A Conceptual Framework for C Programming Learning Through Basic Game Development Courseware

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Abstract— Teaching and learning software are among the mediums used in assisting the teaching and learning process; especially in the C programming. However, most of the developed learning software is more oriented syllabus *per se*. The finishing element of the learning outcomes that are less obvious and less attractive eventually will affect the motivation of the individual, especially the youths' conscious of a learning-focused and fun. Therefore, this paper is aimed to propose a framework of software development learning C programming to the development of a more game oriented. This framework consists of multimedia elements, interactivity and learning theories and learning target the development of computer games.

Index Terms— teaching and learning, courserware, computer game development, C programming

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1 INTRODUCTION

The advancement of the rapid development of technology in education has produced a variety of teaching and learning techniques; from a traditional method of 'talk and chalk' into a system which combines multimedia elements in their process of theaching and learning. Having a glance into teaching and learning materials for the Smart School organized by the Ministry of Education, it is a combination of traditional method; supported by learning materials such as textbooks with new shaped materials such as electronic publications like videotapes, CD-ROMs and Web sites. In fact, with the availability of these technologies, it will also enable educational institutions; regardless of schools and tertiary institutions for exploiting various types of information sources. In addition, it will transform the institution to be more open and accessible to variouskinds of interested parties or stakholders.

The tremendous diversity of teaching and learning techniques based on direct ICT has produced a form of computer soft-ware learning that meets the needs of education. Software development as a tool in teaching and learning is seen as a platform to allow this process to run the control level by teaching at the very minimum level. In addition to the changes of the sophistication of computer technology, it also becomes more interactive than text books or other printed references.

Significant correlation can be seen between adolescents and youth who are living with ICT developments indeed give an advantage to the new method. A combination between fun in learning; together with a good blend of multimedia elements which are appropriate to the current situation enables it to be more accessible to them. Apart from being interactive, game-shaped elements are also being used in order to enable the learning process to be more creative and innovative; which eventually it can applied as the source of knowledge indirectly.

As the subject of the programming language is one of the challenging subjects to students [3]; there is a need to have a courseware to facilitate the process of teaching and learning. In relation to this, a particular courseware for learning C programming through interactive computer game development approach is desirable and created based on the proposed framework.

The purpose of this paper is to discuss the framework used for Developing Basic C Programming through Game Development Learning Courseware.

2 INTERACTIVE COURSEWARE

Alternatively, courseware is applied widely in the process of learning instead of using face to face method with a teacher or instructor. Apart from coping with the hardships encountered with regards to the traditional method, it seems to have a great potential in catalysing the development of educational system nowadays. Indeed, more students have shown their interest increasingly in using the software courses as compared with other teaching materials. Most students have responded positively to the use of software in the course of their studies. A study done by Siti Fairuz Nurr Sadikan and Siti Fatimah Md Yassin showed that students have given a good perception on the use of interactive courseware [10].
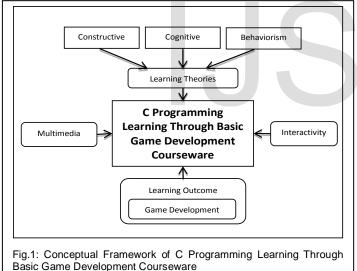
In a similar vein, apart from boosting up the students' interest in programming, it also enhances creativity among themselves. In addition, interactive features which are available in this software also provide reference materials to students for further learning. This course supports the implementation of the software that allows them to use the computer for such purpose.

Interestingly, there is a widespread use of computers nowadays and many software-coursewares are developed for the purpose of meeting the learning needs. Yet, the studies show that the software was not created and designed according to the appropriate syllabus for students. The reason is; most of

the software designers do not have a background courses as educators although they are specialized in building software [6].

On the other hand, among the problems faced in the process of teaching and learning is also related to the self- motivation among students [7]. In this situation, without the commitment and passion, students would find it difficult to learn and eventually do not focus attentively to the learning programming. Hence, developing an effective mechanism such as computer games is among the efforts to develop programming skills among students [1]. Computer game-based approach is perceived to provide an active learning platform [8] for students; as well as to increase the students' self-motivation and interest [7].

