Using Mobile Phones and QR Codes for Formative Class Assessment

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Over the twenty years we have improved our college classes using questionnaires and shuttle card called "Daifuku-cho". In addition to them our students have begun using their mobile phones recently to send some comments in our classes. In Japan more and more young people have a mobile phone with a QR code scanner. The QR code makes it easier for users to view Web pages instead of typing long web address (URL). Moreover using the QR code and mobile phones also allows the teacher to conduct surveys of students for improvement suggestions during classes. In this research we have developed a system that allows college students to answer a question concerning the class and send some comments to the teacher as well as classmates using mobile phones and QR codes in the middle of each class.

1 How to improve our classes ?

Over the past several years, more and more Japanese colleges have introduced surveys for class improvement. At the last class of the school term a questionnaire is handed out to college students. They fill it out to evaluate the class and write some comments to their teacher. After a few weeks the total results are fed back to the teacher with information to improve the class. This provides a method for obtaining summarized class evaluation. But we teachers should also have more formative information about the classes from the students to improve things during our classes.

For this purpose we introduced "Daifuku-cho" (Fig.1) to our classes. "Daifuku-cho" created by Kijun Oda in 1988 is an A4 sized shuttle card for students and teachers. On the card there are 14 comment fields in which the student writes and 14 comment fields in which the teacher replies to them. We have researched and reported on this Daifuku-cho describing how it helps us communicate with the students and obtain a lot of information about our classes. The comments from the students have been very useful for us to improve our classes.

In addition to the questionnaire and the Daifukucho-cho, Our students have begun using their mobile phones recently to send some comments in our classes. In this research we have developed a system that the college students can answer a question concerning the class and send some comments to the teacher and the classmates using mobile phones and QR codes in the middle of each class.

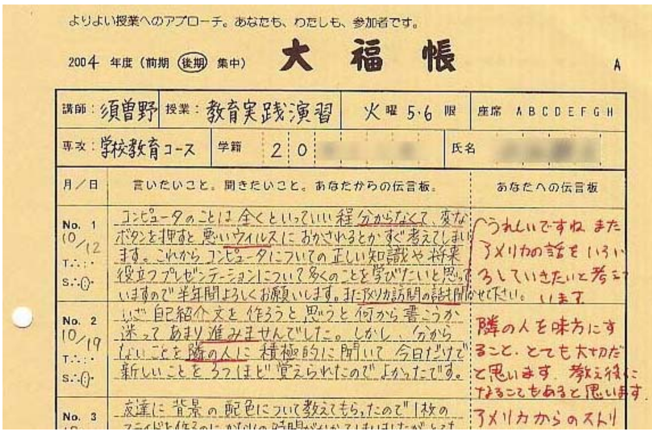

Fig.1 A Sample of Daifuku-cho

2. Using mobile phones and QR code in the classroom

Almost 100% of college students in Japan have their own mobile phones. They can use them as communication tools to receive and send emails and to view websites as well as to talk with their friends.

The use of mobile phones is forbidden in Japanese traditional classes. But some advanced professors reported on the use of mobile phones as learning tools in their college classes. The main usages of the mobile phones are

1) to communicate with the classmates on the web forum (e-bulletin board)
2) to check attendance
3) to evaluate teaching or learning after class.

Most of the mobile phones have small digital cameras in Japan. Some of the newer camera-integrated mobile phones can be also used as QR code scanners. The QR Code is a kind of two-dimensional symbology developed by Denso Wave (a division of Denso Corporation at the time) and released in 1994 with the primary aim of being a symbol that is easily interpreted by scanner equipment. According to the Denso Wave Website, QR Code (Fig.2) contains information in both the vertical and horizontal directions, whereas a bar code contains data in one direction only. QR Code holds a considerably greater volume of information than a bar code.

The mobile phone users can easily take the QR code and view Web pages instead of inputting long web addresses (URL).

Fig.2 QR Code and Bar Code (http://www.denso-wave.com/qrcode/aboutqr-e.html)

3. The features of the QR code

The features of the QR code are as follows.

