

Courseware Design and Learning: Pedagogical Approach

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ABSTRACT

With the rapid development of multimedia technology, multimedia educational courseware is widely available for educational purposes. Previous research showed that courseware can be an effective learning tool and motivate learning. In designing and developing courseware for teaching and learning purposes, it is very important that a developer should analyse and understand the pedagogical perspective. The main objective of this paper is to discuss courseware design from learning theories and pedagogy perspective. Based on the literature, constructive and behaviourism are believed to be the suitable learning theories incorporated in the design phase of Interactive Multimedia Computer Organization.

Keywords: *learning theories, interactive, courseware, computer organization, instruction cycle*

Introduction

With the rapid development of multimedia technology, the multimedia educational courseware is widely used in higher learning in the form of CD/DVD and the Web. Courseware is an interactive educational software used for training sessions for all disciplines. The aim of the courseware is to facilitate and improve the conditions of students' learning and knowledge retention (Jowati, 2006). Courseware includes multimedia capabilities, such as text, graphics, sound, animation, and video clips. Previous research proved that the integration of multimedia application could enhance the teaching and learning environment.

In today's education, interactive educational courseware has been used to support teaching and learning in Malaysia. At Universiti Tun Abdul Razak (UNITAR), a Malaysian virtual university, multimedia educational courseware has been used as a supplementary learning tool that intends to help the students understand the course better when they are studying on their own (Adelina & Rafiza, 2006). Adelina and Rafiza (2006) conducted an evaluation of the courseware design through the students' assessments. The results show that the courseware is effective as a supplementary learning material. According to a research studied by Shiong et al.(2008) on the suitability of the design in the multimedia courseware for learning subject "Goal Programming" (GP), many students prefer to learn GP with an interactive multimedia courseware that provides challenging quizzes and activities rather than to learn only from textbooks.

The establishment of Smart School Project since 1998 by the Malaysian Ministry of Education has introduced courseware in school. In this project, the ministry has distributed a number of interactive courseware aiming to improve all students' learning ability, attitudes, achievement, and enhance teaching performance (Kamaruddin et al., 2008).

In designing an effective courseware in higher education teaching and learning, it is important for the developer to analyze and understand the pedagogical perspective. A lack of pedagogy in courseware can cause refusal to use it by learners (Mark & Claus, 2007). Therefore, it is vital to include appropriate learning theories in designing a courseware to make learning more effective and meaningful. The purpose of this paper is to review some of the learning theories applied in the design and development of Interactive Multimedia Application of Computer Organization.

Interactive Multimedia Courseware for learning Computer Organization

In Universiti Teknologi MARA, Computer Organization is a compulsory course taken by the Diploma in Computer Science students. This course mainly focuses on the organization and functions of the major components of a computer. These include the organization in the computer processor, memory and system buses, and also the basic operation cycle of a computer. Learning this course requires students to visualize and imagine the underlying concept about the basic principles in the structure of computer organization.

Learning this course is not perceptually easy to some students, especially if the teaching focus is only on explanation and illustration from textbook materials. Therefore, a prototype of an interactive multimedia application of Computer Organization (IMCO) has been developed to support the teaching and self learning in the course. IMCO is an educational courseware that uses multimedia elements to visualize Computer Organization concept. It is used as part of teaching activities as well as supplementary materials for students. IMCO includes lecture notes, tutorial, and quizzes for each topic and test modules. The use of animation, simulation and graphics are used for clarifying concepts that are difficult to comprehend by the students.

Being interactive, IMCO refers to a training program where user has the option to control over the order and pace of the application. User can navigate and explore the application with navigational controls such as buttons, hot spots, and others, at his or her own pace. Lindstrom (1994) outlined that the interactivity raised the comprehension and retention rates of the audience to about 75%, compared to the 40% rate from what they see and hear, and the 20% rate from what they see only. This paper attempts to discuss the appropriate learning theories that to be included in designing and developing the courseware.

Learning theories

There are two fundamental learning theories that are relevant in designing and developing IMCO: behaviorism and constructivism.

Behaviorism Theory

In Behaviorism theory, the transmission of knowledge is directly from the instructor to the student (Junaidah & Rashidah, 2006). Howard (2003) reveals that this method is effective for the self study of definitions, basic concept and such technical material an application structure. Furthermore, learning activities in this theory always involve with "drill-and-practice" techniques so that students would learn better until they were properly trained (Jowati, 2006). Feedback and correctives will be given immediately so that student will become competent learners (Hartley, 1978).

From lecturer experience, students faced difficulties in solving exercises. This could be due to students' difficulty in visualizing and imagining the underlying concept of the basic principles. Through behaviorism theory, learning process will be more efficient when the students are totally involved in the learning process (Junaidah & Rashidah, 2006). Thus, in IMCO module, students are given lecture notes and exercises for each topic and tests. This courseware can give feedback and correctives immediately to enable students to measure their understanding.

Constructive Theory

Constructive theory has proven to be successful in the courseware design. Constructivism theory emphasizes students to actively construct knowledge rather than it is directly transmitted from an instructor (Jowati, 2006). She added that the basic principle of constructivism is the learners learn by interacting with learning materials rather than just observing them. Learners must actively build or construct knowledge and their skills. Talib et. al (2005) mentioned that constructivism has become one of the dominant alternatives approaches in teaching and learning. Suradijono (2003) in her study stated that instruction in

courseware must be designed to make productive thinking processes in shape of greatest learning so that the result is more productive.

