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

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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
# Table of Contents

Declaration ........................................................................................................ ii  
Table of Contents ............................................................................................. iii  
List of Tables .................................................................................................... vi  
List of Figures .................................................................................................. ix  
Abstract ...................................................................................................... xii  
Acknowledgments ......................................................................................... xiv  

**Chapter 1**  
Introduction to the Study ........................................................................... 15  
1.1 Introduction ..............................................................................................15  
1.2 Design-based research ............................................................................16  
1.3 The study ..................................................................................................17  
1.3.1 Stage 1: Analysis of practical problems .............................................17  
1.3.2 Stage 2: Development of solutions ....................................................19  
1.3.3 Stage 3: Iterative cycles of testing and refinement .............................22  
1.3.4 Stage 4: Reflection to produce Design Principles .............................23  
1.4 The research questions ..........................................................................24  
1.5 Structure of the thesis ......................................................................... 24  

**Chapter 2**  
Literature Review ...................................................................................... 26  
2.1 Background for the research ..................................................................26  
2.1.1 Student achievement .........................................................................26  
2.1.2 Expenditure on education, US ............................................................32  
2.2 The outcome ...........................................................................................35  
2.3 The teaching culture .............................................................................35  
2.3.1 The education tradition .....................................................................36  
2.3.2 Research and teachers .......................................................................38  
2.4 TIMSS Video Studies ............................................................................39  
2.4.1 Research reports and public-release lessons ....................................40  
2.5 Theoretical underpinnings ....................................................................41  
2.5.1 What do teachers need to know? .......................................................41  
2.5.2 Teacher knowledge base ...................................................................42  
2.5.3 Expanding professional knowledge ..................................................45  
2.5.4 Video-cases .......................................................................................49  
2.5.5 Communities of practice ..................................................................49  
2.5.6 Online technology ...........................................................................50  
2.6 Conceptual framework ...........................................................................52  
2.7 Guiding Principles ..................................................................................53  
2.8 Conclusions ............................................................................................55
List of Tables

