Abstract: A comment card system that is compatible with mobile phones (i-mode, ez-web, and SoftBank) was developed and has been used for four years since 2002 as part of university lectures with large attendance. As per the approach adopted in these lectures, the lecturer poses a question and the students connect to the comment card system Web site from their mobile phones and submit their opinions or questions. The submitted opinions and questions are categorized according to their themes and are displayed on a large LCD screen facing the students in a lecture room in real time. The lecturer then draws attention to these opinions and questions and uses them to develop the lecture. The system was further improved to enable pictures taken from mobile phones equipped with a digital camera to be submitted along with a title and a comment, which the SQL server automatically stores in a picture database. This enabled the students to search for, extract, and view the pictures and the accompanying comments submitted by themselves and others in a ubiquitous learning environment. The application of this system in actual mass lectures indicates that it can promote the exchange of opinions between students and assist those lectures that aim to realize knowledge sharing.

1. Introduction

Improving the quality of university lectures is currently considered to be an urgent requirement. In 1983, the University of California, Berkley, of the USA published a methodology and a collection of examples aimed at improving the quality of university lectures. In Japan, Akahori (1997), and Ito (1999) have each published a collection of techniques and guidebooks for improving the quality of university lectures. Various techniques and case studies have been examined in these publications; however, it has been reported that it is difficult to improve communication during mass lectures, unless innovative means are employed [1], [2]. In mass lectures with more than 100 students, it is difficult for individual students to respond to questions posed by the lecturer, and the lecture tends to become a one-way communication wherein the lecturer simply provides explanations and the students merely listen.

2. Objective of this research

The Through the four years of practical study, it has been revealed that although a positive effect could be observed with regard to promoting the submission of comments and the exchange of ideas, it was difficult to sustain the discussions over successive lectures (Miyata,2004, Miyata,2006) [3], [4]. The reason for this was that only a few students participated in the discussions during the one-week interval between successive lectures. After investigating the reasons behind the system not being used outside the lectures, some students made the following suggestions for improvement: 1) the comments could be submitted from the mobile phone, but one could view the comments and questions submitted by others only using a PC, which in turn implied that an internet connection would be required. 2) In case of some subject matters, it is not easy to explain ideas and express opinions using words alone. If pictures can be submitted along with the comments, it would facilitate the discussions. The objectives of this research are as follows: (1) to add the functionality that would enable the attachment of pictures taken on mobile phones to the comment card system, utilize this system in mass lectures, and ask the students to evaluate its functionality and usability; and (2) to determine whether using the picture mail database promotes knowledge sharing between students.

3. Research Method

3. 1 Subjects for the investigation

A total of 360 students comprising 151 second-, third-, and fourth-year students from the Faculty of Education, University S, and 96 second-, third-, and fourth-year students from the University of Education K registered for the course entitled “Use of Information Media”; further, 113 second-, third-, and fourth-year students from University B registered for the course entitled “General Studies (Information).”

3. 2 Investigation period

April–July 2006 at the Faculty of Education, University S, and University B; May–June 2006 (intensive seminar) at the University of Education K.

3. 3 Investigation method

Learning environments that facilitated the exchange of ideas between students were provided for the three abovementioned courses. In particular, identical themes were presented to the students, and they were asked to send picture mails with comments, which were automatically stored into a database on the server side; they were then able to browse through the ideas of others during and after the lecture hours. Subsequently, the participants were asked to evaluate the picture mail database system as well as the curriculum that utilized this system.

3. 4 Overview of the Lectures

In the two courses, namely, “Use of Information Media” and “General Studies (Information),” a curriculum
comprising lectures, tutorials, discussions, and debate sessions was used for studying the goals and methodologies for utilizing information media in schools. In this curriculum, weekly face-to-face lectures were supplemented by Web-based learning materials. However, the students were not provided with PCs inside the lecture room, and they were asked to use the Web-based learning materials for pre- and post-lecture studying outside of the lectures, for example, at home.

New themes were presented in each weekly lecture, and problem-solving tutorials and debate sessions were held in small groups. One theme, for instance, was “Besides sending text messages, what are the situations in which you use your mobile phone frequently within the context of daily life? Please send a picture mail depicting one such situation along with an explanatory comment.” The participants searched for and browsed picture mails and comments submitted by others, and after a discussion session in small groups, they were asked to submit their opinions for the second time.

4. Components and characteristics of the Picture Mail Database System

4.1 Architecture of the system

The comment card system for mobile phones developed for this research is a client-server system that comprises (1) the mobile phones owned by the students for sending picture and text messages; (2) the client PC used by the lecturer; and (3) the server running a SQL database server for storing the submitted pictures and comments and a Web server for displaying the submitted information.

The client interface for the lecturer’s use was developed using JavaScript and Dynamic HTML, and it can run on Windows 95, 98, NT 4.0, 2000, and XP. The comments submitted from the students’ mobile phones are dynamically processed using Active Server Pages (ASP), stored on the database server, and outputted as HTML or CSV files. The server side is, therefore, independent of the operating environment. Windows NT4.0 and Internet Information Server (IIS) 4.0 were used for the server. Figure 1 shows the components of the Picture Mail Database System.

