T. Hirashima et al. (Eds.) (2011). Proceedings of the 19th International Conference on Computers in Education. Chiang Mai, Thailand: Asia-Pacific Society for Computers in Education

Class Design with Multi-Mouse Quiz in Elementary Schools

Juan ZHOU [a], Hajime KITA [b]
[a] *Graduate School of Informatics, Kyoto University*
juan.z.kt@gmail.com
[b] *Academic Center for Computing and Media Studies, Kyoto University*
kita@media.kyoto-u.ac.jp

Abstract: To motivate learning is one of the key problems in education in elementary schools. Collaborative learning is one of promising methods in teaching, and therefore its support by ICT is an important subject. Single Display Groupware (SDG) is a promising approach to encourage collaborative learning in ordinary classroom by ICT. In this paper, we describe the Multi-Mouse Quiz (MMQ) system, an application of SGD which allows several users to answer quiz questions sharing one screen. The authors are planning to study class design and its effect with MMQ in elementary schools. As a preliminary study, we carried out four experiments that support collaborative learning in two elementary schools. The teachers were able to design their course by using MMQ considering their teaching plans and available resources in the classroom. We observed how MMQ raises children's motivation of learning. It is also proved that MMQ can help children remember the knowledge shown in the quiz. The experiments show that the MMQ system is helpful in education in elementary schools.

Keywords: collaborative learning, single display groupware, quiz, elementary school, children

1. Background and Motivation

Elementary education, as the formative education in the compulsory education, has special roles in teaching rudimentary knowledge and developing good study habits. Children in this period have characteristics that they prefer to pay attention only to what they are interested in. It is widely believed that they have difficulty in controlling their sentiment. Hence, how to maintain the attention as well as how to encourage the enthusiasm to learn is an important issue in education in elementary schools. There are several studies designing practices of achieving educational goals through pleasing the children and amusing them. ICT environments are also developed continuously for supporting school education. Nowadays, it is popularized and in Japanese elementary schools, at least one digital blackboard is equipped in the every classroom.

However, most of the conventional ICT systems are based on the concept of personal computers. That is, the ICT systems are supposed to support collaborative learning by connecting personal computers with network, and each student has to use his or her own seat and computer in a classroom. When a student is going to discuss with his classmates, he or she has to move to others so to see other's computer screen and change views. Considering face-to-face collaborative learning, such inconvenience in activities is a disadvantage to the education in elementary schools.

In this paper, the author discusses usage of Single Display Groupware (SDG) to encourage collaborative learning in face-to-face environment in ordinary classrooms. The Multi Mouse Quiz (MMQ) system was developed as a concrete application of SDG, and

four experiments were conducted in the social studies class through collaboration with two primary schools.

2. Related work

The desire to develop technologies that enhance richness of collaboration in a face-to-face setting by ICT has spurred researchers to investigate a variety of multi-user environments. The Single Display Groupware (SDG) model proposed by Stewart [1] refers to systems with which each of collocating users uses an input device such as mouse sharing a display. SDGtoolkit was a middle ware that provides multi-user interaction environment through multiple mice and keyboards handled independently (Tse et al., 2002) [2]. Mischief proposed by Moraveji et al. is a system to support traditional classroom practices between a remote instructor and a group of collocated students with SDG. Most of the SDG researches assume small number of interacting uses, they tried to make all students in a class use their own mice. In these researches of SDG, the multiple mice have been shown to lead users' higher engagement, a positive impact on collaboration and motivation. As for relating technologies for education, many universities have adopted the Clicker systems to achieve a large classroom to collect students' feedback. Compared to Clickers, SDG with multiple mice provides users more graphical and flexible interaction.

MMQ system studied in this paper is a concrete application of SDG. It allows four users to share one screen to answer quiz questions. Because each user has their own cursor shown on the sharing screen, they can share what they thought during the quiz. Though the sharing results may cause the disadvantage in the sense of a test, the enjoyment and communication encouraged by sharing movement of cursors are supposed to be effective in learning in the classes of elementary schools.

3. Using Multi Mouse Quiz in Elementary Schools

3.1 Multi Mouse Quiz System

Considering the limited computer resources and support in elementary schools in Japan, this system is designed not to use special devices and administrative task using network.

Figure. 1 shows the screen shots of the MMQ system. In (a), teacher can choose the question file and a number of questions he/she wants to use. In (b), any user can click the start button to start the quiz. In (c), each user can choose his or her own color for differing from others, once a color is selected corresponding button disappears. (d) shows a question screen that four users have to click his answer within the time limit. (e) shows the correct answer and commentary. Finally, (f) shows the total score of the whole players. All screens will be controlled by a timer. This timer can be set by the teacher when he or she edits the questions. In actual run of MMQ, the teacher can also stop the timer by pressing the space bar. With this operation, teacher can control the classroom, and also can ask a question or make some comments by him or herself.

Fig. 1. The interface of MMQ

We also developed a quiz question editor for MMQ. As Fig. 2 shows, we proposed an easy-handled question editor for the teachers (and students). So they can create their own questions for MMQ easily.

Fig. 2. Quiz Editor

Fig. 3. Using MMQ in H school

3.2 Research Question and Methodology

My research question is how can we enhance collaborative learning in elementary school with MMQ, or more broadly with applications of SDG. That is, class design and its effectiveness are the topics to be investigated.

