Pedagogical-Based Learning Object System to Support Self-Regulated Learning of Computer Science

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By

Ali Alharbi

BSc. in Computer and Information Sciences (Information Systems),
MSc. in Information and Communication Technology (MICT)

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Statement of Originality

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.

(Ali Alharbi)

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Contents

List of Figures

List of Tables

ABSTRACT

Educators strive to design high-quality learning materials to help students gain an understanding of the subjects under study. Today, in many disciplines, learning is self-regulated by students rather than enforced by teachers. Students are expected to seek knowledge through active participation in the learning process, and teachers serve as facilitators. In areas such as computer science, a dynamically changing field that is affected by new technologies, there is a lack of application of learning theories to the design and delivery of learning materials.

In the last few years, there has been increased attention to the concept of learning objects as a future generation in designing and delivering learning materials. Learning objects can provide a standard approach to design of flexible, adaptable, reusable, and easy to find learning materials. However, research indicated a lack of consideration of learning theories in the current approach to the design and delivery of learning objects.

This thesis investigates the educational effectiveness of the design and delivery of learning objects based on contemporary theories of self-regulated learning by taking into consideration students' learning styles. The study proposes a pedagogical self-regulated learning framework that considers the theory of learning styles as one of its central components. The framework was then applied to the design of a learning object system to demonstrate how learning theories can be embodied in the design and delivery of computer science learning materials. A number of learning objects were designed to support students' different learning styles. The system also implemented a learning style awareness module, which is responsible for identifying students' learning styles and providing guides to learning strategies to help students utilise the strengths and overcome the weaknesses of their learning styles. Moreover, the system focuses on improving students' metacognitive strategies, such as self-assessment and self-reflection, to help them become more self-regulated learners.

An empirical study was conducted to educationally evaluate the system in a core course on programming languages. The study used a quasi-experiment to compare the academic achievement of a group of students who used the system for their self-

regulated learning with a group that was taught using the traditional instructional approach. The results of the study support the educational effect of the system, as indicated by the students' achievement and high level of satisfaction.