1) QR Code holds a considerably greater volume of information than a bar code. While conventional bar codes are capable of storing a maximum of approximately 20 digits, QR Code is capable of handling several dozen to several hundred times more information.
2) QR Code is capable of handling all types of data, such as numeric and alphabetic characters, Kanji, Kana, Hiragana, symbols, binary, and control codes. Up to 7,089 characters can be encoded in one symbol.
3) Since QR Code carries information both horizontally and vertically, QR Code is capable of encoding the same amount of data in approximately one-tenth the space of a traditional bar code.
4) QR Code is capable of 360 degree (omni-directional), high speed reading. QR Code accomplishes this task through position detection patterns located at the three corners of the symbol.
5) QR code can be used with not only scanners connected with computers but also mobile phones.
6) The specification of QR Code is disclosed by Denso Wave, or “open source“, so users can make a QR Code easily with the free software.

4. Assessment during class using QR code

The QR code allows students to easily view Web pages instead of typing long web addresses (URL). Moreover, using the QR code also allows the teacher to conduct surveys during classes. For example, if four QR codes for answering a question (Fig.3) are prepared, the students can

1) Choose one of the QR codes to answer the question
2) Read it with their mobile phone

3) Write some comment to the teacher and the classmates on the mobile web (Photo.1)
4) Send the comments to the Web server
As the data sent by the students are stored in the Web server, the students and teacher can see them instantaneously on the mobile phone display as well as on the computer display. It is especially important for formative assessment that the results of answers to question items are immediately displayed.

