UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT AND EVALUATION OF SCIENCE COURSEWARE THROUGH PUZZLE-BASED GAME : FUNTIME LEARNING SCIENCE

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A thesis submitted
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DECLARATION

I declare that this thesis entitled "Development and Evaluation of Science Courseware Through Puzzle-Based Game : Funtime Learning Science" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature   :   ……………………………………..

Name   :   NUR SAHIDAH BINTI BASHIER

Date   :   ………………………..………

APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in term of scope and quality for the award of Master of Science in Information and Communication Technology.

Signature   :   ………………………..

Supervisor Name : ASSOS.PROF. DR. FAAIZAH

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Date   :   ………………..…………

DEDICATION

To my beloved father, mother and husband,

Bashier Muhammad, Raja Mymoon Raja Sulleiman and Mohd Zahirudin Rosnan

For my supervisors,

Assos. Prof. Dr. Faaizah Shahbodin and co-supervisor Pn. Anizah Othman

(UTeM)

Not to forget my friends, classmates and colleagues that encouraged, guided and inspired me. Without their support, perhaps this thesis is not possible. Special thanks to all who also contributed to complete row of this thesis.

ABSTRACT

Games have become major contributor in education field. Game based learning (GBL) is a paradigm that uses the game as a medium for delivering the learning contents combination with educational content and games on computers or on line for learners in order to induce learner's motivation enhance in continuing learning, increase performance and learning effectiveness. This research will discuss about the development of Science courseware entitled Funtime Learning Science which used game as a tool in learning Science subject. This courseware is specifically developed for a topic in Science subject in Chapter Two which is Nutrition that constitutes a compulsory for students in Form Two in one of the school in Melaka. The purpose of this research is to evaluate students' performances between GBL approach and non GBL. Based on the questionnaires, Human Digestive System in Nutrition topic is identifying as the most difficult topic, because students need to understand and visualize the process in human digestion system. One of their problems faced when learning this topic is student disable to imagine the flow of digestion. The benefits gained from this research are where it gives advantage to the students, teachers and education industry. The development methodology of this courseware is based on ADDIE model. It consists of five phases which are analysis phase, design phase, development phase, implementation phase and evaluation phases. For the preliminary analysis, 71 students from Form Two students are involved to identify the most difficult topic in the Science subject. In order to measure students performances on the Funtime Learning Science courseware, the respondent were divided into two groups namely control group (35 respondents) and experiment group (36 respondents). Both groups were given a set of pre-test questionnaire. From the analysis of the result, both of control and experiment group showed an improvement but the student who uses Funtime Learning Science courseware get higher mark. The prototype called Funtime Learning Science is developed to support in teaching and learning of this research. Findings at this study, 92.3% from pilot study proved that students prefer game based learning method than conventional method. The use of Funtime Learning Science can engage students in learning and increase students motivation and performance as they get better result. Lastly this study has showed that the implementation of GBL can help students to remember the subject especially the human digestion system.

ABSTRAK

Permainan komputer telah menjadi penyumbang utama dalam bidang pendidikan. Pembelajaran Berasaskan Permainan (GBL) adalah satu platform yang menggunakan permainan sebagai medium untuk menyampaikan kandungan pembelajaran dan pendidikan dalam permainan komputer atau dalam talian bagi pelajar untuk merangsang motivasi pelajar, meningkatkan efektif dalam pembelajaran, meningkatkan prestasi dan keberkesanan pembelajaran. Kajian ini akan membincangkan tentang perkembangan pembangunan perisian Sains yang bertajuk Funtime Learning Science yang digunakan sebagai alat dalam pembelajaran mata pelajaran sains. Perisian ini dibangunkan khas bagi mata pelajaran Sains dalam Bab dua iaitu Nutrition yang merupakan matapelajaran wajib bagi pelajar tingkatan dua di salah sebuah sekolah di Melaka. Kajian ini bertujuan untuk menilai peningkatan prestasi dan kehendak pelajar antara Pembelajaran Berasaskan Permainan (GBL) dan bukan Pembelajaran Berasaskan Permainan (GBL). Berdasarkan borang soal selidik, sistem penghadaman manusia dalam topik pemakanan dikenalpasti sebagai topik yang paling sukar, kerana pelajar-pelajar perlu memahami dan menggambarkan proses dalam sistem penghadaman manusia. Salah satu masalah yang dihadapi oleh mereka apabila mempelajari topik ini adalah pelajar sukar membayangkan keadaan sebenar aliran sistem penghadaman. Faedah-faedah yang diperolehi dari kajian ini adalah di mana ia memberi kelebihan kepada pelajar, pensyarah dan industri pendidikan. Metodologi pembangunan untuk perisian kursus ini adalah berdasarkan kepada model ADDIE. Ia terdiri daripada lima fasa dimana yang pertama merangkumi fasa analisis, fasa rekabentuk, fasa pembangunan, fasa pelaksanaan dan fasa penilaian. Untuk analisis awal, 71 pelajar dari pelajar-pelajar tingkatan dua terlibat dalam menentukan topik yang paling sukar didalam subjek sains. Untuk mengukur kehendak dan prestasi pelajar menggunakan pembangunan perisian Funtime Learning Science, responden dibahagikan kepada dua kumpulan iaitu kumpulan kawalan dan kumpulan eksperimen. Kedua-dua kumpulan telah diberi borang soal selidik awal. Daripada analisis keputusan, kedua-dua kumpulan kawalan dan eksperimen menunjukkan peningkatan prestasi, tetapi pelajar yang menggunakan pembangunan perisian Funtime Learning Science mendapat markah keputusan yang lebih tinggi. Prototaip yang dipanggil Funtime Learning Science dibangunkan untuk menyokong pengajaran dan pembelajaran bagi kajian ini. Hasil pada kajian ini 92.3% daripada kajian awal membuktikan bahawa pelajar lebih menggemari kaedah pembelajaran berasaskan permainan daripada kaedah konvensional. Penggunaan pembangunan perisian Funtime Learning Science dapat merapatkan pelajar dalam pembelajaran dan meningkatkan motivasi pelajar serta prestasi mereka kerana mendapat keputusan yang lebih baik. Akhir sekali, kajian ini telah menunjukkan bahawa pelaksanaan Pembelajaran Berasskan permainan (GBL) boleh membantu pelajar-pelajar untuk mengingati aliran sistem penghadaman manusia.

