

An Adaptive ICT Education Service based on Course Knowledge Database in Science and Technologies

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Abstract: This paper describes the structure and results of case studies of a new adaptive ICT education service based on the course knowledge database in science and technologies. The adaptive ICT education service links various university's ICT learning recourses by using knowledge items in the knowledge database. The service provides functions for reminding students of their own learning approach and to explore further knowledge. The case study revealed the effectiveness of the service.

Keywords: Knowledge Database, ICT Education Service, Linkage between ICT Systems

Introduction

Recently, setting the goal of individual student's study and managing the learning process have become an important target to be managed within the entire course in most Japanese universities. In order to let students recognize their level of achievement of their learning results, ICT systems are most powerful and useful. However, ICT systems, such as e-learning, Course Management System (CMS) etc., are generally running independently in most universities. This leads to be difficult for the students to understand how to extend their study for further development of their knowledge and/or career. Consequently, it is not always successful to activate the students' spontaneous will or aspiration of study. The goal of our study is to provide an adaptive ICT education service, which reminds students of their own learning approach referring learning resources and records across ICT systems. By linking multiple learning resources spread over university's ICT system with adequate basis of the study, we have realized several useful functions for the students to remind and find their study results and to set up their future learning plans. The linkage of learning resources is simply structure with the course knowledge database. The following session describes essential structures, functions and the case study results of the new ICT education service.

1. Structure and of ICT Education Service

Figure 1 shows the structure of the new ICT education service that is constructed based on three ICT systems. The CMS manages syllabuses in which various information of each course are included^[1]. The e-learning is a WBT system that uses the function of textbook and problem solving. It consists of the LMS and materials^[2]. The Learning Portfolio System manages course learning results of students^[3]. These three ICT systems are designed to run independently. Therefore, we introduced a knowledge database as the linkage basis between those ICT Systems. The knowledge database is constructed by using the relational database

technology. The database items have been registered from knowledge items determined by course teachers and structured with technological keywords that are commonly used in science and technology field. We assume those knowledge items cover the expertise in our university. In addition to technological keywords, combinations based on the knowledge items of syllabuses and e-learning materials have been registered on the knowledge database. Using the knowledge database as the linkage tool enables the ICT education service to provide the following three services through the Learning Portfolio System:

1. Referring combinations based on knowledge items of syllabuses and e-learning materials.
2. Requesting the appropriate learning recourses (for example: course information, e-learning materials, student efforts of e-learning materials, etc.) on ICT systems, when necessary.
3. Reminding examples of each student's learning approach using his record and the learning recourses.

2. Functions of ICT Education Service

We have implemented two functions for the ICT education service on the Learning Portfolio System.

2.1.1 Function of reminding the link between courses, and showing ease of learning in other course materials

When a student clicks a course name in the list of courses, all courses linked by the knowledge items are displayed on the screen in colored-code. If a student clicks an uncompleted course, then the ease of learning is displayed by star icons. The star icons are displayed up to four of max, and the number of icons indicates a prediction of average ease of the course completion. The prediction is based on the assumption that the ease of the learning in the course for a student is determined by the score of the course based on the linkage between his completed courses.

2.1.2 Function of supplementing with additional learning for the knowledge

When a student clicks "show details" button on the course menu, e-learning materials linked to the course are displayed. The linkage between each course and related e-learning materials are determined based on the commonality of the knowledge items. When a student makes the effort to learning materials, Learning results of knowledge for each student are updated instantaneously when he accomplished the e-learning materials. This leads to students to guide into further development of their knowledge or career.

3. Case study to Explored Effectiveness of ICT Education Service

A case study explored the effectiveness of the new service through a questionnaire. In the cases of the function described in section 2.1.1, generally students use this function in conjunction with syllabuses to select their courses at the beginning of semester. For the questionnaire, we surveyed total number of 274 students, and about 70% of the students answered "the function is useful". The reason why "useful" was "by using the data provided

by the new service, they could investigate the course further and confirm the information which they could not get by legacy syllabuses”. In the cases of function described in section 2.1.2, students used this function to confirm the knowledge and also used related e-learning materials to review and prepare for the final test of the course. For the questionnaire, total number of 272 students answered, and about 80% of the students answered “it is useful”. The reason why “useful” was “by using the data provided by the new service, they could confirm specific learning items by themselves”. These results indicate the new ICT education service has successfully spread to students and accepted as an effective tool to get much information on the course for developing their learning process.

For an issue in the future, further effectiveness verification of the functions provided by the new ICT education service should be conducted especially from the viewpoint of students’ autonomous learning. In particular, the function described in section 2.1.2 is quite unique and important for students not only to remind their learning approach but also to develop their own learning style. The use of this function is not limited to the course learning. It can be widely used in career development programs. Linking those applicable fields by this new ICT education service is also an important future subject.

4. Conclusion

We have proposed a new ICT education service based on a knowledge database of courses in science and technology for reminding students of their own learning approach and activate them getting further knowledge. From our case study, the ICT education service inspired students to consider their learning approach that is not reminded before.

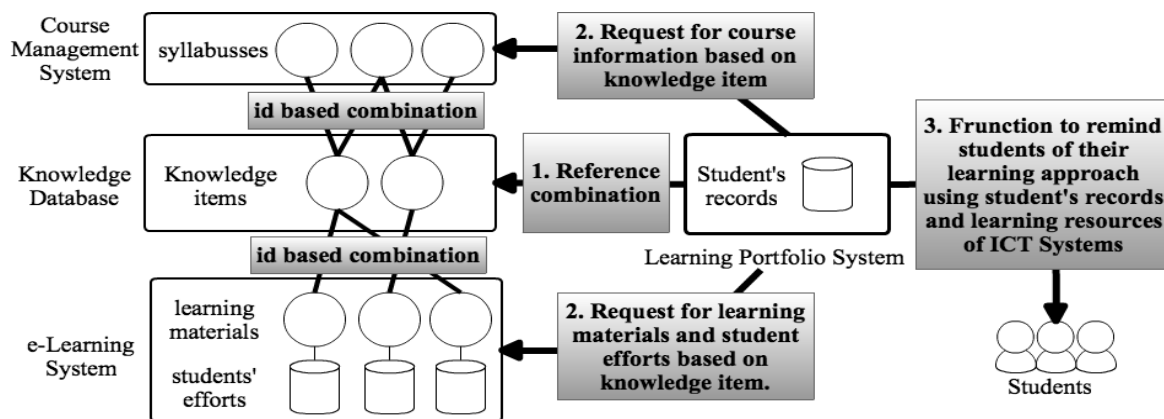


Figure1. Structure of the ICT Education Service based on Knowledge Database

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