A Design and Evaluation of an Integrated Course at Secondary Level

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Abstract

In this paper, we propose a new way to efficiently teach both computer science and English simultaneously using an interdisciplinary approach. To integrate these two subjects, we present a restructuring of the topics and provide the designs for the sophisticated lesson plans based on this restructuring. Also, we evaluate the students after teaching them using the lesson plans devised for the integrated approach. From the analysis of the results, we can see that the students in the integrated course did better than those in existing courses in achieving the learning objectives.

1. Introduction

There has been made research on interdisciplinary approaches based on a thematic unit at the primary school level [1]. However, there has been made little research on them at middle school or higher. Specially, if any, there has been made less research on them to the subjects which are not closely related to each other like English and computer science because it has been generally recognized that their integration is not practical.

One of our motivations to the integration between computer and English comes from the fact that almost terms related to computer science have been originated from English. Previously, the terms have been mostly translated into the native language used by learners. However, it is more desirable to use original terms without being translated in the globalization society. On the contrary, using the original terms can give learners an extra burden because most learners who do not use English as a native language start to learn English and computer science simultaneously and result in not knowing their meaning in terms of English. Thus, we predicted that when we teach some computer-related terms to learners, the learning effect will be boosted if it is possible to provide both the meanings of the term from the viewpoint of computer science and English respectively. In particular, in case of the terms which consist of a few English words. They should be explained first before their concepts or meanings from the perspective of computer science are given.

2. Learning goals and time unit arrangement

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 contents. To meet such requirements effectively, it is necessary to make rules that can make the coverage of the integration clear when we develop the 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 objectives which are being described on the curriculum provided.
2) The entire contents including terms, phrases, and key concepts to be considered should be restricted to those to be covered in English[4][5] and computer science[2][3] textbooks of being commonly used in middle schools.
3) The total number of hours to be lessoned in the form of the integration are fixed 68 hours during one semester because the 34 hours are allocated for each of two subjects on the current curriculum.
4) The skeleton of the integrated course is based on the structure of computer science textbooks. It means that the learning contents related to English is incorporated into computer science after being divided into small units through the definition of micro-objectives.

Based on the above rules, we defined the micro-objectives and made allocations of time unit in the form of the integration for the entire contents to be covered in both subjects during one semester.

3. Developing The Integrated Course

We designed lesson plans and developed learning material in the form of the integration to be used during class. There are two micro-objectives in each lesson plan. One is related to computer science and the other one to English. In addition, we has developed learning materials based on various styles like puzzles to help the integrated learning. In particular, we took efforts in developing the learning materials like a puzzle (ex. crossword puzzle), although it is required to take a long time to develop them. First, puzzle-style learning materials can be used in both
learning and evaluation phase based on instructors' judgment. Second, the anti-feeling or un-adaptability of learners about the integration will decrease because it will help learners to approach more naturally to the integrated form. Finally, we can see that such teaching materials enhance the concentration of learners on learning topics integrated.

4. Analysis Results

We gave K9 students about 10 hour lectures using our integrated learning material in a middle school. The number of students are 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 question instrument after the lectures have been finished. Also, to compare the difference between a learning group of our integrated approach and a learning group of the traditional manner, we developed the questions and tested these two groups using them. The total number of two groups are 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.

The analysis result about the question "Which subject do you think the integrated approach can be helpful in learning?" indicates that more than half of them responded that our integrated approach can be helpful in learning both of them (i.e. English and computer science). It tells that our integrated approach could be positive to some degree. Peculiarly, 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.

We also investigated the learning achievement degree between two groups A and B. It was given to 128 students in total which consist of four classes in the middle school. They were requested to solve 34 questions which are mostly related to the understanding of the computer-related terms. We developed them using the method [6] used for extraction and analysis of computer-related terms in the high schools.

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 has 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.

We infer that there are several factors, which make contributions to boosting the learning achievement degree. First, the depth of concentration of students on learning topics has been increased during each class because the topics are not only directly related to the real life to draw the interest of students, but also are recognized more important to students. Second, the depth of understanding the terms is higher because students can study them after grasping their original meanings in terms of English. That is, it means that it is possible for students to be escaped from only memorizing terms without knowing the original meaning in terms of English. Third, the learning period has been doubled, compared with the traditional manner because students have been exposed to both topics simultaneously during doubled time. Finally, it enhances an association effect that can connect closely both aspects of terms by learning terms from computer science and English standing points respectively.

5. Conclusion

Integration approach is one of attractive teaching methods. We presented a new approach for integrating English into computer science. Also, we presented the results of analyzing students after giving the lessons to them. 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 teaching materials, necessity of more sophisticated teaching skills, and the lack of the systematic support from school authority. These problems should be solved gracefully later.

6. Acknowledgement

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7. References