Photo.1

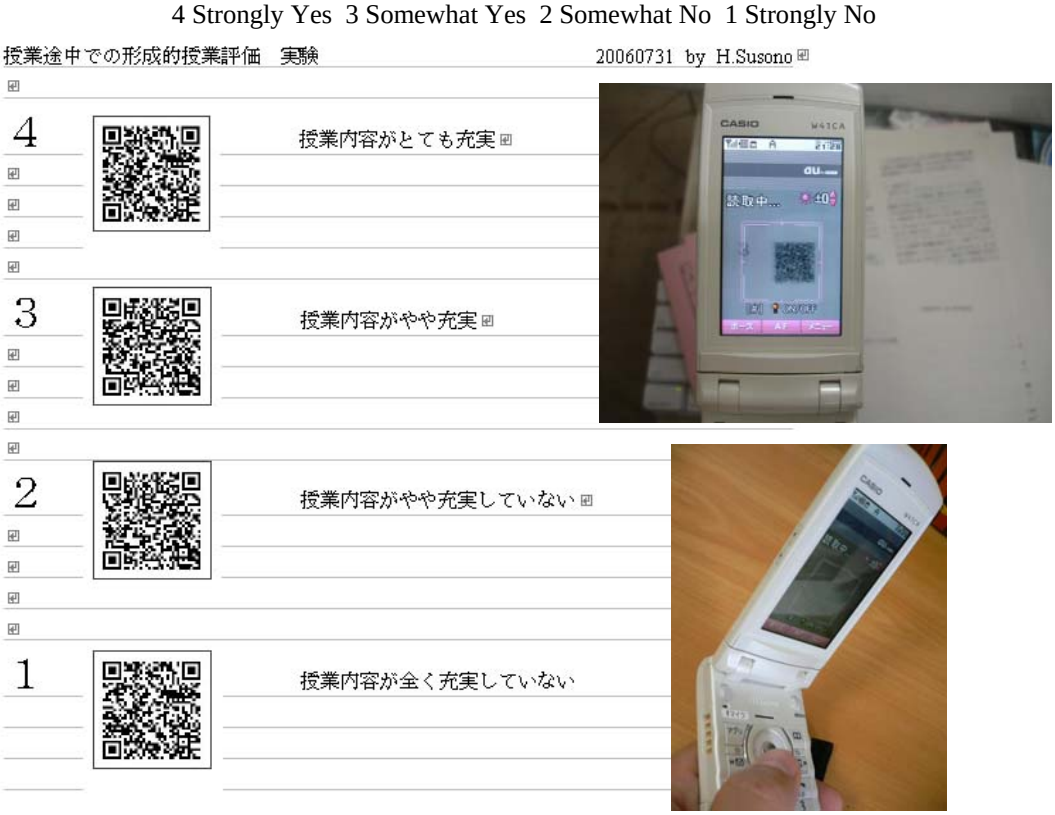

Fig.3 4 QR Codes used by the students and Mobile Phones

In Japanese college education classes are usually 90 minutes long. Some college students feel "The class is too long and boring". Because the teachers talk and talk one-sidedly using a blackboard and chalk, and the students only listen and take notes on their notebooks in many classes. Even though we have introduced PBL (Project/Problem Based Learning) to our classes, such student-centered instruction is actually new and rare in Japan.

For such reasons the students might influence the teacher by evaluating the class using their mobile phones and the QR codes when the half at the class time ends. For example, in case of the 90 minutes' class, after 45 or 50 minutes pass, the students use their mobile phones and answer a question prepared by the teacher.

It is difficult to say what evaluation items would be best for the teacher to select and the students should answer. We are preparing them now for the next fall classes this year. We are considering such items as follows.
1) Is the progress and speed of the class appropriate?
2) Is teaching good or not?
3) Is this class important for me?
4) Am I doing my best or not?
5) To what levels do I (student) understand?

5. How to prepare QR codes

We set up a web server in which the students send the data after they read one of the QR codes and write some comments on the mobile phone display. The operating system of the server is Windows 2000, with FileMaker Pro version 6 installed. Filemaker Pro is a database program that already has a template language called CDML (Claris Data Markup Language). We have developed some programs on CDML to write comments on the mobile web and view the results sent and stored by the students.

Presently in our system, when the students evaluate their class, 4 answers to one evaluation question are prepared. The teacher selects an evaluation item. In case of "Is this class important for me?", the teacher make 4 QR codes (4 Strongly Yes, 3 Somewhat Yes, 2 Somewhat No, 1 Strongly No) to answer. For example, the access URL to answer "4 Strongly Yes" is http://mic**.edu.mie-u.ac.jp/qr/FMPro?-db=qr&-lay=layout1&-format=new-4.htm&-view and is changed into a QR Code (fig 2) by a free software. Other QR codes to access URL are created similarly. The teacher prepares a worksheet where the 4 QR codes are printed.

Photo.2

6. Discussion

We introduced our Formative Class Assessment using mobile phones and QR codes to one class this July (Photo.2 & 3). After the experiment, we identified some problems in using mobile phones and QR codes. They are as follows:
1) The communication fee of mobile phone is charged to the students (Not so expensive in Japan).
2) All the college students do not have mobile phones with QR code scanners. Presently the students with them are about 80%.
3) Some older mobile phones with QR code scanners have some difficulties reading QR codes because of focus, brightness, and size.

Photo.3

4) The displayed form on the mobile phone changes with mobile phone companies (e.g. Docomo, AU, Vodafone).

We asked the students a question "Is it good for you to use mobile phones to improve your class or not?" As a result, the 43% of the students answered "Yes".

The reasons for Yes are as follows.
1) It is better to get and read more comment from classmates in each class than in the summative questionnaire.
2) We can evaluate our class easily at each time.
3) We expect the class of higher quality since quality analysis for class improvement is expected.

On the other hand they point out the reasons for answering NO.
1) We do not have to use our mobile phones in face-to-face classes. It is kind of strange to watch the small display in the classroom.
2) It is hard for the users who do not have QR scanner. They have to buy a new one.
3) Every time I use my mobile phone, it costs me a lot of money.

7. Conclusion

We are planning to introduce Formative Class Assessment in the classes starting this October this year. We feel that it will be especially more effective and useful in a large-scale class where there are 80-100 students. The most important goal of the research is to explore how students can get interested in what their classmates wrote with mobile phones and how to utilize that information for better learning.

References

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