Designing and Evaluating Digital Game-Based Learning with the ARCS Motivation Model, Humor, and Animation

Lai-Chung Lee, Department of Interactive Design, National Taipei University of Technology, Taipei, Taiwan

Kuang-Chung Hao, Graduate Institute of Design, National Taipei University of Technology, Taipei, Taiwan & Department of Computer Simulation and Design, Shih Chien University, Taipei, Taiwan

ABSTRACT

Multimedia teaching applications have been widely utilized in various subjects. The presentation of teaching materials with animations and games helps to stimulate the visual sense and enhance the learning motivation of learners. Successful learning, however, requires the stimulation of learning motivation that can inspire learners to achieve the desired learning objectives. This study combines the ARCS (Attention, Relevance, Confidence, Satisfaction) motivation model, and humor to design a set of multimedia applications that include teaching animations and games for sixth graders' natural science and technology course, called the Cat's Cradle Multimedia Learning System (CCMLS). The scenario stories of anthropomorphic characters introduce four units of natural science: levers, axles, pulleys and gears. Additionally, games are designed to impress learners even more. After the applications were prepared, tests for learning effectiveness, learning motivation and perceived fun associated with teaching materials were conducted with 106 students at the Qishan Elementary School in Kaohsiung. The experimental group used CCMLS, while the control group used videos of the textbook as the applications. A pre-test and post-test, ARCS Learning Motivation Questionnaire, Smileyometer and interviews were conducted with both groups. According to the statistical analysis, significance was detected in regard to learning effectiveness between the experimental group and the control group. Significance was also found in ARCS learning motivation and perceived fun of teaching materials. Moreover, there is a significant positive correlation between the perceived fun related to the teaching materials and learning motivation. The contribution of this study lies in the proposal of the digital game-based learning (DGBL) from the design perspective: to enhance students' learning motivation and use willingness regarding the teaching materials of the drama and the cartoon characters in humorous dialogues. The proper sound and light effects and examples that are close to daily life will also be taken into consideration in the design of the multimedia applications.

Keywords: Animation, Attention, Relevance, Confidence and Satisfaction (ARCS) Theory, Digital Game-Based Learning (DGBL), Humor, Material Fun, Virtual Figures

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INTRODUCTION

In the era of rapid changes in advanced multimedia technologies, modern education now focuses on the utilization of multimedia applications to improve learning motivation and effectiveness. With the maturity of existing multimedia technology, the combination of photos, images, text and sound in the preparation of multimedia applications is better in attracting learners and, most importantly, enhances the learning motivation and fun of students (Small & Gluck, 1994; Maehr & Meyer, 1997).

Mayer (2003) pointed out that in terms of cognition of multimedia learning, the presentation of animation stimulates the visual sense, improves the learning motivation of learners, and is able to present an abstract concept in a dynamic way; thus, it has more advantages than the presentation of static photos. The research results of Rieber (1989) also suggested that the presentation of dynamic images encourages positive and active motivation among learners to make an effort to look for norm-based answers, and enables learners to clearly understand the process underlying the presentation steps. This echoed Tan’s (2001) view on video presentation as being an activity that can effectively promote students’ creativity. Furthermore, Strom (2002) also found, from students’ responses, that lecture contents presented with visual images can be better preserved and enhance and stimulate learning motivation.

Dutton and Lievrouw (1982), however, reminded teachers that although different types of media should be applied for different educational objectives, the selection of media needs to be content-driven rather than technology-driven. This implies that the selection of media has to consider teaching content and the learning effectiveness needed and desired by students (Moore & Kearsley, 1996). In short, therefore, this study aims to combine theories and practice in designing a set of multimedia applications based on an ARCS learning motivation model, anchored instruction teaching, and humor, that incorporates existing multimedia production technology and practical experience involving 2D animation and games. In addition to the design of a set of story-based multimedia applications for sixth graders’ natural science and technology courses in elementary schools, this study also records the design and development process, and examines whether the learning effectiveness and motivation of elementary school students are effectively improved via experiments.

LITERATURE REVIEW

ARCS Motivational Model and DGBL

In 1983, John M. Keller proposed the ARCS motivation model; based on the four concepts (attention, relevance, confidence and satisfaction), practical strategies and methods were developed for teaching material designers to effectively arrange resources and processes related to teaching. This systematic, and repeatable, principle and process focuses on the application of specific strategies and principles to learning motivation, to help teaching material designers and teachers to design curricula, or to improve teaching and make learning activities more attractive. In the end, it is a process to initiate changes in learning motivation (Naime-Diefenbach, 1991; Shellnut, Knowlton & Savage, 1999; Weiler, 2005).

The idea that the use of games for having fun while learning can enhance motivation and trigger interest during learning was proposed by researchers as a feasible and effective teaching method (Hon & Liu, 1997). Prensky (2001) found that the guidance given to facilitate good interaction between a user and a computer helps to actively improve learning interest, reduce learning stress, and achieve individualized learning and experience for further exploration and thinking on the part of the user. Digital game-based learning has been widely applied to each subject and the presentation of teaching materials with animations and games stimulates the visual sense; however, learning motivation needs to be stimulated for good learning so that learners will have an interest in the things...
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