University of Pretoria – Botha, A. (2006)

The use of mobile phones to mediate a design experiment in a secondary school

by

Adele Botha

Submitted in partial fulfilment of the requirements for the degree

Magister Educationis

in

Computer-Integrated Education

in the

Department of Curriculum Studies

Faculty of Education

University of Pretoria

Supervisor: Professor Dr J.C. Cronjé

2006

I dedicate this dissertation to my husband, Phil, and my children, Danielle and Jean-Philippe.

Thank you for always being there…

Acknowledgements

I would like to express my appreciation to the following people who contributed in various ways to this study:

- My supervisor, Professor Cronjé, for his enthusiasm, guidance and support
- My college and friend, Jacqueline Batchelor, who acted as a sounding board for my ideas and who supported me throughout this course
- My friends and family, who strengthened me with their support, prayers and encouragement
- The management and staff of Cornwall Hill College, for making this study possible
- My colleges at Meraka Institute, for their support and fervour
- Elizabeth Makobe, for her unfailing encouragement
- The students who participated in this study and provided the data

Above all, to God, in humble gratitude and appreciation.

Table of Contents

Acknowledgements ---------- iii
Table of Contents ----------iv
List of Tables ----------viii
List of Figures ----------ix
Summary ---------- x
Keywords---------- x

CHAPTER 1 ---------- 1

Introduction---------- 1
1. Introduction---------- 1
2. Background---------- 1
3. Terminology---------- 2
4. Rationale for this research. ---------- 2
5. Purpose of research---------- 3
6. MobilED initiative---------- 4
6.1 Rationale of the MobilED initiative ---------- 5
6.2 First pilot study conducted at Cornwall Hill College ---------- 5
7. The research plan ---------- 6
8. Limitations of the study---------- 7
9. Ethical considerations---------- 8
10. Ensuring trustworthiness---------- 8
11. Significance of the study---------- 9
12. Organisation of the mini-dissertation ---------- 9

CHAPTER 2 ---------- 11

Literature Review----------11
1. Introduction----------11
2. Mobile learning ----------12
3. Application of mobile learning----------14

3.1 International case studies ---- 14
3.2 South African case studies ---- 17
4. Review of case studies ---- 17
4.1 Activity theory as a framework ---- 18
4.2 Review of case studies ---- 20
4.2.1 Mobile technology as tool ---- 20
4.2.2 Tool rules ---- 24
4.2.3 Division of tool labour ---- 25
4.2.4 Tool community ---- 25
5. Conceptual framework ---- 25
6. Summary ---- 30

CHAPTER 3 ---- 31

Research Design and Methodology ---- 31
1. Introduction ---- 31
2. Description of the mobile learning event ---- 32
2.1 Lesson Overview ---- 32
2.2. Initial limiting factors ---- 35
2.2 Context ---- 35
2.2.1 School ---- 35
2.2.2 Curriculum ---- 36
2.2.3 Target population ---- 38
2.2.4 Mobile phones of students ---- 38
2.3 Initial preparation and set-up ---- 38
2.4 MobilED Platform ---- 39
2.5 Support offered to learners ---- 41
2.5.1 Administrative ---- 41
2.5.2 Nano-learning ---- 42
2.5.3 Helpline ---- 44
2.5.4 Chat ---- 45
3. Research methodology ---- 45
3.1 Design experiment ---- 46

3.1.1 Concept ---- 46
3.1.2 Design experiment for this study ---- 46
3.2 The role of the researchers in this study ---- 47
3.3 Data collection and analysis ---- 48
3.3.1 Observation ---- 48
3.3.2 SMS logs ---- 49
3.3.3 Reflective reports ---- 49
3.3.4 Interviews ---- 49
3.3.5 Field notes ---- 50
3.3.6 Questionnaire ---- 50
4. Summary ---- 52

CHAPTER 4 ---- 53

The Research Findings ---- 53
1. Introduction ---- 53
2. How can mobile phones be utilised in teaching and learning? ---- 55
2.1 Push ---- 56
2.1.1 Nano-learning ---- 57
2.1.2 Deadline-driven administration ---- 61
2.2 Pull ---- 64
2.2.1 Learner-initiated interaction: The Helpline ---- 64
2.2.2 Facilitator-reactive interaction ---- 73
2.3 Chat ---- 74
2.4 Rules and norms that govern the interactions ---- 77
2.4.1 Time ---- 77
2.4.2 Texting on the mobile phone ---- 81
2.4.3 Using the short message service ---- 83
3. How useful was the MobilED wiki in facilitating information access? ---- 85
3.1 Student experience with the MobilED wiki ---- 86
3.1.1 Information access ---- 88
3.1.2 Audio vs text requests ---- 90
3.2 Student suggestions for improving the MobilED wiki ---- 94

