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

Gail Hood
University of Wollongong

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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

Declaration

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

2.8.1	Researching online professional learning.....	55
2.8.2	Why will this work?	56
2.8.3	The research questions	58
Chapter 3	Design-Based Research Stage 2.....	60
3.1	Introduction	60
3.2	Stage 2 Development of solutions	60
3.2.1	Components of Stage 2.....	61
3.2.2	Development teams	62
3.2.3	Stage 2: Development of solutions - content and pedagogy	63
3.2.4	Stage 2: Development of solutions - technology.....	84
3.2.5	Stage 2: Development of solutions - implementation.....	92
3.3	Summary of Stage 2 of the design-based research.....	95
Chapter 4	Design-Based Research Stage 3.....	96
4.1	Introduction	96
4.2	The data of Stage 3.....	97
4.2.1	Qualitative data	97
4.2.2	Quantitative data	98
4.2.3	Validity of the research	99
4.2.4	Data analysis in Stage 3.....	100
4.3	Cycles of testing.....	102
4.3.1	Pilots.....	103
4.3.2	Data from the cycles of testing.....	106
4.3.3	The review process	108
4.3.4	Facilitation and support	109
4.3.5	Materials	109
4.4	Cycle 1.....	110
4.4.1	Participants' backgrounds.....	111
4.4.2	Technology	114
4.4.3	Content and pedagogy	122
4.4.4	Implementation.....	163
4.4.5	Evaluation – General Cycle 1	169
4.4.6	Summary of refinements from Cycle 1	171
4.5	Cycle 2.....	172
4.5.1	Participants' backgrounds.....	173
4.5.2	Technology	178
4.5.3	Content and pedagogy	190
4.5.4	Implementation.....	207
4.5.5	Evaluation – General Cycle 2	211
4.5.6	Summary of refinements from Cycle 2	213
4.6	Cycle 3.....	214

4.6.1	Participants' backgrounds.....	215
4.6.2	Technology	217
4.6.3	Content and pedagogy	222
4.6.4	Implementation.....	231
4.6.5	Evaluation – General Cycle 3	241
4.6.6	Summary of refinements from Cycle 3.....	242
4.7	Summary of Stage 3 of the design-based research.....	243
Chapter 5	Conclusions.....	244
5.1	Introduction	244
5.2	Design principles.....	245
5.2.1	Technology	245
5.2.2	Content and pedagogy	249
5.2.3	Implementation.....	256
5.2.4	Summary of design principles.....	260
5.3	Impact on teachers' mathematical knowledge and practices	262
5.4	Educational research.....	263
5.5	Flexible delivery	264
5.6	Limitations of the study.....	264
5.7	Future research.....	266
References	267
Appendices	272

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

Figure 4-18 Facilitator Guide: Initial Explorations	237
Figure 4-19 Facilitator Guide: Hong Kong case study	238
Figure 4-20 Facilitator checklist for online and face-to-face delivery	239
Figure 4-21 Facilitation guidelines for flexible delivery.....	240
Figure 4-22 Facilitation guidelines - sample agenda	241
Figure 5-1 Design-based research Stage 4 (Reeves 2006)	244

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.