A Learner-centered e-Learning Environment by Contributing and Sharing Problems Created by Learners

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Abstract

Recently, education by e-learning has been getting increased by the development of information and communication technology. However, it is generally hard for e-Learning contents developers (including instructors and so on) to quickly prepare e-Learning contents with appropriate quality and quantity in short period because of heavy load for creating the contents. We proposed and prototyped an e-Learning environment by contributing and sharing problems created by learners in order to clear this problem. In our system, learners behave as contents developers so that they create e-Learning contents they need. In addition, our system provides a learning environment wherein students can freely use the contents as common learning resources.

1. Introduction

Recently, distance education and e-learning based education have been getting increased by the development of information and communication technology. Especially, e-learning uses multimedia such as images and movies as the educational contents, which are used for university education, language learning and so on[1]. In particular, e-learning with information networks (especially, the Internet) is expected to be used for self study, because learners can study anytime and anywhere.

However, it is generally hard for e-Learning contents developers (including instructors and so on) to quickly prepare e-Learning contents with appropriate quality and quantity in short period because of heavy load for creating the contents[2,3]. In the case of university professors, they hardly take enough time to prepare e-Learning contents due to other tasks they should do.

We proposed and prototyped an e-Learning environment by contributing and sharing problems created by learners[4,5] in order to clear the above-mentioned problem. In our idea, learners behave as contents developers so that they create e-Learning contents they need. Our system provides a learning environment wherein students can freely use the contents. They are used as common learning resources for all members who use the environment.

The target domain of our prototype system is Information Technology Engineer Certifying Examinations. In addition, the current target learners are university students who belong to the Faculty of Engineering, Kagawa University. We believe that many of them are interested in passing the certification examinations, because it becomes an advantage for getting job.

We think motivating to participate in our prototype system and maintaining learners' learning will are very important, because our idea expects that learners create learning contents spontaneously in this environment. Our system motivates learners to do it by two methods: extrinsic motivation and intrinsic motivation.

We preliminary evaluated our prototype system by a function test and a use test. Through the two evaluations, we found our system provided an e-learning environment easy to use in the viewpoints of system function level. In addition, we confirmed learners did not often use our system, as a motivation problem against sustainable learning.

2. Outline of our system

In this section, our prototype system is explained from four aspects: the features, contributed problems, target domain and target learner.

2.1. Features of our system

Typical users of e-Learning can be classified into two types: instructors and learners. The instructors generally have at least two tasks in use of e-Learning: managing learners' activities in the e-Learning and preparing e-Learning contents for the learners. Although free e-Learning style (in other words, we could call it "unmanaged e-learning") can be accepted in some cases, the former task is

unavoidable for instructors. In contrast, we can think the latter task is avoidable. However, it is general case that they do not have sufficient e-Learning contents in advance, or they do not have enough budgets to prepare ready-made or tailor-made contents. In this case, the instructors have to prepare e-Learning contents by themselves. This becomes heavy load for them to preparing contents described in Section 1.

For reducing the instructor's task to prepare e-Learning contents, we focus on learners who use the e-Leaning environment as alternative e-Learning contents developers. Then, we propose an e-Learning style that learners prepare e-Learning contents for their learning. We also developed a prototype system for realizing this e-Learning style. In our system, there is no instructor who has to prepare e-Learning contents but all of the learners can behave as contents developer. Our system provides functions for creating e-Learning contents and for using the contents as common learning resources. Therefore, Learners can prepare e-Learning contents spontaneously and use them effectively for their learning in our system.

2.2. Contributed problems

We think it is hard for many of learners to immediately create (in this case, "make" might be better expression) e-Learning contents which can be used for learning, because sufficient experience and knowledge are needed for contents creation. As the first approach to contents creation by learners, we put focus on question-and-answer problems. They have simple structure for learners to create them.

In our proposed e-Learning style, learners create such problems as e-Learning contents. In addition, for using them as common learning resources, our system provides a function for learners to contribute their created problems.

All contributed problems created by learners can be treated as open-contents. The concept of "open-contents" is that created contents can be used freely by sharing them. Wikipedia is a representative example of open-contents systems. Our system also accepts free problem contribution to increase e-Learning contents. In addition, learners can freely use them. However, there are possibilities of unbalance of problems' genre and contribution of incorrect problems.

2.3. Target domain

The main feature of our system is that learners can freely contribute learning contents. For investigating the effectiveness of our system, we developed a prototype system for a concrete learning domain.

The target learning domain of our system is study for passing the three kinds of Information Technology Engineer Certifying Examinations. As simple structured problems described in 2.3, we especially focus on a part called "forenoon problems" of those qualification examinations: the Software Design and Development Engineer Examination, the Fundamental Information Technology Engineer Examination, and the System Administrator Examination. Figure 1 shows the difficulties of these three examinations and their required achievement levels. The required knowledge range of each examination is overlapped with other examination's range, and difficulties of these examinations are stepwise determined. Therefore, learners can continuously take plural examinations in this target domain. We think this target domain has appropriate range for our investigation.