Fig. 4. Using MMQ in S school

With assistance of the Board of Education, Kyoto City, we ask several school teachers collaborative study of using MMQ in elementary school. Once, the field of using MMQ is decided, we carry out discussion of using MMQ with the teachers, and also we observe the ordinary classes by the teachers to know the children in the class and teaching style and objectives of the teachers. Then, we ask the teachers to design the class with MMQ considering his goals of teaching, and subject topics to be taught. In classes using MMQ, before the experiment, we took a training session to help children become accustom to the system. Finally, after using MMQ, we ask the children to answer tests of the same questions to examine how much knowledge they remembered. We also ask the children to completed questionnaires to determine their overall impressions of the MMQ. We also conduct interview to teachers after class with the results of test and answers to the questionnaires.

Because of the limited opportunities of experiments and ethical consideration of the experiments carried out in the actual school classes, control groups such as teaching without MMQ were not set. Instead, we carried out data gathering from multiple aspects such as testing, questionnaire to children, interviews to teachers, participant observation and video analysis of the classes for both qualitative and quantitative study.

4. Current Result of Practice

We carried out four experiments that support collaborative learning in two elementary schools (say School H and S) in Japan. MMQ was used for 60 children in total ranging from grades 5 and 6 in two classes. The experiments were performed two times during a month on different days in each school. In both schools, MMQ were used for classes of subject ` social studies'. According to the environment of classroom, as shown in Fig. 3, in the H primary school, we could use two digital blackboards. With them, 8 mice were available in the class with two sets of MMQ working in parallel. Each mouse was used by a group of 3 or 4 children. In primary school S, because only one digital blackboard was available and we used single MMQ set. So, we set up four groups each had 8 children (shown in Fig. 4). Quantitative and qualitative analyses of videotapes, questionnaire and interview to teachers revealed that providing children with MMQ can positively impact their engagement, participation, and enjoyment of the activity. In the questionnaire, we asked children questions "Did you enjoy system?" "Do you want to play again with your friends?". As the result in these items, we obtained positive answers from more than 90% of children. We also

carried out tests asking same questions at the end of each class, and in all of the experiments, children are getting about 80% accuracy rate. The teachers evaluated that this score were good or higher considering usual performance of the children [4].

Qualitative analyses of the videotapes showed that in learning with MMQ, the children become more active. The following two cases are interesting examples of children‘s activities with MMQ.

2. *At the first experiment in H school, child H22 (a girl) didn't touch the mouse even if it is her turn. She just saw her friend answering the quiz. But in the second experiment, she got the mouse when her friend release the mouse, and answered the quiz. We observed she is very interested in the quiz. After watching friends playing the first experiment, she looks confident and active. She asked her friend questions about quiz, confirmed her reply, and got the advice from her friend. Her score in the test after the class was improved largely in the second experiment (89.47%) from the first one (36.36%). The teacher said that her score in the second experiment was higher than usual.*
3. *At the second experiment in H school, H18 (a boy) was able to understand problem of higher level than a level that the teacher expected. The teacher asked him this content a week later, and he could answer it correctly. It proved that he certainly remembered the content.*

According to the observation of the experiments, most of the students show more active in using the MMQ system. The communication and scoring in the quiz have efforts on their understanding of high level acknowledges.

The experiments showed that MMQ and the quiz editor could be operated by the school teachers by themselves with particular assistance by the researchers. The teachers used MMQ with their own arrangement to meet their teaching styles and objectives. In H elementary school, the teacher wanted to emphasize children's writing ability as his objective of class design. He used MMQ as a tool to make children discuss the subject actively. He gave out answer sheets to every children groups, and asked descriptive question during the experiments. Further, he first used basic questions let children feel sure that they can answer questions. Then, he asked a descriptive question so as to encourage discussion. As the result, children could write answers better than usual classes.

In S elementary school, the teacher took a teaching style to make children feel fun in the classroom. After trial use of MMQ as the first experiment, he asked children to make some quiz questions to use them for MMQ. Collected questions were edited for MMQ by the teacher, and were shown to children with MMQ.

5. Future Work

As future work of this study, the author is planning the following:

- To continue evaluation of the MMQ system and class design with it in several different classes with cooperation of more elementary schools, and to clarify the effects of the MMQ system.
- To encourage community of school teachers by gathering and sharing the cases of class design with MMQ and quizzes for MMQ.
- To discuss possibility of using SDG in school, and to try to develop other applications of SDG, by exchanging opinions with school teachers,.

References

[1] Stewart, J., Bederson, B.B., & Druin, A. (1999). Single display groupware: a model for co-present collaboration. *ACM CHI Conference.* 286-293.

[2] Tse, E. (2002). S. SDGtookkit: A Toolkit for Rapidly Prototyping Single Display Groupware. *Screen (London), 91*,79-81.

[3] Neema Moraveji et al.. (2008). Mischief supporting remote teaching in developing regions. *CHI '08*, 353-362.

[4] Zhou J., Mori M., Uehara T., Kita H. (2011) Practice using Multi Mouse Quiz in elementary school social studies, *JSET, 11*(1). 305-312 (In Japanese)