

Applying an Edutainment to a Unified Learning

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Abstract: In most cases, it's not easy to unify efficiently two subjects in face-to-face education. In this paper, by applying web technology and a sophisticated edutainment, we develop a web-based integrated course about the subjects like computing and English, which have high heterogeneity between each other from the perspective of discipline. We present the integrated course structure and lesson plans at middle schools. Also, we show that our interdisciplinary approach could be plausible and effective by using both web technology and edutainment such as a variety of quiz & game-based learning materials. Specially, we develop the various types of educational games, which can be orthogonal to learning contents by constructing them through the parameters. Then, we evaluate the learning effects after teaching students the lesson using the lesson plans devised. The results show that the students in the integrated course did better than those in the traditional one in achieving the learning objectives given.

Key-Words:- Unified course, Parameter, Web-based Course, Edutainment

1 Introduction

It's appealing to provide an integrated course for the purpose of enhancing comprehensive thinking power. However, despite of it, it has been very difficult due to realistic restraints such as time or space limited. Recently, as web technology is rapidly developed, it's more plausible to devise a new method such as the integrated course that previously seemed difficult. Specially, in this paper, we aim to integrate heterogeneous two subjects (English and computer science) into one course with the help of both web technology and animation-based educational games. Our intention of integrating English subject into computer science comes from the fact that most of terms related to computer science have been originated from English. Previously, the terms have been mostly translated into the native language of the learner. However, the original meaning of a term could be contorted during the process of the translation at some cases due to the nuances between two natural languages. Specially, in the information age, there can not afford to do the translation of the new knowledge that is flourishing out rapidly. So, at this point, it is more desirable to use original terms without translating them in the globalization society.

Using the original terms can give an extra burden to learners who are not using English as a native language because mostly it would be simultaneous for these students to learn English as a foreign language

and computer science. So, they have to learn the computer-related terms without knowing their meanings in terms of English. Thus, we predicted that during class, the learning effects could be boosted if it would be possible to provide the meanings of a term from the viewpoint of computer science and English respectively. In particular, in case of the terms, which are composed of a few English words, each English word should be explained first before their concepts or meanings in terms of computer science are given.

We have seen several researches about integrated approaches using a thematic unit at primary school level [2]. The researches showed that it would be easily possible to develop an integrated course between the closely related disciplines at primary level. However, there has been made little research on them at the middle or high school level. Specially, if any, there has been made much less research on them to the subjects which are not closely related to each other from discipline perspective like English and computer science because it has been generally recognized that their integration is almost impossible. In this paper, we show that the integration between the discrete disciplines could be achieved through the sophisticated framework of using both web technology and animation-based games.

There was a research on a constructivist approach to communication skills instruction such as speaking and writing in computer science [1]. In this research,

they designed and implemented a course focused on the students in university. However, this research cannot be classified as an actual integration approach intended to learn distinct two subjects because the learning was limited to only improving communication skills without considering the learning of computer science. We have also seen computer science integrated into other disciplines at postsecondary level [3][4][5]. There have been the ideas of using games in learning the specific learning topics like programming [6] or multiagent system [7] at postsecondary level. However, unlike their approaches, we are using quizzes & games as an effective method to be immersed in learning the knowledge of heterogeneous disciplines gracefully without any reluctance as well as to boost learning achievement.

We expect that our approach will make contributions to bringing a few positive aspects. First, English softwares (we can see that most of them belong to this category) can be used without difficulty, even though the users are non-native English speakers. Second, it can be easier to get useful information through the navigation on Internet because students can understand Internet-related terms as well as their original meanings in English. Finally, there is no need to translate computer-related terms created newly according to the development of technology. Sometimes, actually, it is not easy to translate some terms into those of the corresponding native language. In our approach, such difficulties will be removed.

2 The Strucutre of the Unified Course

These two subjects have very broad coverage in topics to be learned. However, learners are only ready to learn the basic knowledge about them because they start to study the subject at that point. So, it is required to make very delicate approach considering learners' level and learning content. To meet such requirements effectively, it is necessary to make rules that can make the coverage of integration clear when we develop an integrated course. We made four rules to be used as a baseline. They are at the following.

