

UNIVERSITI TEKNOLOGI MARA

**THE COMPARISON OF INTERACTIVE 3D
VISUALIZATION BETWEEN STATIC AND
ANIMATED APPROACHES FOR LEARNING
BINARY TREE TOPIC**

MOHD ZULHISAM B YAAKUB

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 22 October 2015 to conduct the final examination of Mohd Zulhisam Bin Yaakub on his Master of Science thesis entitled “The comparison of interactive of 3D visualization between static and animated approaches for learning *binary tree* topic” in accordance with University Technology MARA Act 1976 (Act 173). The Panel of Examiners recommends that the student awarded the relevant degree. The panel of Examiners was as follows:

Muthukkaruppan Annamalai, PhD
Associate Professor
Faculty of Computer & Mathematical Sciences
Universiti Teknologi MARA
(Chairman)

Nazrul Azha Mohamed Shaari, PhD
Senior Lecturer
Faculty of Computer & Mathematical Sciences
Universiti Teknologi MARA
(Internal Examiner)

Norziha Megat Mohd Zainuddin, PhD
Senior Lecturer
Advance Informatics School
Universiti Teknologi Malaysia, UTM
(External Examiner)

SITI HALIJJAH SHARIFF
Associate Professor
Dean
Institute of Graduates Studies
Universiti Teknologi MARA
Date: 20th April, 2016

ABSTRACT

Growth of three-dimensional (3D) visualization technology in computer science has led to more research into teaching and learning in instructional environments and content areas. The implementation of Computer-Assisted Instruction (CAI) in learning results in benefits as medium offers to provide specific dynamic representation. However, the research has not consistently considered instructional approaches for learning algorithm lesson, and some researches indicated that utilized methods might not be enough. The purpose of this study is to compare score performance of students enrolled in a binary tree lesson using two types of 3D visualization approaches in CAI which are 3D static and 3D animated. An experiment was conducted to determine which of those two methods of presenting a 3D visualization would enhance student achievement and spatial abilities. The Instructional Design Model (IDM) and ADDIE model were applied to achieve the objectives of the study. In addition, usability evaluations using the CAI also investigated. The study participants were undergraduate students randomly selected from the Faculty of Computer Science and Information Technology (FCSIT), Universiti Malaysia Sarawak (UNIMAS). The assessment was divided into two groups using quasi-experimental evaluation. The control groups (Co) received CAI that provided 3D static instruction while the experimental groups (Ex) subjected via 3D animated instruction. Statistical tests used to achieve the study designs were the independent-samples t-test and pair-samples t-test. The results of the study have indicated that there was a statistically significant difference in the pre-test scores of students receiving 3D animated instruction and 3D static instruction while other results show no statistically significant difference between the post-test scores of students receiving 3D animated instruction and 3D static instruction. However, there was a statistically significant difference in students' increment scores between students receiving 3D static instruction and student receiving 3D animated instruction. This shows that both 3D visualization methods implemented in this study can increase the student learning achievements and spatial abilities. Overall results have shown that the 3D visualization approach in CAI is effective and fulfils usability needs.

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CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

Education is the process of receiving or giving systematic instruction at university through storytelling, discussion, teaching, training, and research. In that respect, there are three categories of learning activities: random learning, formal teaching and informal training. Random learning is not an intentional learning, but happen in any activities which the primary aim is not learning alone (Li Zhigang, 2010). Conventional training takes place in the university and involves a lecturer and students, including methods such as the formal learning methods such as chalk and talk and power point presentation. Conventional instruction is an intentional mode of learning with less organize and proceed in daily actions. Non-formal instruction is defined as any organized and sustained educational activities with no particular time taking place inside and outside educational institutions using electronic media. The newest evolution in education is electronic learning, defined the provision of training and training electronically by taking out the boundaries of classes and available at all time for apprentices (Ai-Lim Lee & Wong, 2014). It is indispensable to help students and educators customize and personalize learning content toward the enhancement of performance and enable the transference of skills and knowledge (Lau, Yen, Li, & Wah, 2013).

Recently, with the advent of the computer, much interest has been concentrated on the presentation of instructional materials on a computer screen. Research in instruction via computer has occurred in many fields of study. Due to the technology growing faster and by its very nature, learning by using computer-assisted instruction (CAI) has become the third form of education and training. CAI makes use of the computer as a medium to provide instruction (information). CAI produces knowledge from the subjects of learning, knowledge, and human computer interaction (HCI) (Shuguang, Pengfei, & Lin, 2010). CAI has several potential benefits as a medium in teaching and learning, including self-paced learning, self-directed learning, the exercising of various senses, and the capacity to signify content in multiple media (Ai-Lim Lee & Wong, 2014).