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A Blended Learning Approach to an Assignment-intensive Course

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Abstract. The innovation of information technology spreads from closely related industries with information technology to all industries. Most industries are developing through fusion with information technology. In this sense, the importance of programming education, which is a key component in the information technology, is increasing. Some advanced countries have selected programming education as a required course in primary, secondary, and higher education. But it is hard to settle assignments within the regular face-to-face class time, since programming requires a relatively long period of time except when performing basic tasks. Therefore, this study aims to suggest a blended learning approach which gives a prompt online feedback to students for solving a programming assignment. Through the blended approach, students can perform assignments easily and reach learning goals that teachers intend to achieve, by improving the perfection of assignments by combining face-to-face class with adaptive online feedback.

Keywords: Assignment-intensive course, Programming, Blended learning, online feedback, Face-to-face class

1 Introduction

Until a recent date, high school and college programming classes required a semester or a year to learn and master programming language. As a result, many students failed to carry out programming properly, even though they completed the programming classes [1]. In current programming education, students analyzed codes and carried out programming, based on the programming theory taught in the class. But many of programming tasks are not finished at a time after coding. Once an error is found, it must be corrected properly. In reality, it is difficult for teachers to fix up all programming errors, because there are plenty of students to teach in a course.

Up to now, a lot of web-based application programs have been developed to provide regular coding frames for users to carry out programming readily rather than

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the webpages which users have to produce and manage by themselves from beginning to end [2][4].

Performing a programming assignment helps in developing creative, reflective, and critical thinking. For this reason, the age group for programming education has become younger and expanded more. Recent web-based programming education pages offer simple structures and instructions, since they are mainly targeted at users who first learn coding and lack experience in coding [3].

This is insufficient for learners or teachers that look for more enriched and intensive programming education. The program developed by this study aims to enable teachers to help students do programming assignments by getting over the limitation of the fixed course time. Also, it would enable learners to finish their assignments, receiving a feedback from teachers in the middle of learning.

This application program is quite effective even for getting a high academic achievement, since not copying and pasting codes of other people, students can create their own codes and upload them using this after receiving adaptive feedback.

2 Related work

Programming consists of four stages (stage 1: designing, stage 2: implementation, stage 3: execution, and stage 4: debugging). Students can develop creative, reflective, and critical thinking naturally, by repeating these processes. If a logical mistake occurs during computer programming, it causes an error and the program does not work. Students are able to form a habit of thinking of how to solve problems logically through coding practice. In other words, programming education can highly influence a person's life beyond the simple educational scope.

Analytic feedback was found to have a more significant influence on academic achievement than comprehensive feedback. It implies that classifying assignments into each domain for evaluation and providing suitable feedback is more helpful in improving academic achievement. Analytic feedback means to give suitable feedback by sorting children's performance evaluation results into some essential elements and scoring each of them [5].

There are only objective, subjective, and O-X types of quiz, so it is impossible to check the process in which students solve problems. For improving this, it could be a good way that students are allowed to leave comments so that teachers give extra points to those who know of how to solve problems [6].

According to these theories, programming education influences the whole life of students, and for effective programming education, offering analytic feedback in the middle of doing an assignment might be better to improve academic achievement than offering feedback after it is completed.

3 Functions and Entity-relationship Diagram

The functions necessary for programming assignment are described in Table 1. These functions are required to provide adaptive feedbacks between a teacher and students

on the web. To achieve learning goals considering learners' abilities in an assignment-intensive course, adaptive interactions between a teacher and learners should be supported.

Table 1. System Components

Functions	Descriptions
Log-in	- Enter ID and password.
Member registration	- Enter information including ID, code and email address. - Select my class out of the designated ones from the beginning.
Assignment and news feed	-Name of assignment, XP, average execution time, difficulty, category, etc. are listed. - Every item for assignment is arranged in sequence of date. - Assignments that you should perform and performed, are displayed in the far right.
Assignment for this week	- A list of new assignments is displayed.
News about our class	- Hourly notices of assignment performance are listed by students in the same class and group.
My compensation	- Sticker-form compensation contents are shown when an assignment is finished. - A list of assignments that students performed, is shown.
Bonus learning space	- Additional learning is presented. - If a student completes an assignment with a high difficulty, a more intensified assignment is given. - If a student completes an assignment with a low difficulty, an easier assignment is given.
Excellent assignment board	-Teacher chooses an excellent assignment of those submitted by students and post it.
Q&A	-A bulletin board for questions and answers about assignments.

Fig. 1 shows an entity-relationship diagram of the database necessary for our approach suggested for an assignment-intensive course. As entities, there are students and quests, and as elements of relationship, there are 'Quests Newsfeed, 'Assignment for this week, 'Bonus learning space', and 'excellent assignment board '.

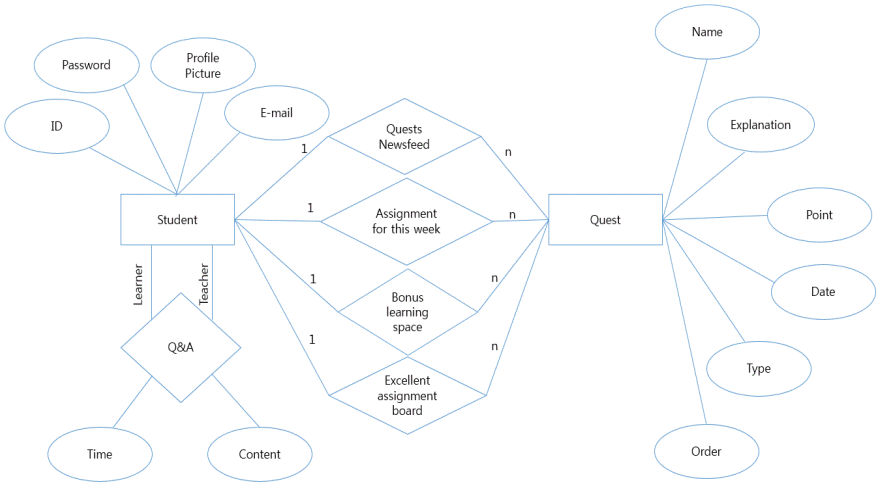

Fig. 1. Entity-Relationship Diagram of the System

4 Conclusion

The blended learning proposed in this study facilitates more intensive enrichment learning in programming education, because providing regular frames is more helpful for basic programming education.

This program reduces teachers' burden of learning progress even when students submit assignments after they teach students theoretical contents sufficiently, and help students reach learning goals that teacher’s desire. Moreover, teachers are able to teach by connecting an offline class with an online class, which is kind of a blended learning approach.

Contributions of this study are as follows. First, this program links an offline class with an online assignment. Escaping from simple theoretical learning, students can check learning contents through online assignments and enhance problem-solving skills by performing programming assignments themselves.

Second, adaptive feedbacks are more effective in performing an assignment than comprehensive feedback. Students can check their assignments in the middle of learning. Teachers can also check the progress of assignments and carry out learning for assignments anytime in addition to the appointed face-to-face class.

In conclusion, it is anticipated that students will be able to perform programming assignments effectively, based on these strengths.

For further study, we’ll implement our blended learning system on the web for a programming course that is a kind of an assignment-intensive course. Then, we’ll extend our approach to a global education course that a distance learning or blended learning is required.

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