Constructivism theory is used in IMCO courseware to help the students construct their own understanding based on their prior experiences through exploration in the courseware. Students will take control of the learning environment and summarize their understanding. In IMCO courseware, the role of the lecturer as a facilitator is seen as the most important aspect in constructivism context.

Theoretical framework for IMCO

Figure 1 shows the theoretical framework of the application that has been developed by incorporating behaviorism and constructivism theories. The prototype, which focuses on the topic Execution of Instruction Cycle, has been developed. This topic was perceived by students as difficult to understand. Based on the learning theories above, IMCO theoretical framework consists of three stages:

1. Identify the student’s existing idea through questions raised during lecture about the Execution Instruction Cycle process.
2. Provide student’s understanding through animations presented to them.
3. Construct their knowledge through questions in Exercises and Test module.

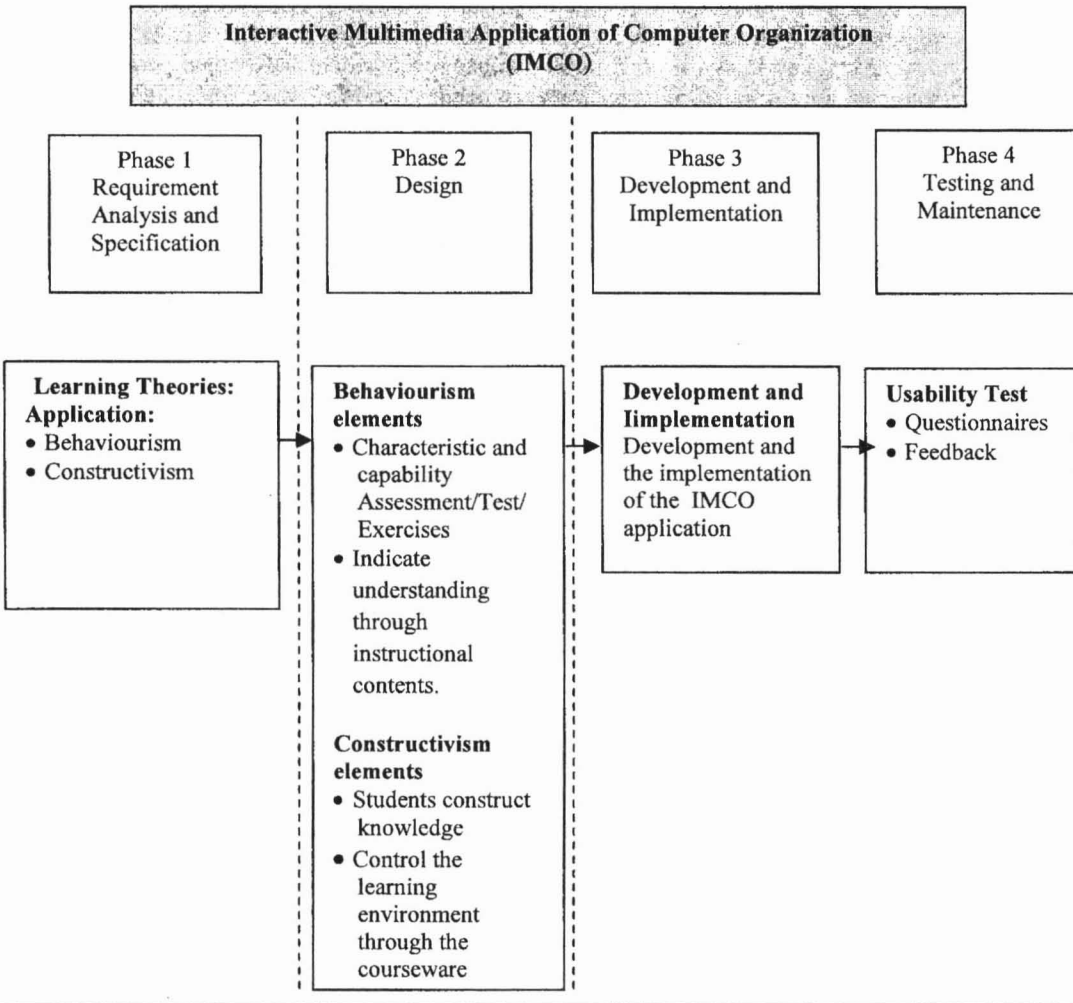


Figure 1: Theoretical framework for Computer Organization Courseware

Conclusion

The use of IMCO courseware offers opportunities to overcome existing difficulties imagining computer concept structure. The courseware can serve as an excellent resource with various alternatives approaches on learning materials. The focus of this paper is on two learning theories namely constructive and behaviorism which have been referred to design the prototype of Computer Organization courseware. Constructive and behaviorism theory offer many options for students to develop qualities to become good learners by promoting active learning and critical thinking. Hopefully the study will show the positive benefit of using IMCO as an effective instructional tool in understanding the computer concept.

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