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## Problem solving in technology-supported learning environments

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# **Problem Solving in Technology-Supported Learning Environments**

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**B.Sc. (NSW), Dip.Ed. (W'gong), M.Ed. (W'gong).**

A thesis submitted in partial fulfilment of the requirements for the degree of  
Doctor of Education  
from the Faculty of Education, University of Wollongong.

April, 2002

# Abstract

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The increasing availability of technology-supported learning environments designed to enhance the development of skills for life-long learning in the classroom and the wider community provides opportunities for student-centred and cooperative learning. Researchers experimenting with these learning environments are attempting to use cognitive tools to scaffold learners in the process of a cognitive task, usually presented in the form of a problem.

Constructivist approaches to learning shifts the focus for organising knowledge construction from the teacher to the learner. Learners therefore need to develop a range of information processing skills to cope with this approach to learning. When faced with the responsibility for knowledge construction, they are thrown on their own management resources. While some may have the metacognitive skills to cope, many fend poorly in the increased complexity of such a learning environment. Many see the task as daunting and complex and feel ill-prepared for such creative freedom and choice of direction. Such learners need tools to help them represent the knowledge they are acquiring.

This study explores ways in which a range of support frameworks may be used to assist learners when solving problems of an ill-structured nature. The main objective was to gain a better understanding of how learners identify, organise and present information when problem solving in technology supported learning environments. The research has focussed on the three main areas: *problem clarification* (identifying the nature of the task and what information was required or provided); *solution formulation* including data collection and the solution process (sorting out the resources and generating new information as required); and *presentation of argument* for the solution (identifying propositions and the appropriate evidence for support or refuting the argument).

The primary data gathering strategies adopted for the study focussed on individual participants' notes, audio transcripts of think-aloud protocols, participant observation and participant interviews.

The results from the analysis of the collected data indicate that many learners have underdeveloped skills and find it difficult to adopt a systematic approach to both information gathering and in the analysis of supporting information. In constructing a response to the problems under investigation many participants preferentially consider one or two pieces of information rather than discriminating between issues. As a result of poor search strategies a number of participants missed access to essential information. Consequently this resulted in the formation of poorly constructed responses when developing an argument to support the answer to the problem under investigation.

Of the four frameworks introduced into the study, the Six Hats framework and the Critical Thinking framework appear to offer clearer strategies to assist learners with problem clarification and solution formulation. There was little difference in the quality of argument produced by participants using the different frameworks. The findings arising from the research suggest that many learners would benefit from cognitive support tools when engaged in solving ill-structured problems within technology supported learning environments.

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# Acknowledgement

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In total, thirty-two pre-service teachers participated in the study and I would like to extend my appreciation to each of them for their cheerful and generous contributions and for their time and commitment associated with the data collection.

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To my wife Dianne, and our sons Scott, Evan and Paul, thank you for being there in helping maintain a focus on the important things in life.

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# Declaration

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I, Gwyn Brickell, declare that this thesis, submitted in partial fulfilment of the requirements for the award of Doctor of Education, in the Faculty of Education, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged.

The dissertation has not been submitted for qualifications at any other academic institution.

Signed:

Date:

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