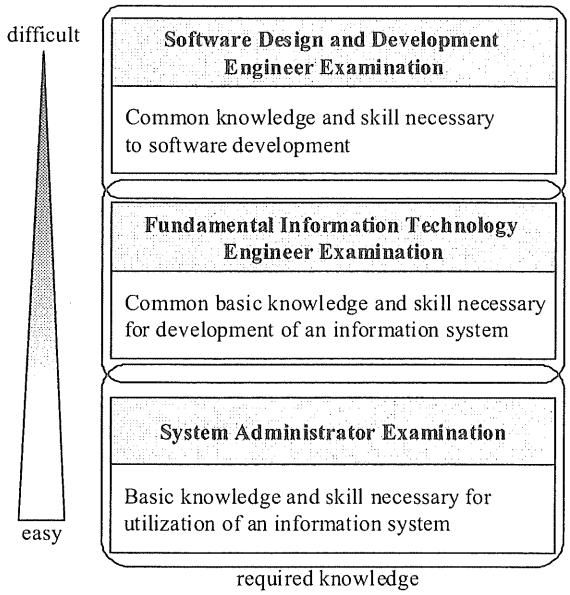

Figure 1. Difficulties of the examinations and their required achievement levels

Problems of the Information Technology Engineer Certifying Examinations are classified into forenoon problems and afternoon problems. They are also multi-choice problems shown in Figure 2 to ask knowledge and skills for information technology.

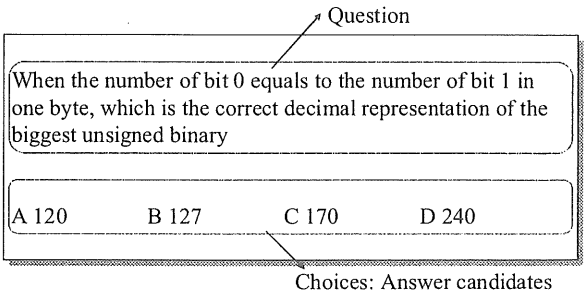

Figure 2. Problems of the Information Technology Engineer Certifying Examinations

2.4. Target learner

In our current research, the target learners are university students who belong to the Faculty of Engineering, Kagawa University. We believe that many of them are interested in passing the certification examinations, because it becomes an advantage for getting job. The curriculum of the Faculty of Engineering is shown in Figure 3. They get lectures of the general education course of Kagawa University in a campus until the first semester of the second year. After that, they have to get lectures of the professional education course in another campus. Because the main campus is changed after this semester, the number of lectures students should get is reduced in this semester as the period for changing the main campus. Therefore, students have more free time compared with other periods. We assume that they can use our system for their self-study in order to use the free time effectively.

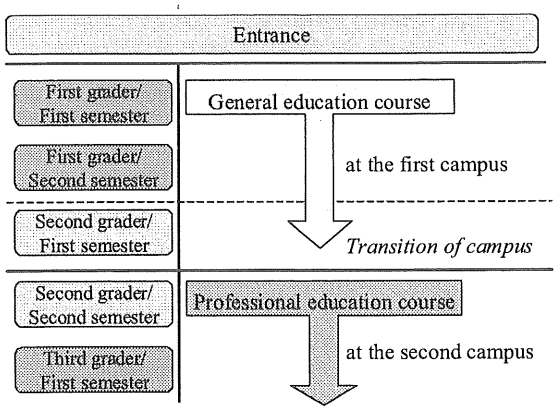

Figure 3. The curriculum style of the Faculty of Engineering, Kagawa University

3. Functions of our system

Our prototype system is provided as a web-based system. Learners can freely use our system for their self-learning on the Internet. Our system provides "My Page" for each learner. From the My Page, learners can access and use various functions. This section describes My Page and the functions provided for contributing and sharing problems in detailed.

3.1. My page

Learners have to register personal information at our system in advance. After the registration, Learners can login to their My Pages. Figure 4 shows an example of My Page. It has a menu which contains Problem contribution and correction, Practice, Problem search, BBS, and Ranking. Learners can use each function from the menu. My Page also gives learning information such as learning records, rankings, and learning histories of each learner. In addition, learners can get information about Information Technology Engineer Certifying Examinations and messages from other learners by a message function and BBS.