1. The integrated course should satisfy both English and computer science goals which are described on the curriculum for middle schools.

2. The entire learning content including terminology and key subjects should be restricted to the area to be covered in English and computer science textbooks in middle schools.

3. The total number of hours to be lessoned in the form of integration is fixed 68 hours during one semester. This value can be calculated from summing the 34 hours allocated for each of two subjects on the curriculum.

4. The skeleton of the integrated course is based on the structure of a computer science textbook. This means that the learning contents related to English would be incorporated into computer science after being divided into the small units through the definition of micro-objectives.

Based on the above rules, we defined the micro-objectives and made the allocation of the time unit in the form of integration for the entire content to be covered in both subjects during one semester. Actually, there are 6 chapters and 18 subchapters in total. It is designed to learn the original meanings and usages of the computer-related terms in terms of English in parallel. For example, the words such as 'send', 'receive', 'sender', 'receiver', and so on will be learned in connection with the learning of knowledge about email to be covered in computer science.

We designed lesson plans and developed learning materials in the form of integration to be used during class. Table 1 shows one example of the lesson plans. The lesson plan applies to the one hour class (actually 45 minutes) at middle schools. There are two micro-objectives as seen in the table. One is related to computer science and the other is related to English. Now, it is necessary to explain how to proceed the integrated teaching-learning based on the lesson plan in class. According to the lesson plan, the teaching-learning can be divided into largely two phases: learning and evaluation phase.

During the learning phase, the lecture will be mostly given to students by instructor to achieve the objectives of two subjects. Of course, sometimes, it is possible for instructor to provide group discussion to draw active participation during the phase. Also, if it is difficult for students to understand the integrated learning material directly, instructors can give some explanations briefly in the separated form for each subject before going for it. After finishing the learning phase, there is an evaluation phase of using web-based quizzes & games for about 10 minutes for the purpose of checking out the learning effects and also combining discrete two subjects gracefully.

Table 1. An example of lesson plan

1. Topic
 - The main devices of the computer
2. Objectives

the game, which is proper to learning content. Figure 4 represents the forms to pass the learning content as parameters to construct the game chosen.

We also devised the educational games in the form of collaborative learning. Figure 5 shows the basic process for learners to participate in the collaborative learning. Learners are categorized into groups using a clustering algorithm based on the diagnostics of learners.

We have taken efforts in developing quiz & game-based learning materials due to three reasons, although it is required to take a long time to develop them. First, they can be used in both learning and evaluation phase on an e-learning environment according to instructors' judgment. Second, the anti-feeling or un-adaptability of learners about the integrated approach will decrease because it will help learners to accept the integrated framework more naturally. Finally, they enhance the immersiveness of

learners in learning discrete topics by inducing interest and competition between learners.

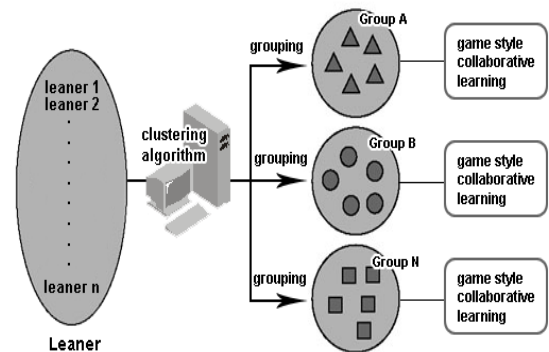
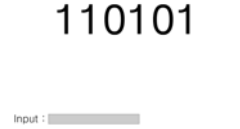


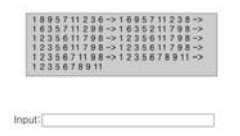



Fig. 5. Collaborative learning based on educational games

Table 2. Educational games

Name	Preview	Description
Guessing word		This is to select the correct answer word from many alphabets as fast as possible. The correct answer words will be terms or concepts learned during class. The time limit might be given. Each alphabet is randomly animated.
Crossword		The player has to find out completely the terms mentioned during class using the mouse. The time limit might be given. If necessary, some hints could be provided.
Hangman		We modified and upgraded the Hangman game which has been used in learning the word for the purpose of the integrated learning
Making word		This is to complete the meaningful words from the alphabets given. Each alphabet is animated back and forth in order not to find out them easily.
Bingo		This is to count the number of row or column that represents Bingo. This game is useful in learning the classification of learning content.

