A Supporting System of Informatics Education for University Freshmen

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Abstract: Informatics Education for high schools started in 2003 in Japan. Although it is compulsory, university freshmen in 2006 are expected to have large differences in their computer literacy competency. One of the reasons for this is that many teachers have no technical knowledge of Informatics because they were licensed by taking only ninety hours of training during their summer vacation. It is necessary for universities in Japan to classify their freshmen with respect to their computer literacy to be able to provide appropriate education. We have developed a testing system for this but further improvement is required due to quality variations of the test. Appropriate classification of the problems is also required for giving good advice for the student to learn properly. We are developing a Learning Management System (LMS), which supports not only students but also the collaborative works of teachers as well.

Keywords: Informatics Education, Testing System, Learning Management System (LMS), Collaborative Works

1. INTRODUCTION

In 2003, Informatics Education for high schools started in Japan. Although it is compulsory, university freshmen in 2006 are expected to have large differences in their computer literacy competency. One of the reasons for this is that many teachers have no technical knowledge of Informatics because they were licensed by taking only ninety hours of training in during their summer vacation.

These changes have prompted the Keio University Shonan Fujisawa Campus to modify the curriculum related to information processing in 2004. The class of basic information processing was abolished and a qualification test was introduced to measure the competency level of computer literacy.

The qualification test consists of three parts: touch typing, basic operation of office applications, and a multiple-choice test for measuring basic knowledge of Informatics.

As a result, teachers had to create many questions for the qualification test and provide a self-learning environment for students. However, there is still an insufficient number of questions and students cannot efficiently study for the qualification test due to the lack of a good self-learning environment. To solve these problems, we propose a Learning Management System (LMS) that not only offers a self-learning environment to students but also supports the managerial work of teachers.

2.   CONCEPT OF THE SUPPORTING SYSTEM

The supporting system that we propose supports the following two processes:
1. Process of Self-learning (for the Students)
2. Process of teaching materials management through collaborative works (for the Teachers)

We plan to develop this system by adding new features to the existing LMS. The system is divided into two modules. A relationship of the two modules and details of support are given in Figure 1.
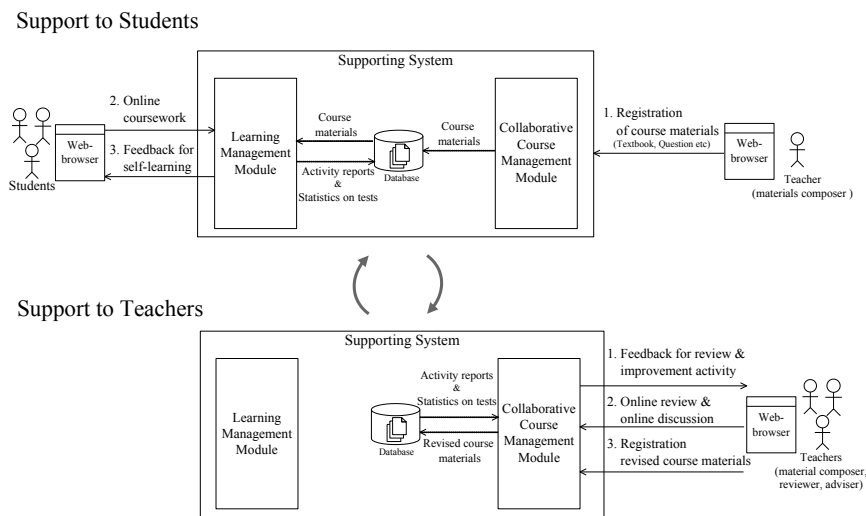

Figure 1. Basic concept of the supporting system

A Learning Support Module supports activities that students learn by themselves using an online textbook and online test. The results of the tests and activity reports of self-learning are stored in the database.

A Collaborative Course Management Module supports teacher activities such as online reviews and online discussion about teaching materials.