4.2 Characteristics of the Picture Mail Database System

(1) The system is compatible with all mobile phones equipped with a digital camera, including i-mode, SoftBank and ez-web. The pictures taken from the mobile phones are sent along with a title and comments to the server, and this is automatically stored on the web database.

(2) The system is easy to use. All that the user is required to do is to capture an image using the mobile phone camera, enter the email address, the title, and the comments, and finally press the [send] button. In three easy steps, the data submission is complete (See Figure 2).

(3) The email address can also be entered using a QR code, and there is no need to type the email address if a mobile phone that is compatible with QR code is used.

(4) After the submission, the picture mail database can be viewed from a mobile phone or from a PC (See Figure 3).

(5) The database with pictures is constructed automatically, and keyword searches can be performed on the submitted comments. A full-text search can also be performed on the comments. The primary difference between this database system and other electronic picture message boards is that the submitted data can be displayed not only sorted by time but also by many other criteria; further, this system also allows for the extraction of data based on keyword searches.

Figure 2 Sending a Picture Mail with a photo attachment

Figure 3 Viewing the picture mail database from a mobile phone
5. Results and Discussions

5.1 Results from the practical application of the system in lectures

Figure 4 shows the screen after filtering the 360 comments that were submitted with the title “discovering barrier-free or hazardous places around us” using the keyword “tactile paving.” Some students stated that the installation of tactile paving on streets and staircases served as a device for promoting a barrier-free environment. As seen from the example shown in Figure 5, an explanation of how the tactile paving have been installed can be communicated visually with the aid of a photograph, which makes sharing of information more natural as compared to the case wherein only text is used. As another example, the word “broad” in the description accompanying the placement of the tactile paving panels near a staircase is visualized by the use of a photograph, thereby enhancing the information that is shared between students. The interpretations on this aspect of the study are mentioned in the following chapter, in which the evaluation of the system by students is presented.

5.2. Students’ evaluation of the Picture Mail Database System

A paper-based survey was conducted on 360 undergraduate students wherein they were asked to evaluate the usability and usefulness of the picture mail database system. The results revealed that 86% of the students stated the system was easy to use as well as useful ($X^2(2) = 461.9$, $p < 0.1$). As shown in Figure 5, the results of the survey question inquiring about the different aspects of the usefulness from the 311 students who found the system to be useful revealed that 46.9% evaluated the effectiveness of the system from the standpoint of knowledge sharing; these students responded saying, “it was useful to read the opinions of other students with their picture mails.” In addition, 23.8% of the students responded stating that “the system could be accessed from both the mobile phone and the PC, anywhere and at any time,” commending the ubiquitous environment enabled by the system ($X^2(2) = 186.4$, $p < 0.1$).

The fact that the system was able to facilitate the exchange of viewpoints and assisted cooperative learning through knowledge sharing by allowing participants to search and browse through each other’s opinions and ideas using a mobile phone or PC was reflected in the following open-text responses from the survey.

I think that the system is useful because ideas that one could not generated of by oneself can be shared with everyone (second-grade student; female).

The good point about the picture mail database is that we can submit the data immediately after taking a picture using a mobile phone, and that it is easy to use. Because I carry a mobile phone all the time, the system can be used easily and on the spot. When the system is used during a lecture, I felt that it was useful to view the comments and pictures of many participants (third-grade student; female).

It is easy to view because the picture and the accompanying text are shown alongside each other. It was useful in that it was easy to find the data that I was seeking by using keywords (third-grade student; female).

It is good that I could understand other people’s opinions. Additionally, the opinion can be enhanced using a picture, and it is advantageous that the opinions of a wider range of people can be viewed and shared at the same time (third-grade student; male).

Using the open-text student responses evaluating the picture mail database system, verbs and adjectives that could be used with Nishinosono’s action-verbs (2006) and

![Figure 4 The search function of the Picture Mail Database System](image1)

![Figure 5 Evaluation of the Picture Mail Database System and the reasons why it is useful](image2)
Tsukamoto’s learner response analysis (2006) were entered into a dictionary, and a vocabulary analysis was performed using a text-mining system [5], [6]. The results revealed that verbs categorized under [sense] were observed frequently, as shown in Figure 6. In addition, based on a dependency parsing of the vocabulary, it could be deduced that the students were able to operate the system without any confusion and instinctively accepted it as a tool for posting comments with picture mail and also that they used it actively.

Further, a vocabulary analysis was performed on the open-text responses evaluating “the lecture utilizing the picture mail database system” using the text-mining system. Verbs in the category [insight] were frequently observed, as shown in Figure 7. In addition, a dependency parsing of the vocabulary revealed that when utilized in the curriculum, the picture mail database system promoted the students’ exchange of viewpoints with others as well as the sharing of opinion, knowledge, and ideas, thus leading to deeper insights. From this, it can be interpreted that the communication between the students and the lecturer as well as that between the students became more active.

References