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Mobile Learning Ontologies:

Supporting Abductive Inquiry-Based Learning in the Sciences

A thesis presented in partial fulfilment of the requirements for the degree of

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New Zealand

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To my parents for their love, endless support and encouragement!!
Abstract

The use of ontologies has become increasingly widespread in many application areas, particularly in technology-enhanced learning. They appear promising in supporting the generation and adaptive presentation of learning content for specific domains. This thesis examines how ontologies can be applied in abductive mobile science inquiry-based learning, an example of a learning activity that can allow students to learn science by doing science.

Traditionally, school science education has been dominated by deductive and inductive forms of inquiry investigations, while the abductive form of inquiry investigation has previously been sparsely explored in the literature, which emphasizes the development of scientific hypotheses from observed phenomena. Thus, this provides us with an opportunity to explore some new approaches to technology-assisted learning in the sciences.

The main purpose of this thesis is to demonstrate to science educators how an abductive mobile application may be applied in a science inquiry activity, and how ontology-based scaffolding can support technology-enhanced learning environments.

This thesis uses a Design Science Research Methodology (DSRM), supported by Activity-Oriented Design Methods (AODM) tools to create an ontology-driven application ‘ThinknLearn’ for a science inquiry domain, which has been evaluated using the M3 evaluation framework with high school science students. The results were promising and showed improvements in the students’ understanding of the learning domain as well as developing their positive attitudes towards mobile learning.
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List of Publications


List of Acronyms

AIM  Abductive Inquiry Model
AODM Activity Oriented Design Methods
API  Application Programming Interface
AT  Activity Theory
DL  Description Logics
DSRM Design Science Research Methodology
DTD Data Type Definitions
HTTP Hypertext Transfer Protocol
IBL Inquiry-based Learning
JSP Java Server Pages
LO Learning Objects
MCQs Multiple Choice Questions
NCEA National Certificate of Educational Achievement
OWL Web Ontology Language
PBL Problem-based Learning
RDF Resource Description Framework
RDF-S Resource Description Framework Schema
TEL  Technology-Enhanced Learning
W3C  World Wide Web Consortium
XML  Extensible Mark-up Language
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