Number play		This is to type the exact binary number within the time given. The number is swiftly animated from left to right. It can be helpful in exercising the binary numbers.
Guessing image		There is an image for learning behind the square tiles. Each square tile disappears very shortly to enable players to see the hidden image.
Shooting		This is to shoot each balloon flying up. The player will get some tips from blown up the balloon. Then, the player can answer the learning terms by combining the tips.
Sequence combination		Each step for solving any problems will be animated randomly. Then, player has to answer the correct sequence.
Speed quiz		The player has to answer the correct words within the limited time. A question that is difficult to answer could be skipped.

3 The Analysis of Learning Effects

We gave the 9th grade students about 10 hour lectures using our integrated learning material in a middle school. The number of students is 64 in total. They are divided into two classes, where each class is composed of 32 students. We investigated the responses of the students using a survey instrument after the lectures have been finished. Also, to compare the difference between a learning group with our integrated approach and a learning group with the traditional manner, we developed the questions and tested these two groups using them. The total number of two groups is 128. As we mentioned above, the 64 students of them took the lectures based on the integrated approach. On the contrary, the rest 64 of them took the lectures based on the traditional manner.

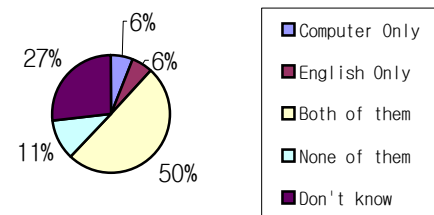


Fig. 6 Response to learning effects

Figure 6 shows one of the results of our analysis. The figure represents the analysis results about the question "Which subject do you think the integrated approach can be helpful in learning?". As you can see in the figure, it indicates that more than half of them responded that our integrated approach can be helpful in learning both of them. It tells that our integrated approach could be positive to some degree. Peculiarly, in the figure, it is represented that the 27 percentage of

them couldn't be sure whether the integrated approach could be helpful or not. We infer that the reason came from both the short period of integration education and the need of time for the adaptation to the new teaching learning method which has been changed abruptly.

Table 3 shows the results of our test regarding learning achievement degree between two groups. It was given to 128 students in total which consist of four classes in middle schools. They were requested to solve 34 questions which are mostly related to the understanding of the computer-related terms. The result shows that students in the integrated courses (group A) have gotten higher scores than those in the traditional courses (group B). There is some argument that there can be a difference of learning base level between two groups. To minimize the difference between two groups, we have formed each group by arranging equally students with similar learning level to each group beforehand. Therefore, the significant difference indicates that our integrated approach has brought distinctly the improvement of the learning achievement.

Table 3. Learning achievement degree

Confrontation	Paired Differences					t	Sig (2-taild)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference			
				Lower	Upper		
C1	16.688	30.851	5.454	5.565	27.810	3.060	.005
C2	20.031	30.079	5.317	9.187	30.876	3.767	.001
C3	19.469	42.033	7.431	4.314	34.623	2.620	.013
C4	22.813	40.530	7.165	8.200	37.425	3.184	.003

4 Conclusion

We presented a way to integrate two subjects of computer science and English that might be orthogonal to each other with the help of web technology. We have restructured the course topics to be learned in computer science and English in an integrated form. Then, we developed lesson plans and quizzes & games based on this restructuring. Also, we presented the results of analyzing this work after the lessons were given to students. The results indicated that our approach could be efficient in improving the learning effects. However, since our approach is not a

traditional one, we faced a few problems such as difficulty in preparing game-based learning materials and necessity of more sophisticated teaching-learning skills. These problems should be solved gracefully later.

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