4. Summary ---- 95

CHAPTER 5 ---- 97

Conclusion ---- 97

1. Introduction ---- 97

2. Summary ---- 98

3. Discussion ---- 100

3.1 Methodological reflection ---- 100

3.2 Substantive reflection ---- 101

3.3 Scientific reflection ---- 102

4. Recommendations ---- 103

4.1 Recommendations for policy and practice ---- 103

4.2 Recommendations for further research ---- 105

5. Closure ---- 106

Appendix 1:Facilitator SMS log ---- 107

Appendix 2:MobilED Platform SMS request log ---- 116

Appendix 3:SMS log summary ---- 118

Appendix 4:Lesson notes ---- 119

Appendix 5:Ethical Clearance ---- 124

References ---- 125

List of Tables

Table 1-1. A planning matrix for this study ---------- 7
Table 2-1: International case studies in mobile learning. ----------14
Table 2-2: South African case studies in mobile learning ----------17
Table 3-1: GoMobile learning event----------32
Table 3-2: GoMobile learning event planned timeframe ----------34
Table 3-3: Learning Outcomes and Assessment Standards for Physical Science(Grade 10, FET band) ----------37
Table 3-4: Nano-learning content and timeline ----------43
Table 3-5: Data collection methods used in this study ----------48
Table 3-6: Questionnaire ----------50
Table 4-1: Examples of deadline-driven administrative text messages ----------61
Table 4-2: Examples of student-initiated administrative text messages ----------67
Table 4-3: Examples of student-initiated academic text messages ----------69
Table 4-4: Examples of student-initiated technical text messages. ----------72
Table 4-5: Examples of facilitator-initiated general text messages----------73
Table 4-6: Emotions that are added to text messages ----------83
Table 4-7: Example of SMS lingo ----------84
Table 4-8: Invalid requests logged on MobilED platform ----------89

List of Figures

Figure 2-1: Vygotsky's triangular model ---- 18
Figure 2-2: Expanded triangle of an activity system ---- 19
Figure 2-3: The technological tool component with possible new relationships ---- 26
Figure 2-4: Activity theory model expanded to reflect the dual nature of Mobile learning ---- 28
Figure 2-5: Components of conceptual model ---- 29
Figure 3-1. Simple high-level usage scenario (from a user's perspective)(Aucamp, 2006) ---- 39
Figure 4-1: Pull and push continuum in the use of the mobile phone ---- 53
Figure 4-2: Usefulness of nano-learning ---- 58
Figure 4-3: The usefulness of deadline-driven administrative text messages ---- 62
Figure 4-4: Learner-initiated interactions ---- 64
Figure 4-5: Usefulness of the "Helpline" ---- 65
Figure 4-6: Distribution of text messages ---- 66
Figure 4-7: Usefulness of general class announcements ---- 73
Figure 4-8: Graph of the time distribution of text messages ---- 79
Figure 4-9: Graph of the daily distribution of text messages ---- 80
Figure 4-10: Student preference for text-entering interface ---- 81
Figure 4-11: Distribution of student satisfaction and dissatisfaction with the is MobilED wiki ---- 87
Figure 4-12: Student attitudes to wiki access with a mobile phone ---- 87
Figure 4-13: Distribution of requests that the MobilED platform received from students ---- 88
Figure 4-14: Finding information ---- 89
Figure 4-15: Distribution of audio and SMS requests ---- 90
Figure 4-16: Distribution of requests by hour ---- 91
Figure 4-17: Satisfaction with audio / Figure 4-18: Satisfaction with content retrieval SMS text retrieval ---- 92
Figure 4-19: Students' suggestions for making improvements to the MobilED wiki ---- 94

Summary

Current advances in mobile technology have enabled the formation of mobile technology enriched learning environments. This study documents a specific experimental research project in which secondary school learners used mobile cellular phones as a form of mobile technology to create, support and enhance a learning event in physical science studies. Although students used their own mobile phones for the duration of the research, they could connect to the MobilED platform used in this study to access information that they had previously created online. Mobile phones therefore served to extend the physical boundaries of the classroom by creating an ubiquitous and personal learning experience for each student. The experimental learning event was central to the design of the research. The iterative component of the design made it possible for the facilitator to operate as a "reflective practitioner" (Reeves, 2005) who could manipulate the components of the lesson in a quest for optimal success.

The data and conclusions of the study confirm that that the texting function of mobile phones may be effective in furthering communication, cooperative learning and access to content.

Keywords

Mobile learning	Mobile Phones	Nano-Learning	Design Experiment
MobilED	Mobile Technology	Cooperative learning	