Disseminating the outcomes of educational research to inform mathematics teachers' practices

Gail Hood
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Disseminating the outcomes of educational research to inform mathematics teachers' practice.

A thesis submitted in partial fulfillment of the requirements for the award of the degree

Doctor of Education

From the

University of Wollongong

by

Gail Hood
Graduate Diploma of Computer Science
Graduate Diploma of Media Studies
Bachelor of Arts
Trained Primary Teachers Certificate

Faculty of Education
2009
I, Gail E Hood, declare that this thesis, submitted in partial fulfillment 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 below. The document has not been submitted for qualifications at any other academic institution.

Signed:

___________________
Gail E Hood
August, 2009
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Abstract

Between 1999 and 2003 the Trends in International Mathematics and Science Study (TIMSS) Video Study (Mathematics) analyzed approximately 100 randomly selected eighth-grade classes from each of seven countries. Findings are published in two written reports and a set of twenty-eight public released lessons. The development of an online course aimed at disseminating the study’s research methodology and findings to mathematics teachers to inform their practice is the focus of this study.

A design-based research paradigm was selected to guide the development, implementation and evaluation of the course. The four cyclic stages of design-based research are identifying and analyzing the problem; developing a solution informed by existing design principles; testing and refining the solution in practice; and producing design principles from the solution to inform future practice. The design principles from the last stage provide the means for the study to contribute to research and are the focus of the main research question: What are the design principles for developing online professional learning to disseminate the outcomes of educational research that will inform teachers’ practice? The three sub-questions address more specific aspects of the study: (1) What is the impact on teachers’ mathematical knowledge and practices of an online professional learning resource that focuses on analyzing culturally diverse mathematics lessons from high-achieving countries? (2) What is the impact on teachers’ understanding of educational research and its application to practice, of an online course designed around the findings and lesson videos of a major mathematics education research project? (3) What structures support flexible delivery methods of an online, interactive course for teacher professional learning?

Each stage of the design-based research for this study has been examined through three lenses - technology, content and pedagogy, and implementation – that, blended together, form the solution to the problem. The technology used for the solution was online interactive video-centric software developed in-house specifically for teacher professional development. The online course at the centre of this study was the first to use the software and so its development and testing was critical for the new software. The content of the course had as its basis research findings and public-release lessons
selected from the TIMSS Video Studies. The pedagogy used in the course was informed by guiding principles developed from extensive literature research into teacher professional development and video cases. The main requirement for implementation was that the course delivery should be flexible, catering for individuals or groups either online or in blended formats, both facilitated or non-facilitated.

Data collected during the cycles of testing and refinement, Stage 3 of the design-based research, included videotapes of all face-to-face sessions, questionnaires, observers’ notes, participants’ responses to the online tasks and forums, participants’ journals and general emails. Analyses of this data occurred at two levels – one during the cycles of Stage 3 and the second after the completion of Stage 3. The first of these resulted in refinements being made to the solution before the next cycle of testing and the second, augmenting the first analyses, provided foci for the reflections of Stage 4. From these reflections, the design principles of Stage 4 were produced.

In all, sixteen design principles were produced from the research. Apart from technical issues with the software and video, the four technology-based design principles focused on the support (online, printed and helpdesk) and online scaffolding needed by end-users. Content and pedagogy of the course afforded eight design principles including the adoption of situated learning and its focus on authentic activities; opportunities for knowledge construction; the use of video-cases incorporating content and pedagogical content knowledge, lesson exploration, lesson analysis, and expert input; and links to practice. Four design principles covered implementation addressing flexibility of delivery, scaffolding, facilitation and the printed course guide.

The design principles are central to the main research question. In relation to the sub-questions, the study found that there was an impact on teachers’ mathematical knowledge and practices; and that teachers had become more aware of the TIMSS research and how it related to their practice. The structures to support flexible delivery are addressed in the implementation design principles and further in the design and implementation of facilitator training, resources and materials. The findings from the study have been used to guide the development of similar online, video-centric courses. Suggested areas for future research conclude the study.
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I dedicate this work to my parents Cliff Rechter (1918-1979) and Betty (nee Cato) (1921-1993) and wish they were here to share the moment.