Chapter 11
WIRE:
A Highly Interactive Blended Learning for Engineering Education

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ABSTRACT

Much research has shown that the blended learning can effectively enhance the motivation, communication skills, and learning achievement compared with teaching in a single form. However, a crucial issue in blended learning is how to integrate each blended format, media and experience into a coherent learning model, and then to keep interaction between teacher and students either in or outside the classroom. This study introduces a highly interactive strategy for blended learning that incorporates web-based and face-to-face learning environments into a semester course through answering the warm-up questions before class, interactive teaching in class, and review and exercise after class. By the empirical study in a 'Data Structure' class, most students made progress in learning achievement and gain more motivation and interaction within the class.

INTRODUCTION

Blended learning is a learning solution that incorporates instructor-led classroom events and any form of technology enabled instruction used outside the classroom (Pulichino, 2006). Many research findings show that the blended learning can more effectively enhance the motivation, communication skills, and learning achievement than the learning in a single form (Troha, 2002; Barbian 2002; Zenger & Uehlein, 2001). However, a crucial issue in blended learning is how to integrate each blended format, media and experience into a coherent learning model, and then to keep interaction between teacher and students either in or outside the classroom. Learners will not busily deal with multiple learning styles and can absorb the knowledge delivered in a continuous learning path.

This study presents a blended learning model that integrates four activities into a continuous and complete learning experience, which comprises

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the warm-up before class, interaction in class, and review and exercise after class, WIRE for short. The WIRE model has been experienced in the Department of Information Management of a university in Taiwan for 18 weeks of a semester. For quasi-experimental research method, the participants were divided into two groups (classes). The experimental group adopts WIRE model while the control group adopts lecture-based activities with the encouragement of warm-up and review lessons. The preliminary findings from the learning achievement, questionnaire, and focus group interview show some conspicuous dissimilarities between the experimental group and control group on the degrees of the motivation, interaction between teacher and students, and collaboration among students The WIRE model can help enhance the learning effects.

THE REQUIREMENTS OF DESIGNING BLENDED LEARNING IN SCHOOLS

The Aspect of Cognitive Development

The type of a blended model can be various combinations of different environments, strategies, technologies, and medias for learning (Osguthorpe & Graham, 2003; Singh, 2003; Valiathan, 2003; Rossett, Douglis, & Frazee, 2003), which depends on the characteristics of audience, time, scale, application, content, and resource (Bersin, 2004). The designer of blended learning should consider how to gain the biggest benefits for the organization under the minimum cost of time consuming or resources. However, in the school setting, a teacher who adopts blended learning in a subject for a whole semester has to design an appropriate blended model that generally integrates eLearning and face-to-face classroom learning formats to help students keep active on the scheduled instructional plan. Especially, the learning content and its objectives are different from the training courses for enterprises, which focused on the knowledge construction and the cultivation of learning abilities. Some learning outcomes cannot be evaluated immediately and explicitly, but will exert the influence on students' future development. Therefore, the instructional design for the blended learning in schools should take into account the students' cognitive development in learning the new knowledge and then adopt appropriate learning technologies.

By referring to the learning objectives in cognitive domain of Bloom's Taxonomy (1956), the instructional plan should be designed in a smooth process that can develop learners' knowledge and intellectual skills, starting from simplest behavior to the most complex, that is, from knowledge, comprehension, application, analysis, synthesis, to evaluation. The challenge in designing a blended learning model in the school setting is to gradually incorporate the cognitive skills, from basic to advanced, into a serious of learning activities with the use of appropriate technologies. This study divided the whole process of learning a new concept or topic into three stages, including the 'Warm-up' before class, the 'Interaction' with teacher and classmates in class, and the 'Review and Exercises' after class, that is WIRE model. In order to cultivate students' high-order thinking skills, students are requested to understand the assigned learning materials as far as they can before class. Then, in face-to-face class, the teacher can put the emphasis on the analysis and application of the new knowledge to inspire students to higher order thinking, such as the synthesis and evaluation of knowledge. The most important key principle in WIRE model is to keep effective interaction between teachers and students during the learning process in order to maximize the learning effect towards the abilities of synthesis and evaluation.