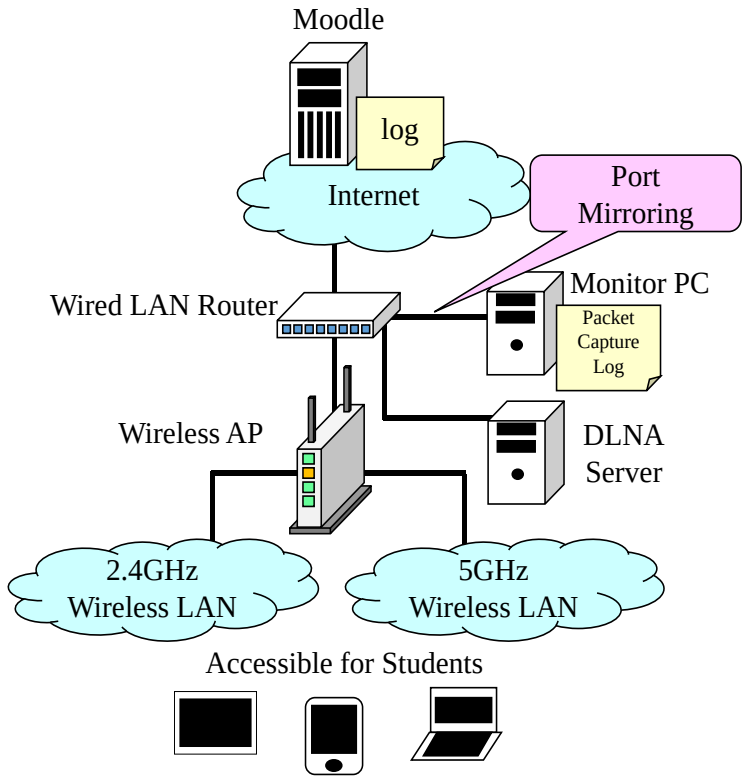

Figure 1. Overview of the System

3. Overview of the Support System

3.1 ICT in a face-to-face Class

We focus on a face-to-face class with a projector and a PC. In order to take notes of a lecture, the teacher shows students teaching materials not only as projector but also as handouts. The handout has some restrictions such as not color printing or small-size slide. In order to provide the easy-to-read handout and to support absentees, we prepare the Learning Management System (LMS) by web-based service called Moodle. The LMS provides handouts and mini-examinations. The overview of the system is shown as Figure 1.

Figure 2. Showing teaching material

Most students have smartphone with a large-size touch screen. The students can use watching the handout such as magnifying the handout and looking over previous lesson in face-to-face class. However, it is difficult for the teacher to develop and to prepare a system. Therefore, we focus the DLNA that is easy for the teacher to prepare the system. It is also easy for students to operate to get teaching materials with installing an app. The usage example is shown as Figure 2.

4. Result

We gave lessons with the system and become clear as follows: (1) The system should be made user-friendly. (2) A teacher should give explanation of the system usage suavely.

The affirmative impression of the students are: “It is easy to operate with smartphone.” “It is convenient because the handout is not needed.” However, some students says about the system as follows: “It is difficult to turn back at once because an operation to the system is renewed.” “It is hard to see the slide because it seems to be mixed all lessons.” “I hope to remove unnecessary folders.” with this in mind, we provide further information about the manner of operation. After that, students’ impressions become better.

In comparison with Moodle, some favorable answers are gotten as follows: “DLNA is better suited for seeing slides.” “It is convenient because we do not have to login.” “I can see the slide quickly.” “It is convenient when I get used to operate it.” “It takes no time to access it.” In addition, “It seems to be convenient if I can submit the mini-examination by the system.” We think that students feel the user-friendliness of DLNA.

However, we have the opinion: “Moodle is easier to see teaching materials than DLNA.” We think the difference by students’ application experience. It is important to use for different purposes with considering the students’ need and the learning effect.

5. Conclusion

In this paper, we describe the trial that is to provide the teaching materials to students by DLNA. The system is used with the technology of the digital appliance. In order to discuss the requisite learning functions, we continue to practice the system and make a study on the analytics by the log.

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