

# **Knowledge Engineering Technologies and Semantic Networks as Mindtools for Context-Aware Ubiquitous Learning**

**Hui-Chun CHU**

*Department of Computer Science and Information Management, Soochow University,  
Taiwan*

[carolhcchu@gmail.com](mailto:carolhcchu@gmail.com)

## **Introduction**

Recent advances in mobile and wireless communication technologies have enabled various new learning approaches which situate students in environments that combine real-world and digital-world learning resources; moreover, students are allowed to share knowledge or experiences with others during the learning process. Although such an approach seems to be promising and innovative, researchers have indicated several problems when applying it to practical applications, in particular, the lack of proper strategies or tools to assist the students to learn collaboratively in such a learning scenario with abundant content. Students might feel interested when using the mobile devices to learn; however, without proper assistance or guidance, their learning achievements could be disappointing. To cope with this problem, I and my colleagues tried to develop Mindtools for ubiquitous learning based on knowledge engineering and concept map approaches. Experimental results on several elementary school natural science courses showed that such approaches not only enhance learning motivation, but also improve the learning achievements of the students.

### **1. A Knowledge Engineering Approach to Developing Mindtools for Context-Aware Ubiquitous Learning**

In this paper, a knowledge engineering method, the repertory grid, is proposed to develop Mindtools for context-aware u-learning. Moreover, a learning activity has been conducted for a natural science course of an elementary school to investigate the effectiveness of this innovative approach.

### **2. A Concept Map Approach to Developing Collaborative Mindtools for Context-Aware Ubiquitous Learning**

This study presents a collaborative Mindtool for mobile and ubiquitous learning based on the concept map approach. Moreover, a learning activity has been conducted to evaluate the effectiveness of the innovative approach. Experimental results show that the learning achievements of the students who learn with the collaborative Mindtool achieve significantly better results than those who participate in tour-based mobile learning or the traditional concept map approach.

### **3. A Two-Tier Test Approach to Developing Location-Aware Mobile Learning System for Natural Science Course**

In this study, we present a mobile learning system that employs Radio Frequency Identification (RFID) technology to detect and examine real-world learning behaviors of students. This study also utilizes each student's responses from two-tier test (i.e., multiple choice questions in two-level format) to provide personalized learning guidance (called two-tier test guiding, T<sup>3</sup>G). Experimental results from a natural science course of an elementary school show that this innovative approach is able to improve the learning achievements of students as well as enhance their learning motivation.