2.1   Self-learning process support

By using the existing LMS, teachers can deliver the teaching materials online to students, so we will not need to develop new systems in the future. However, it is necessary to define the self-learning process for the freshmen. Students study according to this process (Figure 2).
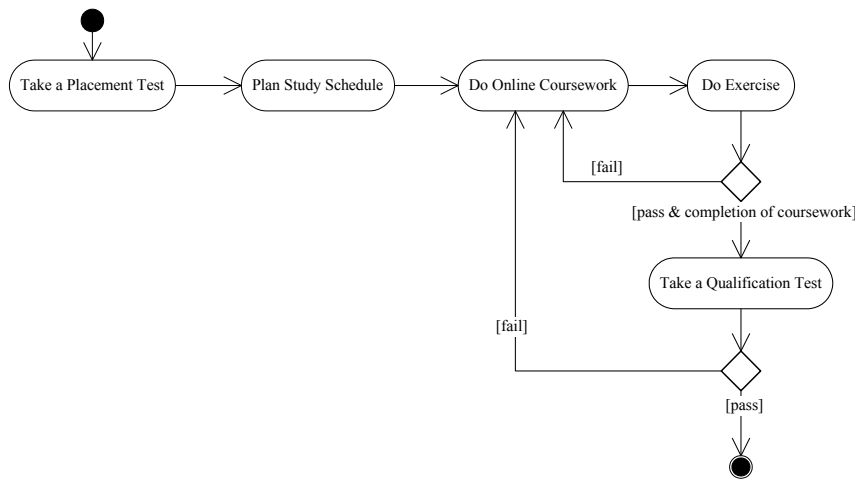

Figure 2. Activities of self-learning

2.1.1 Online placement tests

The mechanism to measure the level of computer literacy is necessary because the freshman should make his/her own study-plan. We think the online placement test is effective as the measurement mechanism. The student plans his/her schedule of self-learning based on the result of the online placement test.

2.1.2 Teaching materials for self-learning and feedback from the system

According to PSI (Personalized System of Instruction) advocated by Keller, students study at their own pace, and do the exercise (Keller 1968). PSI is good match with self-learning that uses LMS (Watanabe & Furukawa 2005). The freshmen are expected to have large differences in their level of computer literacy competency, so they should study at their own pace.

The qualification test result can include review materials if the system has the mechanism for feedback to be included in the qualification test

results. A student can be provided with an effective review by showing a link to the textbook relating to the incorrectly answered question (Figure 3).
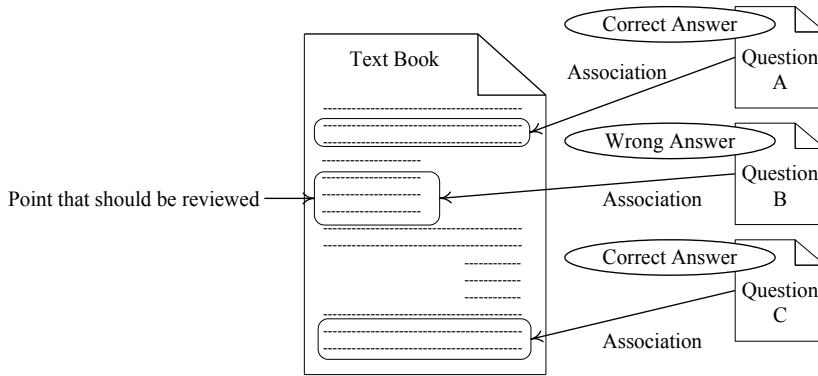

Figure 3. Association between Textbook and Questions

2.2   Teaching materials management process by teachers through collaborative works

2.2.1   State management of teaching materials

Existing Learning Management Systems support uploading teaching materials to the internet. We think that our supporting system should also support the development of teaching materials. The questions on the qualification test and other teaching materials for freshmen should be revised and improved as necessary based on a review by teachers. Now teachers use E-mail as a communication tool; however, this method makes state management of questions difficult.
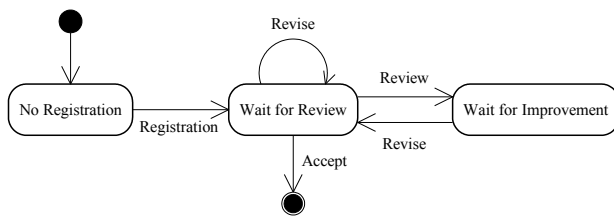

