

Evaluation of TERA KOYA Learning System Linking Multi-point Remote Users as Supplementary Lessons

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Abstract: This paper discusses the effectiveness of the new TERA KOYA learning system in remedial education. This system provides both interactive lessons and a small private school environment similar to the 18th-century Japanese basic schools called TERA KOYA. It helps students study actively anywhere on a local area network linking multipoint remote users, and it provides an interactive evening lesson using tablet PCs and custom-built applications both in the dormitory and at home, so students and teachers can stay in their own living spaces. The proposed learning system was implemented in a girl's dormitory with a teacher at home or in a teacher's room on campus over one year. The implementation employed a handwritten electric whiteboard with verbal communication through a headset. After this test was conducted, the effectiveness of the system in helping students study actively and willingly as an example of "right time, right place" learning was verified.

Keywords: Interactive system, Active learning, Remedial education

Introduction

In the present scenario where computers are ubiquitous, promoting the use of computers in school is very important. E-learning and learning through web content, however, are passive methods, and it is difficult to cultivate comprehensive active learning which has recently gained prominence. Because active learning requires learner participation, computers, which are becoming increasingly ubiquitous, are expected to complement classroom lectures given by teachers to students.

The present study aims to motivate learning and foster study skills, cooperation, and a sense of responsibility through remedial and developmental education. The purpose of the study is to realize and test a computer-supported learning system that cultivates a faculty for active learning [1][2]. We discuss here the new collaborative TERA KOYA learning system for remedial education, which helps students study actively anywhere on a local area network (LAN) linked to multipoint remote users, as shown in Figure 1. The TERA KOYA learning system provides both interactive lessons and a small private school environment similar to the 18th-century Japanese basic schools called TERA KOYA. In particular, the system provides an interactive evening lesson that uses tablet PCs on a wireless LAN (WLAN) and custom-built applications, linking students in the dormitory and the home with a teacher in the school or at home. In this new system, the students and teacher cooperate and interact in real time, as in some existing systems using a personal digital assistant (PDA). This system can be used to submit and store lecture notes or coursework using one tablet PC.

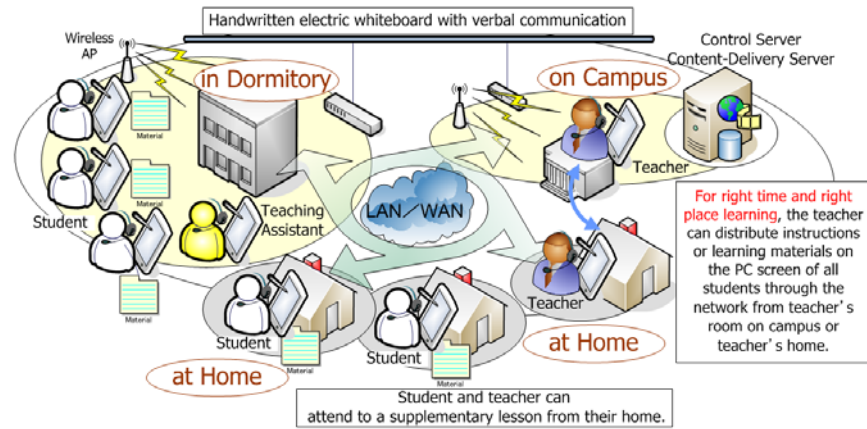


Figure 1: Conceptual structure of TERA KOYA learning system.

1. Practice and Evaluation

This system is optimized to work smoothly between 1 server PC and 50 client PCs, each with a 12-inch XGA display for one lesson, and the network speed was maintained at 500 kbps or less for each connection. Furthermore, this system interconnects via a Gbit LAN for the server on our campus via an IEEE 802.11a/g/b WLAN for the target hosts in our dormitory and via an IP virtual private network (VPN) for a teacher in his/her home.

As a prototype for applying this system to a real lesson for students in dormitories divided by sex (i.e., male and female dormitories), we assembled 25 computers: a Windows server, a client host for the teacher, and 23 client hosts for students. The proposed learning system was implemented in a pilot evening class as shown in Figure 2. After conducting this class, the feasibility and practicality of the system in helping students study actively and willingly was verified by observation and questionnaires.