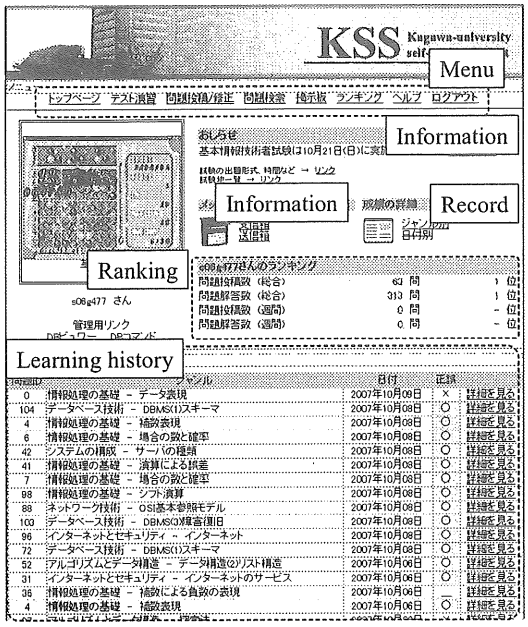

Figure 4. Example of My Page

3.2. Problem contribution and correction

As the most significant function of our system, learners can contribute problems. In addition they can correct them anytime after contributing the problems. Figure 5 shows the Problem contribution form. When learners contribute a problem, they first have to select the problem genre, and then input the problem text, and choices in this form. If the problem contains numerical formulas or Figures, their image files can be registered by referring the file names at the form. Contributed problems are stored in the problem DB. As for problem correction, learners can edit the target problem and contribute it again in the same form.

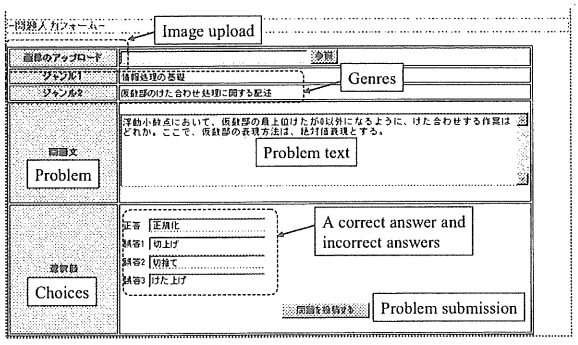

Figure 5. Problem contribution form

3.3. Practice

Learners can freely practice anytime by using contribute problems. Our system provides two types of practices: Free practice and Examination practice. As for Free practice, learners retrieve contributed problems by keyword search and then they can try to solve them. As for Examination practice, learners select problem genres and the number of the problems and then they can try to practice with examination style. Learners can repeatedly try them. Figure 6 shows a snapshot of Examination practice.

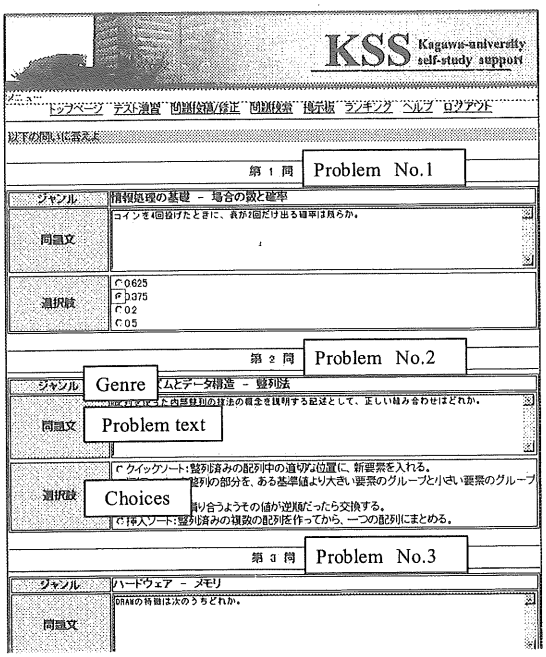

Figure 6. Examination practice

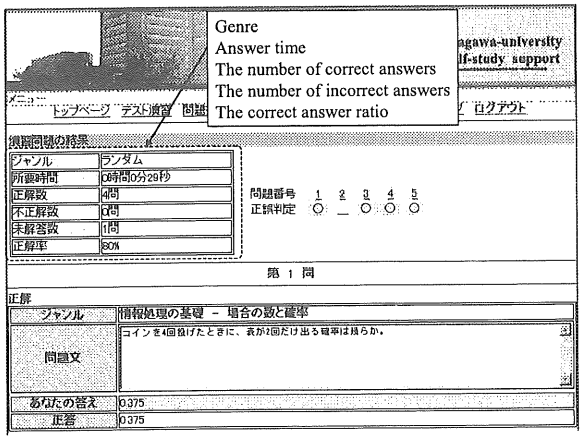

Figure 7. Result indication of Examination practice

As the feed back information of an Examination practice, our system provides the practice result shown in Figure 7. The result consists of the genre, the answer time, the number of correct answers, the number of incorrect answers, and the correct answer ratio. In addition, the result and right answer of each problem are indicated.