ACKNOWLEDGEMENTS

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ADDIE   Analysis, Design, Development, Implementation & Evaluation

AS   Action Script

GBL   Game Based Learning

ICT   Information & Communication Technology

PBK   Pembelajaran Berasaskan Komputer

SMKAK   Sekolah Menegah Kebangsaan Ayer Keroh

SPSS   Statistical Package for Social Science

UTeM   Universiti Teknikal Malaysia Melaka

LIST OF APPENDICES

LIST OF PUBLICATIONS

Bashier N.S., Shahbodin F. (2010)." Development And Testing Of Games And Storytelling Approach In Multimedia Based-Courseware : Case Study Form 2 Nutrition" Proceeding of Kolokium Universiti Teknikal Malaysia Melaka 2010, UTeM, Malaysia, 10 November 2010.

Bashier N.S., Shahbodin F. (2012). "Preliminary Testing on Development of Science Courseware Through Game-Based Learning (Puzzle) : Case Study Nutrition Form 2" Proceeding of International Conference on Active Learning 2012 (ICAL 2012), UTeM, Malaysia, 18-20 September 2012.

CHAPTER 1

INTRODUCTION

1.0   Introduction

Multimedia is a combination of different media which implemented with science and technology that makes an educational courseware more practical, attractive and interesting (Mazyrah Masri, et al, 2008). The integration of technologies into the education system, such as the integration of Information Communication Technology (ICT) in education, has offered better opportunities for teaching and learning alike (Hashim.N & Salam.S, 2009). There is a great promise for technology use in educational settings. The social, economics, and cultural realities of this century are undergoing such radical changes, including technological transformations (David Mioduser, 2015). Nowadays, educations are important element in academic field. There are many mediums to convey education such as books, magazines, computers and network. According to Kasra Majbouri Yazdi and Sai Peck Lee (2011), educational institutions are looking for new methods and techniques to enhance user interaction during learning process and avoid presenting less interactive learning activities which are mostly boring and less efficient with innovative software.

Research believes that new generation of students is different from former generations because of changes in media consumption patterns (Melero.J, et al, 2012). David (2015) said that learning is a complex system as it related to individuals' cognitive and effective states. Games are a product of multimedia and interaction (Tsung-Li Wang &

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Tseng.Y.F, 2011). Based on Chen P. G and Liu E. Z. (2012) research, they found out that students prefer playing games to other forms of multimedia. By integrating games in learning process, it is well worth of investment of school time to benefit student's in the classroom. Integration of games and learning will change from traditional idea '*learning is depressing*' to '*learning by playing, learning through playing*' (Lin.K.C & Wei.Y.C, 2011). Sung (2012) opined that educational computer games can enhance students' learning interest and motivation. There is abundant empirical evidence supporting the positive effects of computer games as instructional tools, indicating that games strengthened and supported school achievement (Javier Melero, et al, 2012).