(a) For a teacher at home



(b) For students in dormitory

Figure 2: Snapshot of the practice when using in dormitory and at home.

We conducted a questionnaire survey to investigate subjective impressions of the prototype system. The test subjects were six teenage students in the Department of Electrical Engineering in a girl's dormitory. The subjects became familiar with operating the tablet PC over the course of the year. While test subjects attended the lessons from the girl's dormitory, the teacher conducted the lessons from his room on campus for the first six months; he also conducted the lesson from home via VPN. The intent of the investigation was clarified before they filled out the questionnaire. The questionnaire included the 10 questions as shown in Figure 3. The questionnaires evaluated subjective impressions using a five-point rating scale: Better = 5, Slightly better = 4, Fair = 3, Slightly worse = 2, and Worse = 1. Table 1 indicates the results of the questionnaire, where the mean score and standard deviation (SD) are calculated for each question. Subjects evaluated this system

favorably. Subjects' rating of the ease of use of the system was high at 4.3 points, whereas the comparison with using a notebook was low (less than 3 points). However, other evaluations of our system by these users indicated greater effectiveness. In particular, subjects' rating of their wish to continue the supplementary lessons using this system was quite high at 5 points. The ratings regarding the ability to concentrate during the supplementary lesson (questions 3, 4, 5, 7), showed that, because it is possible to concentrate on the teacher's explanations without taking notes and to concentrate on hearing the teacher's voice from the headphones without other noises, this system helped students concentrate better. As freely provided advice in the subjective evaluation, we got useful comments such as "The response of the stylus pen is slightly slow," "It is inconvenient that the voice is interrupted sometimes," "It may take some time before a student's question gets a response from the teacher," and "We want more time to do a lot of exercises." These ratings of the supplementary lesson provided by using this system suggest that this system could have the same outcome as a face-to-face class if the supplementary lessons are provided as multipoint remote interactive lessons. A further investigation of the subjective impressions of the prototype system is necessary. We would like to discuss the evaluation of the system in more detail later because we need to analyze the effectiveness of the small private school environment that uses the prototype system through the tablet PC [3].

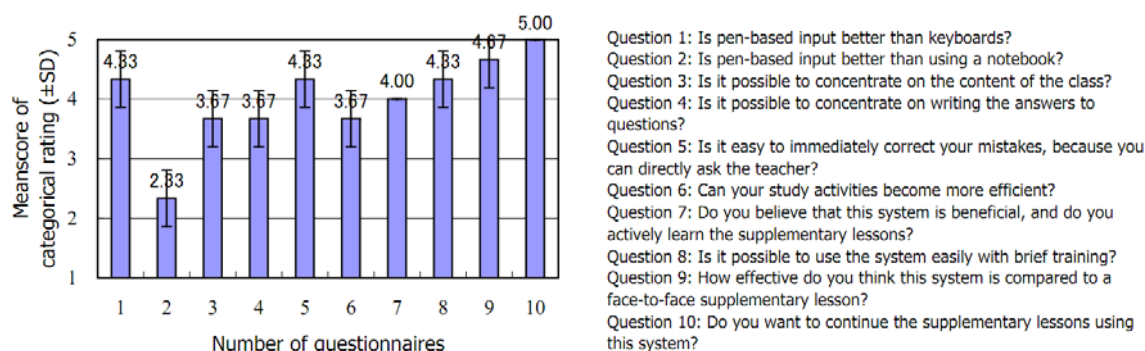


Figure 3: Questionnaire results.

2. Conclusions and Further Work

This paper describes an implementation of our proposed learning system framework in a dormitory. The system was implemented in a girl's dormitory with a teacher at home or in a teacher's room on campus for one year. After this test with the students in this dormitory, the feasibility of the system in helping them study actively and willingly by employing the handwritten electric whiteboard with verbal communication through a headset was verified. Because the PC screens of students were viewable on the teacher's PC screen, the teacher could check the students' work and support their thinking process by online collaboration. The teacher could also clarify any misperceptions in their thinking processes, providing appropriate support for each student.

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References

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