Table 2-1 Summary of NAEP Trends in student achievement (average scores) ............................................... 27
Table 2-2 Comparative assessments reading, mathematics and science ......................................................... 29
Table 2-3 Countries in TIMSS 1999 Video Study (Mathematics) ................................................................. 40
Table 4-1 Pilot Overview ............................................................................................................................. 104
Table 4-2 Data from the cycles of testing ..................................................................................................... 106
Table 4-3 Mathematics teaching experience ............................................................................................... 112
Table 4-4 Level of mathematics studied .................................................................................................... 112
Table 4-5 Subjects studied at tertiary level ................................................................................................. 113
Table 4-6 Computer usage frequency ....................................................................................................... 113
Table 4-7 Type of internet connection ...................................................................................................... 113
Table 4-8 Summary data Questionnaires 2.1, 2.2 & 3.2 ........................................................................... 121
Table 4-9 Questionnaire 3.3 ......................................................................................................................... 121
Table 4-10 Reflections Task 1 ..................................................................................................................... 130
Table 4-11 Task: Introduction to the problem Japan Q1 coded responses ................................................. 131
Table 4-12 Case 1 Japan Task 1 .................................................................................................................. 135
Table 4-13 Selected codes from Pilot 1 Task Exploration: Japan Q1 ......................................................... 136
Table 4-14 Case 1 Japan Task 2 .................................................................................................................. 140
Table 4-15 Data from Pilot 1 Task Analysis: Japan ..................................................................................... 141
Table 4-16 Frequency of selected codes tasks 2 & 3 Case 1: Japan Pilot 1 ................................................. 144
Table 4-17 Case 1 Japan Task 3 .................................................................................................................. 145
Table 4-18 Case 1 Japan Forum .................................................................................................................. 147
Table 4-19 Case 2 Hong Kong Task 1 ......................................................................................................... 152
Table 4-20 Case 2 Hong Kong Task 2 ......................................................................................................... 152
Table 4-21 Case 2 Hong Kong Task 3 ......................................................................................................... 154
Table 4-22 Case 2 Hong Kong Forum ....................................................................................................... 155
Table 4-23 Case 3 Switzerland Task 1 ......................................................................................................... 156
Table 4-24 Case 3 Switzerland Task 2 ......................................................................................................... 157
Table 4-25 Case 3 Switzerland Task 3 ......................................................................................................... 159
Table 4-26 Case 3 Switzerland Forum........................................................................................................160
Table 4-27 Questionnaire 2.5 ....................................................................................................................161
Table 4-28 Questionnaire 2.7 ....................................................................................................................162
Table 4-29 Questionnaire 2.3 ....................................................................................................................168
Table 4-30 Questionnaire 3.4 ....................................................................................................................169
Table 4-31 Questionnaire 2.12 & 2.15 .......................................................................................................170
Table 4-32 Refinements from Cycle 1 ........................................................................................................171
Table 4-33 Mathematics teaching experience Pilot 2 .................................................................................174
Table 4-34 Level of mathematics studied Pilot 2 .................................................................................174
Table 4-35 Subjects studied at tertiary level Pilot 2 .............................................................................175
Table 4-36 Computer usage frequency Pilot 2 .......................................................................................175
Table 4-37 Type of internet connection Pilot 2 ......................................................................................176
Table 4-38 Mathematics teaching experience Pilot 3 .............................................................................176
Table 4-39 Level of mathematics studied Pilot 3 ..................................................................................176
Table 4-40 Subjects studied at tertiary level Pilot 3 .............................................................................177
Table 4-41 Computer usage frequency Pilot 3 ......................................................................................177
Table 4-42 Type of internet connection Pilot 3 ......................................................................................177
Table 4-43 Summary data Questionnaires 2.1, 2.2 & 3.2 .....................................................................179
Table 4-44 T_IE.1 Selected codes Pilots 1-3 ............................................................................................184
Table 4-45 T_JP.1 Methods used to solve problem .............................................................................191
Table 4-46 T_JP.1 Explanations included ..............................................................................................191
Table 4-47 Completion rates for tasks and forums Initial Explorations and Japan .........................194
Table 4-48 Completion rates for tasks and forums Hong Kong .........................................................195
Table 4-49 Completion rates for tasks and forums Switzerland .......................................................197
Table 4-50 Reflections Task 1 ...............................................................................................................202
Table 4-51 Reflections Task 2 ...............................................................................................................204
Table 4-52 Questionnaire 2.5 ...............................................................................................................205
Table 4-53 Questionnaire 2.7 ...............................................................................................................207
Table 4-54 Questionnaire 2.9 ...............................................................................................................207
Table 4-55 Initial Explorations Forum .................................................................................................209
Table 4-56 Refinements from Cycle 2.................................................................213
Table 4-57 Mathematics teaching experience Pilot 4 ........................................215
Table 4-58 Subjects studied at tertiary level Pilot 4 ..........................................216
Table 4-59 Computer usage frequency Pilot 4 ..................................................216
Table 4-60 Type of internet connection Pilot 4 ..................................................217
Table 4-61 Time taken for materials delivery Pilot 4 ..........................................219
Table 4-62 Introduction Task ...........................................................................221
Table 4-63 Summary data Questionnaires 2.1 & 2.2 ..........................................221
Table 4-64 Summary data Pilot 4 Q3.3b .............................................................222
Table 4-65 Getting your feet wet Q5 and forum ...............................................223
Table 4-66 Reflections Task 1 Cycle 3 ...............................................................226
Table 4-67 TIMSS 1999 Video Study Up Close Forum ....................................229
Table 4-68 Questionnaire 2.5 ..........................................................................229
Table 4-69 Questionnaire 2.7 ..........................................................................230
Table 4-70 Questionnaire 2.9 ..........................................................................231
Table 4-71 Usefulness of Course Guide ............................................................232
Table 4-72 Refinements from Cycle 3 ...............................................................242
Table 5-1 Questionnaire 2 Q7 Mean values Pilots 1-4 .......................................255
Table 5-2 Design principles – technology, content & pedagogy, implementation ..260
Table 5-3 Mean responses to the research topic Pilots 1-4 .................................263
List of Figures