1.1   Research Background

This research emphasis on development and evaluation of game-based learning approach by using computer in learning Science subject. According to Aina and Adebowal J. (2013), science is an activity-oriented subject. Greater emphasis should be placed on doing than telling. Students should immerse in an extended series of enriched experiences that could help them ample opportunity of discovery. In teaching learning process, we must remember that those at the receiving end, that is learners must take delight in what we are teaching and in teaching science to students in particular, we must go extra mile with them involving all that is good in science (Aina & Adebowal J. 2013; James, 2008). Game, in teaching and learning process is a scientific skill such as observation, identification, classification etc and is very important for laying a sound foundation for subsequent science (Aina & Adebowal J. , 2013). Based on research,students found dificulties in visualizing and understanding science subject as they learned more in lecture and books. Thus, science should be made more relevant in everyday life. The game based learning environment presents with learning opportunities to construct new knowledge with

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emphasizing logical thinking (Hsin I Yung, 2010). Most educational games resemble too much digital exercise books and don't utilize the power of games as an interactive context-free media (Noor Azli MM, et al., 2008). Computer games with exciting interactive activities and interesting multimedia provide a way to motivate students to learn actively and interestingly (Maya Agarwal & Shubhajit Saha, 2011).

The development of this courseware is aligned with Malaysia government and educational sector to create and use ICT innovations in school as one of teaching tools. According to Malaysia Education Blueprint 2013-2025:

"The Ministry will ensure that students not only learn how to use ICT but are able to leverage it effectively to enhance their learning. The Ministry will deliver this by strengthening the foundation of ICT-enabled schools while introducing proven ICT solutions into the education system include : Providing students with the skills and knowledge to learn effectively and live productively in an increasingly global and digital world; Equipping all 10,000 national schools with 4G Internet access and a virtual learning platform that can be used by teachers, students, and parents through the 1BestariNet programmed; Training all teachers to embed ICT in teaching and learning in order to support student learning; Increasing the number of ICT devices until the student- to device ratio reaches 10:1. The ratio may be lowered further subject to an impact assessment and availability of funds; and Piloting ICT innovations for delivery such as distance-learning and self-paced learning before scaling up nationwide."

This highlight the important of ICT not just in educational field but in life because it can improves knowledge community. The integration of ICT in technical and vocational classrooms (Kuskaya & Kocak, 2010; Crittenden, 2009) involves using instructional software during the course, making presentations, carrying out the tasks in laboratories or workshops or application services (Hashim.N & Salam.S, 2009; Norasiken.B et al, 2010). The use of ICT in classroom helps in the explanation of difficult concepts so students' are able to easily under-stand those concepts (Alazam et al., 2012). The use of Information and Communication Technology (ICT) in teaching and learning can enhance curriculum delivery, and concurrently improve the quality of education, provided that there is appropriate attention to pedagogy (Bladergoen, 2012). Adriana and Juana (2015) stated that initiatives to introduce digital technology into education are based on necessity of helping students to develop creative thinking and higher-order thinking skills.

In this research, courseware named Funtime Learning Scienceis developed. The purpose of developing this courseware is to investigate the effectiveness of game-based learning (GBL) approach in helping students to understand, motivate and engage them more about Nutrition, especially process in human digestive system. It is develop for form two students in the age of 14 years old in secondary school. The content of the courseware will be delivering in English and it includes some activities such as concept, exercise, games and glossary. The games element makes the courseware more fascinating. The GBL element in the games module helps to develop higher thinking skills among the students and test their understanding when they have to complete the puzzle game. This make the students feel more engage with the environment of the class and the subject itself.

The primary purpose for teaching Science is to enable students to learn and appreciate Science education in the best way possible. As there are rapid development of current science and technology, the use of multimedia approach must be expand into

broaden field of education as one of material for teaching and learning in school. Therefore, many methods and learning technique had been approach in order to increase student's passion in learning Science, especially students in Form Two. One of it is by using multimedia based-courseware. Educational courseware is very common nowadays as teaching tools for children early education (Kien et al., 2015), but most of the courseware are designed for children with normal learning ability. Integration of multimedia elements in education can promote learning habits among children who found hard in learning (Dimitriadi, 2001). Besides that, notes with narrator voice, glossary, exercises and games are provided in the courseware so that the students will feel friendly and make it easier for them to learn the topic. Students also can learn it at home without the guidance from the teachers as the courseware is provided with instruction and answers. This type of multimedia courseware can be used by many schools as it followed the syllabus from the National Education Curricular by Ministry of Education in PBS (*Pentaksiran Berasaskan Sekolah*). Furthermore, with this courseware the learning and teaching process between teachers and students becoming more smooth and easier. Pedagogical aspects and their underlying learning theories are pertinent considerations to ensure that students gain the learning objectives that the courseware seeks to achieve (S. Sulaiman, et al., 2008). This also proves that Learning Using Computer or *Pembelajaran Berpandukan Komputer* (PBK) and multimedia becoming more useful and effective.

By using the courseware, it is more interactive and effective for the students. Studies have shown that computer-based multimedia can help students learn more effectively than traditional classroom method (Zurina Muda, 2006). Unlike traditional teaching methods, multimedia learning enables the students to control their own pace of learning. In an interactive multimedia presentation, students are free to navigate through the contents and select the sections that they want to learn, thus optimizes the use of

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