

# A New Method for Teachers and Students to Record Daily Progress in a Class

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**Abstract.** The purpose of this study is to help to improve teachers' instructions by using information and communication technology. We developed a new method with the LAPP (Linux, Apache, PostgreSQL, and PHP) system. We adopted a mobile-phone as a terminal device. Using this system, a teacher could record easily and quickly students' learning situations also with taking pictures and evaluation data. A teacher could understand how well a particular student and whole students during a lecture – numerical evaluation values, average and the standard deviations of classroom average. We used this system actually for improving a lecture of programming and checking students' wood works. In both using, our system could work without any trouble. Understanding trends in students' learning, we found that this system could help teachers' instructions for students and reduce teachers' load.

**Keywords:** mobile-phone, interaction, learning situation, taking picture, improving a lecture.

## 1 Introduction

This paper is about a using information and communication technology to record various data for a teacher and students as an effective tool. We adopted a mobile-phone as the means. This is a really small device, which is able to connect to the Internet and has a camera function without the wire. We developed a network server system for a mobile-phone. This system was used in several classes as a trial. As a result, it was concluded that this system and method could help teachers to record data and to improve their class. In addition to, we found that we had to improve user-interfaces of this system.

## 2 Background and Purpose

In the Japanese educational field, a teacher has to record students' evaluation data [1]. In the past, teachers usually do it using a pen and papers from the old days. The amount of this data is huge and a teacher can not keep remembering. Thus, a teacher

could not just record, but their lecture and use of data would not improve either. We think that a teacher has to utilize evaluation data for improving his/her way of lecture. In many cases, teachers record evaluations data on paper. After recording, they input huge amount of evaluation data to a PC for calculation. It is obvious that this operation is hard work and troublesome. And some teachers often make a mistake. To solve these problems, we are in much need of a new tool for evaluations. As a similar antecedent study, a handy terminal - called "bar code reader" - is used.

The way this antecedent study works was to collect evaluation data using a handy-terminal, bar-code and PC efficiently [2][3]. However there were three problems. First, it was so particular that the terminal lacked versatility. Second, it was troublesome to cooperate with a PC. To do it, a user must prepare a special software and hardware drive. Finally, the bar-code dirties or tears easily [4].

In this study, our purpose is to develop a versatile evaluation-system for teachers to use it efficiently and easily. A mobile-phone was selected as its means.

### 3 Essential of Evaluation Data and Validity of a Device

In this chapter, we will describe essential evaluation data for a teacher and the valid device to collect them. Table 1 shows evaluation data, which a teacher collected during a lecture.

**Table 1.** Evaluation data

Kinds of Information	Description
Information (numerical calculations)	Criterion of evaluation.
Information (characteristics)	To describe a reason or appearance of numerical information.
Information (illustrations)	Such as pictures or drawings.
Information (audio or sound)	Such as students' speech
Information (visuals)	Such as students' work or movement.

Other various information of evaluation may be needed by a teacher. In many cases, these five kinds of information are sufficient. We will not feature audio (sound) information and moving information because of size of data.

Next, we will consider the device to input information. According to a situation which a teacher will use the device in a class, we make a specification of the device (Table 2)

There are small laptop-PCs or PDAs or mobile-Phones (smart phone) which apply to this specification. Mobile-phones are a popular device these days. The number of contractor of mobile-phones is 78% of the Japanese population [5]. A mobile-phone is one of the information and communication terminal devices because of the high-rate of contractors, its small size and the ability to connect to Internet [6][7].

**Table 2.** A specification of the device

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- Easy to prepare
  - Easy to use and handy
  - Ability of treating much information (numerical information, described information, illustrated information and so on)
  - Easy to collect
  - Easy to save, record and manage
  - Easy to understand students' records.
  - Good PC compatibility
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## 4 Outline of the System

### 4.1 Circumstance of Development and Execution

We developed the system under the circumstance shown as table 3.

**Table 3.** The spec we used

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• CPU	AMD Athlon1600+
• Memory	512MByte
• HDD	40GByte
• OS	FedoraCore1
• Database	PostgreSQL7.4.3
• CGI	PHP5
• Httpd	Apache2.5

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This is a common system as a network-server using LAPP: Linux, Apache, PostgreSQL and PHP. This system can be used by mobile-phones which has a web browser function for example 2G and 3G models. The database tables of this system were defined as followed.

1. Teachers table, 2. Students table, 3. Subjects table, 4. Unit table, 5. View points table, 6. Evaluation value table, and 7. Image table.

### 4.2 Function of This System and Executing Screen Capture

This system has mainly three functions. First, inputting numeric value. Second inputting comments. Finally, taking pictures. A teacher selects one numeric value and a target student when he/she records evaluation information. Then comment information is written at a text box form. When a teacher wants to look for students' data, the average of all data is shown as a radar-chart. Also, the standard deviations of classroom average and their average can be shown (Figure 1).



Fig. 1. Understanding trend in students’ learning with a radar-chart on a PC screen (left) and on a mobile-phone (right)

Because this radar-chart is shown together on the screen for inputting data, a teacher can input students' data with understanding statistically about them - i.e. what are the students’ strong or weak points.

All of these data are recorded in a database-server. Whenever a teacher needs data, he/she can download them as CSV format. Thus a teacher can deal with data using a spread-sheet - i.e. MS-Excel.

### 5 Demonstration in a Class

We tested our system in two situations to see if it works normally without trouble.