Figure 4. State transition of a question

Figure 4 illustrates a typical state transition of a question. The workflow of developing teaching materials such as questions can be represented by this state transition diagram. The supporting system can define the state of each type of teaching material, transitions and actions. The Content Management Framework (CMF) for Zope provides a tailorable platform for

building content management applications (Zope 2005). We think that a framework similar to CMF is required for our supporting system.

Table 1. The features of each tool

	E-mail	BBS	Wiki (2005)	Nongnu (2005)
State management	C	C	C	C
Revision history management	C	C	B	A
Easy to communication (review & discussion)	A	A	A	C
Access control by user authority	C	C	C	B

A: Good, B: Fair, C: Bad

Table 1 gives the features of each tool that can manage teaching materials online. The table shows that E-mail, bulletin board system (BBS) and Wiki are useful for discussion, but on the other hand it is difficult to manage states of materials.
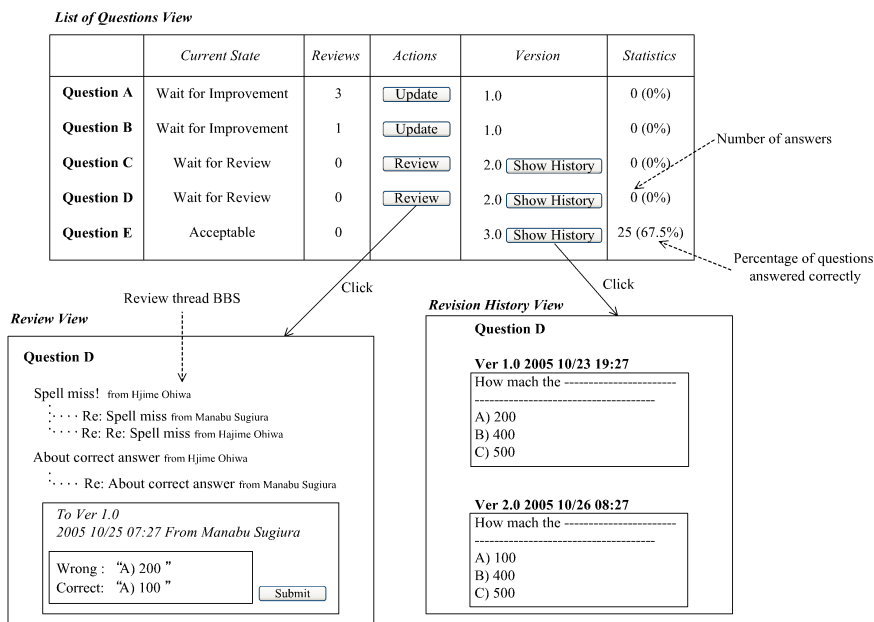

Figure 5. Screen images of question management

Figure 5 is screen images of the management of questions. The supporting system that we propose can manage development of questions by using a Web-browser. The Review view has a BBS because it is suitable for discussion and review. If a question is being reviewed by someone, the current state of the question changes to "wait for improvement" automatically.

2.2.2 Centralization of information management

The student's study records and the results of tests must be stored in our supporting system. This information is used for reference for teaching

materials improvement and must be stored in the same database as that of the supporting teaching materials management process.

3.   CONCLUSION AND FUTURE WORKS

The system described in this paper offers a self-learning environment to students but also supports the collaborative works of teachers. Using the system, online teaching materials can be efficiently managed by teachers while offering an effective self-learning environment for students.

We wish to analyze the teaching materials being used and define the relationship between them. Creating an accurate placement test is another necessary component to improve the current system. In the search for a flexible system that reduces the managerial works of teachers, we are currently developing a prototype system based on Moodle (2005).

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