Figure 1-1 Design-based research (Reeves, 2006) ................................................................. 17
Figure 1-2 Stage 1 of design-based research ........................................................................ 18
Figure 1-3 Stage 2 of design-based research ....................................................................... 19
Figure 1-4 Stage 3 of design-based research ....................................................................... 23
Figure 1-5 Stage 4 of design-based research ....................................................................... 23
Figure 2-1 G8 Countries Total expenditure per student .......................................................... 33
Figure 2-2 Guiding principles for the design-based research .................................................. 54
Figure 3-1 Design-based research Stage 2 (Reeves, 2006) ...................................................... 61
Figure 3-2 Components of the design-based research ............................................................ 62
Figure 3-3 Teams for development of solutions .................................................................... 62
Figure 3-4 Stage 2 Content and pedagogy ............................................................................ 63
Figure 3-5 TIMSS Video Studies: Explorations of Algebra Teaching course .......................... 64
Figure 3-6 Explorations of Algebra Teaching topics Stage 2 ................................................ 66
Figure 3-7 Initial Explorations 1/2 ........................................................................................ 67
Figure 3-8 Initial Explorations 2/2 ........................................................................................ 68
Figure 3-9 Task: Getting your feet wet .................................................................................. 68
Figure 3-10 Segment of Lesson Graph ................................................................................ 69
Figure 3-11 TIMSS 1999 Video Study Up Close page 3 ....................................................... 70
Figure 3-12 Research Findings: using physical materials ...................................................... 71
Figure 3-13 How teaching differs across countries ................................................................. 72
Figure 3-14 Kinds of Problems (1) ....................................................................................... 72
Figure 3-15 Kinds of Problems (2) ....................................................................................... 73
Figure 3-16 Making Connections Problems ........................................................................ 74
Figure 3-17 Task for Hong Kong Problem ............................................................................ 76
Figure 3-18 Exploration inside the classroom ....................................................................... 76
Figure 3-19 Q1 Task: Exploration Japan .............................................................................. 77
Figure 3-20 Task: Exploration Hong Kong .......................................................................... 78
Figure 3-21 Segment 1 Japan Focus on Content .................................................................. 79
| Figure 3-22 Segment 2 Japan Focus on Content | ................................................... 79 |
| Figure 3-23 Segment 3 Japan Focus on Content | ................................................... 80 |
| Figure 3-24 Segment 4 Japan Focus on Content | ................................................... 81 |
| Figure 3-25 Hong Kong Analysis Q1 | .............................................................. 82 |
| Figure 3-26 Hong Kong Analysis Q2 | .............................................................. 82 |
| Figure 3-27 Japan Case Viewpoints | .............................................................. 83 |
| Figure 3-28 Japan Case Viewpoints cont. | ........................................................... 84 |
| Figure 3-29 Stage 2 Technology | .............................................................. 84 |
| Figure 3-30 LessonLab Viewer™ Interface | ........................................................... 87 |
| Figure 3-31 LessonLab Viewer™ Task and Forum Interfaces | .................................................. 87 |
| Figure 3-32 LessonLab Course Builder Resources | .................................................. 89 |
| Figure 3-33 LessonLab Course Interface | ........................................................... 91 |
| Figure 3-34 Stage 2 Implementation | .............................................................. 92 |
| Figure 4-1 Design-based research Stage 3 (Reeves 2006) | .......................................... 96 |
| Figure 4-2 The data analysis spiral (Kervin et al., 2006 p,140) | ........................................ 101 |
| Figure 4-3 Cycles of Stage 3 | .............................................................. 103 |
| Figure 4-4 Cycle 1 of Stage 3 | .............................................................. 110 |
| Figure 4-5 Participants discuss 1995 TIMSS Video Study and the Teaching Gap | .............. 114 |
| Figure 4-6 Graph solution to JP problem (T.JP.I.1.P.1.10.J) | .......................................... 134 |
| Figure 4-7 Case 1: Japan Pilot 1 data for selected questions Tasks 2 & 3 | ......................... 142 |
| Figure 4-8 Case 1: Japan Pilot 1 P2 & P4 codes for Tasks 2 & 3 | ........................................ 143 |
| Figure 4-9 Cycle 2 of Stage 3 | .............................................................. 172 |
| Figure 4-10 Sample page from course | .............................................................. 186 |
| Figure 4-11 Example of ‘Making Connections’ problem, TIMSS 1999 Video Study | .............. 201 |
| Figure 4-12 Introduction: Course Planner | ........................................................... 211 |
| Figure 4-13 Cycle 3 of Stage 3 | .............................................................. 214 |
| Figure 4-14 Introduction: using the software | ........................................................... 220 |
| Figure 4-15 Facilitator homepages builder mode | .................................................... 234 |
| Figure 4-16 Facilitator Home Page viewer mode | ..................................................... 235 |
| Figure 4-17 Facilitator resources page | .............................................................. 236 |
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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