One is a situation where a teacher uses it in an actual class. Another is a situation where a teacher checks a student's work. This demonstration was used in university classes. The numbers of participant were 13 persons and we used it for a month (for a total of four times). In this class, an instructor teaches programming grammar and the students are writing a program every time. This system was used to record for a teacher how students write program (Figure 2). This was recorded on four view-points. First point is “Interest”, second is “Idea”, third is “Skill” and fourth is “Knowledge”. Each view-point was based on a scale from 1 to 5. “1” means “worst”, “3” means “normal” and “5” means “very good”. “Interest” is how hard a student works. “Idea” is how far a student contrives his/her own works. “Skill” is how realizes a student's intention. “Knowledge” is how well a student remembers what a teacher taught - whether a student remembers programming grammar.

It was trouble and hard work for a teacher to keep remembering how students wrote a program code a few weeks ago. Using this system, a teacher can understand trends in students learning. If a teacher notices that students keep maintain a low level of “knowledge”, a teacher will give homework to help students understand programming grammar or, if a teacher notices students maintain a low level of “skill”, a teacher will teach know-how about programming. In this class, many students had



**Fig. 2.** Recording with a mobile-phone

knowledge about programming, but they could not write a program code using their own knowledge at the beginning of the first and second classes. The teacher could understand this deficit vaguely. However it was impossible for him/her to understand it in detail without our system. Concretely, students could not write a program code for reading all lines in a file with using the “while” command. Because of this, at the beginning of the third class, a teacher prepared some sample program codes and changed the method of teaching by indicating some similar algorithms. Then, at the beginning of the third and fourth classes, students got higher “skill” levels – i.e. using the “for” and the “while” statements.

Next, a teacher checked students’ works using our system and a mobile-phone with a camera function, as shown in Figure 3 and 4.



**Fig. 3.** Checking students’ works

Until now, a teacher used a pen and paper to record students’ situations or conditions and evaluation data. After writing, the teacher had to re-type data into a PC in order to tally up data on a PC. Moreover, it was difficult for a teacher to remember situations in detail because he/she had only numerical values or only characteristic data. In this trial, total twenty persons used our system. They tried taking “smooth snap” – a method of taking pictures with a digital camera and uploading them to the server – pictures of students’ works with numerical evaluation data. The steps were as follows: First, a teacher snapped pictures of students’ works. Second, teachers accessed the system server using a web-browser on a mobile-phone, Third, he/she input data in forms on web-pages. Finally, he/she uploaded pictures via the Internet which had already been taken.

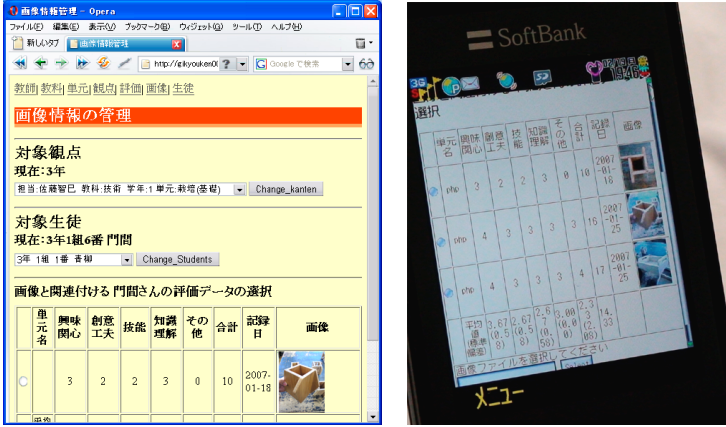


Fig. 4. A student’s evaluation data and a picture shown in a web-browser on a PC screen (left) and on a mobile-phone (right)

This system was used by five teachers and fifteen students who were studying to be a teacher in a particular class which they performed some instruction as a teacher role. We had an interview with total twenty subjects, where they were asked about usefulness of the system to understand about trends in their students learning and convenience for their improving classes. All of the subjects answered that they thought it was meaningful to record both pictures and numerical data together, as this would allow them compare more effectively current conditions to past conditions. 90% of the subjects answered that they could upload pictures easily with numeric evaluation data. 35% of the subjects answered that they wanted to know a students’ name when they looked at a file name. At the time, file names for pictures were a student’s serial number. In the newest version the file name contains the student’s name with a time stamp. Furthermore, 18% of the subjects answered that it was at times, a little hard to select a target student from pull-down menus on web pages.

## 6 Discussion

These trials show that such usage can help expand the potential of a mobile-phone. It is small, wireless, contains a digital camera, and can connect the Internet – it is the most suitable tool for this purpose. It is really hard for a teacher to carry a laptop-PC with single-handed, and a PDA is a minority device in Japan. Our system used some “form-parts” in web pages to input data. These kinds of “form-parts” have poor usability. It was not convenient when a teacher wanted to change or find a target student freely and smoothly from a lot of students’ lists. In many cases, a teacher does not check a student in turn. If we could use a PC which has a wide screen and high performance, we could design a new user-interface using Java Script. However, many of the mobile-phones don’t have performance to work Java Script without trouble. As long as the technology to run complex processes on the mobile-phone was not developed, it is better for us to use only versatile method – i.e. traditional HTML.

## 7 Conclusion

In this study, we developed the system for a teacher to record students' data and to help students learning using “form parts” in web pages on a mobile-phone web browser. In Japan, Most of the mobile-phones have “web browser” with limited function. Our system was coded with using simple statement. So our system can be almost worked on mobile-phones. In addition, the communication channel will be able to be encrypted by SSL (Secure Socket Layer). Using this system, a teacher could consider and arrange his/her way of teaching with understanding trend in students' learning, which maybe miss them if he/she had used old method. And we have to consider a new user interface to expedite to change and find a target student and to use smoothly a camera function.

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