3 CONCEPTUAL FRAMEWORK OF C PROGRAMMING LEARNING THROUGH BASIC GAME DEVELOPMENT COURSEWARE

This framework was developed to guide the development of the C programming language learning software through the development of computer games. The combination of learning theory, multimedia and interactivity as well as clear learning outcomes of game development is aimed at enabling more effective learning process.

Fig.1: Conceptual Framework of C Programming Learning Through Basic Game Development Courseware

4 MULTIMEDIA ELEMENTS

According to Shelly Cashman, multimedia consists of a combination of text, audio, images, animation and video delivered using a computer or delivered digitally and interactively [2]. The elements of text, audio, image, and video animation give significant impact in assisting the teaching and learning.

4.1 Text

The purpose of using color and form text in the construction of this software is to give effect to the perceptions and to emphasize the importance of an action to the users [4]. In this courseware, the interaction is conducted in Malay language as the main language.

4.2 Audio

Audio is also used in order to increase the focuss of the software users; particularly to show the importance of an action, as evidence that the action has taken place; as well as to provide a better understanding among them. In this situation, the use of background sound is to create a relaxed learning environment.

4.3 Image

Images also help to deliver a software course or relevant information easily and more efficiently to the users. The images are displayed in accordance with the content of a topic in this courseware.

4.4 Animation

Animated display also facilitates the users to follow and understand the process efficiently.

4.5 Video

Video also allows the users to understand the combinations of sounds and voices which are more focused on the process such as on how to compile coding.

5 LEARNING THEORIES

Learning theory needs to be applied during the application development as teaching and learning guidelines that will allow the use of limited sources to be more efficiently [11]. Some of the theories that will be taken into account in the construction of software design are behavioral learning theory, cognitive theory and the theory of constructivism. According to Mohamed Ally, the three respective theories have a positive impact on the learning based on the use of computer technology [5]. The theories can be applied to help in the production of quality software; as well as to assist in the learning process to be more effectively.

6 MAIN CONCEPTS OF COURSEWARE

6.1 Programming Concept

Programming concepts and problem solving should be understood in advance in order to facilitate the transfer of problem-solving ideas to a physical system. According to Salina, programming concepts outlined five consecutive steps that should be followed [9]. Some of the steps are as follows:

a. The first step - defining the problem posed and further analyzes and identifies some relevant matters that help in the process of a hearing regulator required such as input whereas the process should be carried out and the output design to be produced.

b. The second step - designing the algorithm in the form of a flow chart or pseudo code.

c. The third step - encoding program by using programming languages such as C compiler which is later to be compiled by using the software to find for the logic errors and syntax errors.

d. The fourth step - testing the program by filling in some of

the input to ensure that the output produced is the same as required.

e. The fifth step - documentation to be used as guidelines for other programmers to be modified and maintained from time to time in accordance with the latest requirements.

6.2 Game Development Concept

The concepts generated should include objectives, roles and rules.

Objective - the objective is to achieve the goals needed in the computer game. The normal objective is the explanation on how the players can dominate the game and eventually becomes the winner.

Roles - roles are apart of the players' character in the computer game. The concept of game defines the role of each player in computer games. If there is not a specific player in the computer games, the explanantion must be focused on the roles which must be carried out by the user.

Rules - guidelines that explains on how to play computer games. The rules should include the following items:
a. Rules that explain the role of each player.
b. Rules that describe how players interact with each other.
c. Rules that explain how achieve their objectives.

4 CONCLUSION

Computer game development is one of the methods applied to learn the C programming. A combination of computer programming concepts and development is designed for the users to develop a computer game; as well as to learn the language C indirectly. It is hoped that through this method, it can provide a more enjoyable learning techniques for the users; as well as to assist the instructors in their teaching and learning process in future. For future work, the researchers have planed to get a suitable system development methodology in order to create a better quality of courseware.

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