DEVELOPMENT AND DESIGN OF PROBLEM BASED LEARNING GAME-BASED COURSWARE

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ABSTRACT

In an educational environment, instructors would always think of ways to provide students with motivational learning materials and efficient learning strategies. Hence, many researchers have proposed that students' problem-solving ability enhances their learning. Problem-solving ability plays an important role for users in dealing with problems that arise during their learning. In order to facilitate high quality performance, computer programmers have been trained to solve the problems they encountered. The purpose of this study is to design and develop an e-learning game-based environment integrated with problem-based learning strategies for college freshman majored in computer science.

KEYWORDS

Problem based learning, Design-based research, Game-based learning.

1. INTRODUCTION

With the advance development of information technology in recent years, more and more electronic devices, such as PC, laptop, smart phone or tablet, have been widely used by college students. Many college students like to play games on their electronic devices, and digital simulation games have been designed to be more visual, interactive and problem-solving focused (Federico & Hélène, 2011). Moreover, game-based learning (GBL) is a popular and potential learning method in e-learning. Increasingly more research issues have been identified. Similar to entertainment and serious gaming, these issues have introduced a new important marketing direction to practical technologies such as human-computer interaction, multimedia interaction, and ubiquitous computing (Lin, Kinshuk & Mark Dutchuk, 2009). Besides, GBL is attractive to students who want to learn the complex/high level knowledge via digital simulation games.

Therefore, this study is developing a problem-based leaning game based courseware as the learning material and use design-based research to evaluate the design and development of this game-courseware, which simulated the business management of an e-cafe. This study would like to integrate the principle of "usability" to determine whether this courseware corresponds to the above principle and whether it could meet the expectations of learners as an education resource (Chang & Huang, 2013).

2. RELATED WORKS

2.1 Problem Based Learning

Problem Based Learning (PBL) focuses on active learning, finding the problems, thinking ability, and the process of solving problems. For instructors, it becomes a teaching aid and builds a safe environment for students. When PBL is incorporated into a course, it helps student to construct their knowledge concepts and integrate their basic knowledge (Şendağ, & Odabaşı, 2009). In fact, several courses already have PBL incorporated into the course design in school settings. One study indicates that PBL incorporated into the course design helps students focus more on the connection between real problems and subject knowledge.

Furthermore, using PBL in online courses also help students improve their critical thinking (Cheng, She, & Annetta, 2014).

2.2 Design based Research

Design-based research (DBR) is a research methodology and also known as design experiments. It is defined as "an emerging paradigm for the study of learning in content through the systematic design and study of instructional strategy and tools" (Design-Based-Research Collective, 2003, p. 5). DBR approach is an iterative cycle of multiple steps, including design exploration, interventions enactment, outcome evaluation and analysis, and redesign (Chang, & Wong, 2014; Wong, Boticki, Sun, & Looi, 2011). Based on the research (Hartson, Andre & Williges, 2003), usability evaluations in this study is tied to each phase of the DBR, the following figure 1 is the original design of pbl game-based courseware development process adopted from DBR.
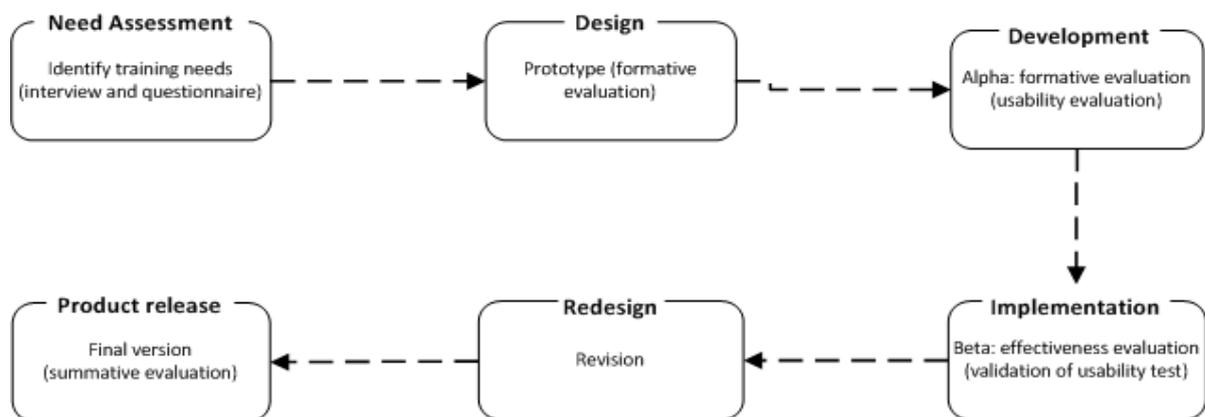

Figure 1. PBL game-based courseware development process adopted from DBR

3. CONCLUSION & FUTURE WORK

In this research, we propose a pbl game-based courseware called Programmers' Adventure, which were tested by 65 college freshman majored in computer science in an university, Taiwan. The Programmers' adventure courseware is designed for users to familiarize with knowledge of programming language. Based on the results of pilot study, students' subject knowledge about program language in application - cognitive process dimension have improved. In addition, game designers received positive feedback from students regarding the Programmers Adventure game. Finally, our research will test the usability of the Programmers Adventure game-based courseware. The results will give us several improvement suggestions in the future, and we hope to provide a well-designed game-based courseware for students to help them learn efficiently more complex/high level knowledge.

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REFERENCES

Chang, Chiung-Sui, & Huang, Ya-Ping. (2013). Usability assessment of e-café simulation game-based material. Proceedings of 7th International Conference on E-Learning, IADIS. Prague, Cz. pp. 132-136.

Cheng M. T., She H. C. & Annetta L.A. (2014) Game immersion experience: its hierarchical structure and impact on game-based science learning. Journal of Computer Assisted Learning, 1-22

The Design-Based Research & Collective. (2003). Design-based research: an emerging paradigm for educational inquiry. Educational Researcher, 32(1), 5-8.

Federico Pasin, Hélène Giroux. (2011). The impact of a simulation game on operations management education. Computers & Education, 57, 1240–1254.

Hartson, H. R., Andre, T. S. & Williges, R. C. (2003). Criteria for evaluating usability evaluation methods. International Journal of Human-Computer Interaction, 15(1), 145–181.

Şendağ, S., & Odabaşı, H. F. (2009). Effects of an online problem based learning course on content knowledge acquisition and critical thinking skills. Computers & Education, 53(1), 132-141.

Wong, L. H., Boticki, I., Sun, J., & Looi, C.K. (2011). Improving the scaffolds of a mobile-assisted Chinese character forming game via a design based research cycle. Computers in Human Behavirors, 27, 1783-1798.