In addition, our system provides a list of practice history shown in Figure 8. Learners can check their learning situation by a set of problem ID, genre, date and right and wrong data. In addition our system provides results of each genre shown in Figure 9.

Figure 8. Practice history

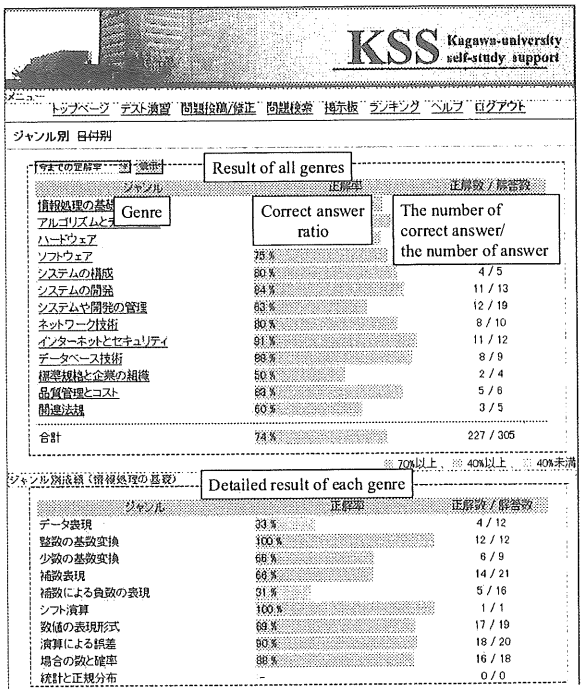

Figure 9. Result of each genre

3.4. Ranking

Our system provides a ranking function to promote contributing problems and solving problems. We think the ranking function works as an extrinsic motivation device in our system. Figure 10 shows an example of ranking. The ranking function indicates two kinds of orders about the number of contributed problems (left side) and the number of solved problems (right side). As for the ranking period, our system provides Total ranking for the all use periods and Weekly ranking for each week.

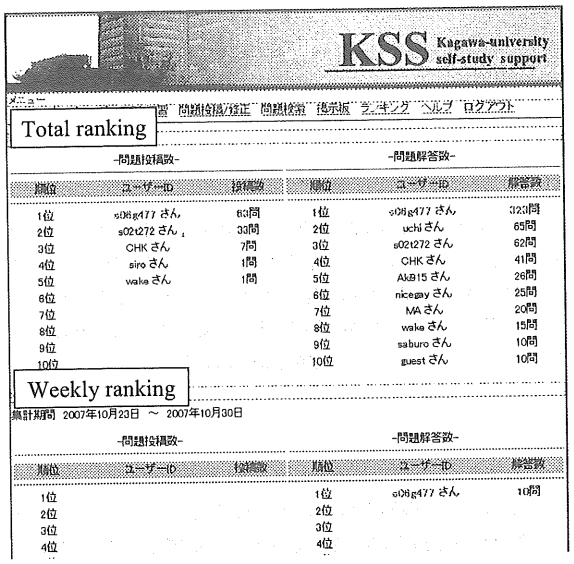

Figure 10. Ranking about contributing problems and solving problems

3.5. BBS

Our system provides a BBS as communication spaces for learners. We expect opportunities of collaborative learning that learners mutually solve problems with other learners or exchange learning information and so on. In order for learners to participate in the BBS smoothly, the following five threads are prepared in advance: requests to the administrator, requests about systems functions, requests about problems learners want, requests about problem explanations, and requests for new threads.

4. Preliminary Evaluation

As the preliminary evaluation of our prototype system, we did a function test and a use test.

The function test was to investigate that our system functions worked correctly. This test was held from Aug. 21 until Oct. 3 in 2007 (44 days). The number of participated learners was two. 68 problems were prepared for the function test in advance. As the results, we could not find serious troubles in all functions. In addition, we found participants contributed and solved problems only in the former half of the test period.

The use test was to obtain basic data about tendencies of problem contribution and problem solving. This test was held from Oct. 4 until Oct. 21 in 2007 (18 days before Information Technology Engineer Certifying Examinations). The number of participated learners was nine (eight new participants and one participant from the function test). 92 problems were prepared for the use test in advance. Most of participants use our system only once during the test period. We guess the scale of participants caused this result, but we must consider mechanisms for promoting sustainable learning. This point is one of our future works.

5. Summary

In this paper, we proposed an e-Learning environment by contributing and sharing problems created by learners, in order to clear a representative e-Learning problem that it is generally hard for e-Learning contents developers to prepare e-Learning contents with appropriate quality and quantity in short period. We also prototyped an e-Learning system for Information Technology Engineer Certifying Examinations based on our proposal. In our system, learners behave as contents developers so that they create e-Learning contents they need. We preliminary evaluated our prototype system by a function test and a use test. We found learners did not often use our system, as a motivation problem against sustainable learning.

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